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Integrated Watershed Development : Some Major Issues

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Prof. A Vaidyanathan has had a distinguished career as a development economist of rare perception and wide experience.

After obtaining Masters degree in Economics from the University of Pittsburg and Doctorate from Cornell University, he has been associated with a number of academic institutions and planning organisations in India and abroad. Some of the major institutions he has served with distinction include NCAER, Planning Commission, FAO, IBRD, Centre for Development Studies, Trivandrum and MIDS, Madras.

Prof. Vaidyanathan has lent his deep knowledge of development economy and varied experience in many spheres of the government to add weight and substance to several official committees and technical panels. A few of these bodies empanelling him were: Joint Indo-U.S. Study Team on Application of Systems Analysis of Optimum Management of Irrigation Facilities, Committee of the Union Finance Ministry for Improvement of Data for Short-term Forecasting and Policy, Committee on Taxation of Agricultural Income and Wealth (of the Finance Ministry), Committee on Fiscal Measures to Promote Employment (Finance Ministry), Panel of Economists of the Planning Commission, Committee of Experts on Employment Planning (Planning Commission), Advisory Committee on Irrigation and Water Management (Planning Commission), the Committee to review the Statistical System of Andhra Pradesh, and so on.

Prof. Vaidyanathan has over 35 research papers to his credit.

I am grateful to the Society for Promotion of Wastelands Development for honouring me with the invitation to deliver the Foundation Day lecture this year. The Society has been very active in spreading awareness of the alarming rate of soil erosion, land degradation and deforestation; encouraging and supporting voluntary efforts to tackle these problems on the ground; and providing a forum in which those actively involved in this effort — from both the government and non-government organisations — can meet and discuss their experience with an open mind. It has accomplished much in a short time and all of us, I am sure, wish and hope that it will grow in strength and continue its good work for a long time.

Evolution of the Concept

Soil, water and associated plants and animals, together constitute an important part of our natural resource endowment. This endowment is strictly limited even as the claims on its produce, on account of an expanding population and even modest improvements in living standards, is growing apace. The pressure on land resources, already severe, has been aggravated by an indiscriminate expansion of cultivation on marginal lands which are better used for pastures, trees or other uses. As a result problems of soil erosion, deforestation and land degradation have grown in dimension and become more difficult to tackle.

The necessity for purposive measures to check soil erosion, improve the moisture retention capacity and the natural fertility of the soil, and reverse the progressive decline in the extent and quality of forest cover has of course been long recognised. Successive five-year Plans have included a variety of programmes to this end; substantial resources have been allocated for these programmes and the scale of outlays has increased manifold. However, the approach has been to tackle each of these problems separately and piecemeal rather than in an integrated manner. Thus the soil conservation programmes of the agricultural department and, subsequently, those meant to raise the productivity of drylands have been confined to agricultural lands; construction and renovation of minor surface irrigation works is the responsibility of the PWD; while afforestation and social forestry are taken care of by the Forest Department. Increasingly, however, it has become apparent that all these are inter-related problems which need to be tackled in an integrated manner, not one by one. The concept of "integrated watershed development" reflects this awareness.

Surprisingly, the idea of an integrated treatment of all lands on a watershed basis was actually adopted and implemented by the Damodar Valley Corporation from as early as 1949. The Damodar Valley Corporation set up an "interdisciplinary department of soil conservation" — the first of its kind in India— with scientific manpower of "various disciplines like soil science, agro-engineering, forestry, social science, fisheries, grasslands development etc.". It is reported to have functioned in "an integrated way, and built a series of small ponds, afforested their catchments, reclaimed land to give land for land for the future dam construction oustees in the shape of bench terraces, controlled gullies through check dams and plantations. The department also set up production fisheries in the big and small reservoirs ....." (Bali : 1988 : 42-3).

But this remained an isolated experiment — about whose experience and impact very little is known— till the early seventies when the idea of integrated treatment of watersheds was revived in

the context of the programme to reduce the sediment inflow into the big reservoirs and, subsequently, to the catchment of selected flood prone rivers. The Soil Conservation Department of the Central Government took the initiative and sought to get the States adopt this approach by making it one of the conditions of assistance to the schemes for treatment of catchment of selected river valley projects and of flood-prone rivers, both of which weresponsored and funded by the Centre.

That contour bunding and gully plugging was not sufficient to check soil erosion and its consequences for productivity of agricultural land also came to be explicitly recognised in the early sixties. The Fourth Plan in fact proposed "an area saturation approach so as to treat all types of land on a complete watershed basis". Programmes of soil conservation were to be preceded by standard soil survey for the identification of priority areas within the watershed by means of interpretation of aerial photographs. Priority was to be given to areas which have a greater potential for development. Basinwise master plans were to be prepared to include afforestation, pasture development, terracing and bunding of cultivated lands, gully control and follow up measures to be coordinated among concerned agencies. The concept of watershed development combined with improved techniques has been reiterated in subsequent plan documents, the emphasis being on small watersheds of 1000 to 2000 ha.

A series of integrated watershed development projects (other than these for upper catchments of major river valley projects and flood prone rivers) were started during the seventies and early eighties : one of these is the ICAR operational research projects for integrated development of 47 selected watersheds.[1] Scientists from the Centre for Research in Dryland Agriculture (CRIDA); the All India Coordinated Programme for Research in Dryland Agriculture (AICPRDA) and their research centres were to prepare integrated master plans for the selected watersheds, to supervise and monitor their implementation by the concerned departments of the State Governments, and assess their impact.

A second set comprises projects for watershed development in rainfed areas funded by the World Bank : four of these are currently under implementation — one each in AP, Maharashtra, M.P. and Karnataka. The average size of a watershed under this scheme is much larger (around 25,000ha) than under the ICAR or the National Watershed Projects.

Then there is the National Watershed Management Project. Details of the distribution of these projects between States or their organisation and functioning are not readily available. During the 7th Plan they are reported to have covered 99 districts in 16 States. By 1984-85 an estimated 4,400 watersheds covering nearly 4.2 million hectares were under this programme. Based on their experience a new centrally sponsored scheme for National Watershed Management Project for Rainfed areas to cover all development blocks with less than 30 per cent of area under irrigation has been announced recently.

The initiative to promote watershed development has mainly come from the Centre. While the response at the State-level has been mixed, atleast three States seem to have taken the idea

1. Work on 29 of these were started in 1983-84. The area of the selected watersheds ranged from 120ha to over 2,200ha, the modal value being 500 to 1,000ha.

seriously and formulated fairly ambitious programmes. Thus Andhra Pradesh has selected 105 watersheds each of 2,000 ha, and a pool of Rs. 10 lakhs is made from allocations under various schemes for integrated development of each watershed. In Maharashtra, all activities in watershed of one village in each block are integrated under the leadership of the local MLA. This programme called COWDEP, was launched in 1980.

The most ambitious is Karnataka where a comprehensive land use management project (CLUMP) is to cover in a phased manner, all the 629 mandals of 5 selected drought-prone districts. For each watershed a comprehensive programme for the integrated development and optimum use of land, water, animals, energy and forest resources is to be prepared and implemented by a watershed development team with provision for bringing together all concerned line departments — namely, agriculture, soil conservation, rural development, forestry, horticulture, cooperation and animal husbandry — under the supervision of a District Dryland Development Board.

All these programmes provide for treatments to control soil erosion, optimum rain water utilisation, cropland improvement by using dry farming technology, farm forestry, horticulture and supporting measures for training and research. While organisational arrangements vary, all are concerned to ensure coordinated action by concerned departments in the project area. The more recent proposals also emphasise the necessity for consultation with and participation of beneficiaries, as well as equitable distribution of benefits. But all of them see the government departments playing the key role at any rate in the immediate future.

Non-governmental and voluntary organisations have also shown a growing interest in integrated watershed development. Some, like Ralegon Siddhi and Jawaja, started out tackling a particular problem (like water management and wasteland develpment) and came to the realisation that a broader, more inclusive, programme for ensuring optimum use of available land and water resources was necessary. Others (like Sukhomajri, Tejpura, Naigoan and Daltonganj) were conceived as integrated watershed projects. There have been doubts whether the watershed or the village should be the unit of planning, but in either case the idea of coordinated plan covering all land seems to command widespread acceptance. The SPWD itself, which started out being concerned primarily with wastelands, has come around to the view that development of degraded and other wastelands cannot be viewed in isolation from that of cultivated lands and that integrated programmes covering all categories of land in an area is essential. The Workshop on Small Watershed Development organised by the Society in 1988 reflects this perception and provided an opportunity for exchange of views on the key problem areas and formulating at least some tentative suggestions for future action. The summary of the workshop proceedings flags almost all the major issues (SPWD-n.d.).

Non-governmental activity is, however, quite limited in scale; and their projects are largely dependent on State funding. In any case the bulk of the integrated watershed projects are conceived, funded and implemented by the Government directly. Obviously there has been a marked increase of both the level of interest in this approach and also in the willingness to commit resources to implementing it. However, relative to the size of the problem and even the magnitude of resources devoted to these activities under the conventional programmes, "integrated watershed development" is still at an infant and largely experimental stage. Indeed even as the watershed approach was gaining greater currency, the tendency for proliferation of various special area, rural

development and employment programmes — all of which have one component or another relevant to soil and moisture conservation, afforestation and the like — has also been very much in evidence.

From the chart below one can see that there are nearly ten programmes dealing with one or more aspects relevant for watershed development. To the original list of departments involved in

PLAN PROGRAMMES UNDER WHICH DIFFERENT ELEMENTS OF WATERSHED DEVELOPMENT ARE COVERED

Dept/ Programme	Aspects covered					
	Soil conservation	Land shaping development	Minor irrigation	Sylvipasture/ pasture	Social/farm forestry	Afforestation
Agriculture						
Soil Conservation[1]	x	x	x	—	—	x
Integrated dryland agricultural development[2]	x	x	x	x	x	x
Special crop programmes[3]	?	?	x	—	—	—
Forests						
Afforestation[4]	—	—	—	x	x	x
Rural fuelwood[5]	—	—	—	x	x	x
Soil watch[6]	x	x	—	—	x	—
Catchment area treated RVP, FPR[7]	x	—	—	x	x	x
Rural development[8]						
DPAP	x	x	x	x	x	x
DDP	x	x	x	x	x	x
Rural employment programmes	—	x	—	x	—	—
National Wastelands Development Board[9]	x	—	—	x	x	x

1. Conventional soil conservation programmes cover only agricultural lands and concentrate on contour bunding, gully plugging, nallah control and other conservation works together with some afforestation of denuded areas.
2. Launched as pilot project in 1970-71 to test and demonstrate AICRPDA technology, modified in 1982 into integrated development of selected micro-watersheds and promoting available technique of dryland farming. Covers soil conservation, land development, construction of water harvesting/storage structures, improving vegetative cover and improved seeds and fertilisers.
3. Special programmes for pulses, oilseeds and cotton, which are largely dry crops, also provide for minor irrigation.
4. Includes seedlings for farm forestry.
5. Rural fuelwood plantation project introduced in 6th Plan in 157 districts — fast growing trees, fodder and small timber in block plantations and farm forestry.
6. Introduced in 1977-78 in selected micro-watersheds of Himalayan States.
7. River valley project catchments projects covers 587 watersheds in 27 catchments. Flood-prone catchment projects cover 240 watersheds in 8 catchments of the Ganga basin.
8. DPAP covers particularly all treatments figuring in watershed projects. Afforestation and pastures, explicitly on a watershed basis, with earmarked allocation.

   DDP started in 1977-78, operates in 21 districts (17 hot, 4 cold deserts) includes afforestation, pasture, shelter belt plantations and sand-dune stabilisation.

   Rural employment programmes cover in principle all the categories of treatment figuring in watershed projects. But social forestry and afforestation have earmarked allocations which are spent on projects of NWDB, Forest Department, zilla parishads, and cooperatives. Main component of wasteland develoment programme is to step up the rate of afforestation with people's participation. A shift of emphasis from social forestry and block plantation in Govt. land to farm forestry and community plantation on private and community lands . . . Funds drawn from various, other programme allocations.
9. NWDB set up in 1985 as a nodal, coordinating and maintaining body at the apex level.

this activity — namely soil conservation, minor irrigation and forests — has been added another, viz., the Department of Rural Development. The number of programmes under which each one of these activities are taken up has multiplied. The reporting mechanisms are so poor that it is difficult to say with confidence as to how much of a particular activity has been achieved under each programme. In every district the line departments pursue their own programmes largely unmindful of similar activity carried on by other departments. With rare exceptions (like W. Bengal) there is not even an attempt to avoid duplication of effort under different programmes. On the other hand, even programmes like the ICAR model watershed schemes and wastelands development under NWDB, which are supposed to be "integrated", remain fragmented in terms of funding sources and implementation responsibility. Thus the wastelands development programme draws funds from at least 5 different sources: The Central Government, the State plans, the Rural Employment Programmes; DPAP; and DDP. And different components of the model watershed plans are implemented by the respective line departments.

Highlights of Experience

Nor have the integrated watershed projects implemented under various auspices been an unqualified success. While no comprehensive evaluation of their experience is available, the annual status and progress reports on the ICAR model watershed projects, the evaluation reports on some of the River Catchment Area Projects and the papers presented at the Workshop on Small-Scale Watershed Development organised by SPWD in 1988 point to several weaknesses.

The organisation and expertise needed for preparing comprehensive plans for the selected watersheds simply was not available except in the ICAR. Even these, however, suffered from lack of skilled, experienced and motivated staff to implement the projects and this was aggravated by frequent transfers. They also suffered from lack of coordination between concerned line departments; absence of active interest on the part of the district level officers in monitoring the programme; complicated financial procedures leading to delays in release of funds; unrealistic norms and lack of flexibility in use of funds; weak arrangements for monitoring and evaluation; and the low level of beneficiary involvement and participation in the whole activity. A few impact studies have been made but these are not systematic enough. Also they have been done too soon after the launching of the project to permit confident inferences. The absence of any provision for follow-up action and continuing management of the watersheds after they are developed, is clearly a major weakness which is bound to affect the prospect of sustaining the impact. (CSWCRTI : 1987, Kartar Singh : 1988, SPWD n.d; Joshi: 1988).

These weaknesses have also been highlighted by evaluation of the scheme for soil conservation in river valley catchments (Agricultural Finance Corporation 1988). The Report on Nizam Sagar, for instance, found that inter-departmental watershed planning teams were not set up. Instead "the line departments separately prepare their parts of the plan and the two are artificially combined and called the watershed management plan". The "plans" are not even sent to the Centre for sanction; complete records of plans are not readily available anywhere; there is no effective arrangement for collecting basic data on sedimentation, hydrology, the use pattern of land, water, plant and animal resources needed for integrated planning. The staff of the Soil Conservation Department consist largely of agricultural personnel who are not equipped to perform

engineering functions. Their relation with other segments of the Agriculture Department are marked by an "undercurrent of hostility"; frequent transfers prevent development of the commitment and expertise to the watershed programme; the project is not given sufficient attention by heads of the State Agricultural Departments who are sometimes even hostile.

The evaluation further noted that there is no proper coordination between the soil conservation organisation for agricultural land and the Forest Department; unbalanced allocation of outlays results in "hillocks and nallas around the agricultural lands remaining bare and denuded"; district level coordination committees are not functioning; contact with people is poor and schemes do not cater to their fuel and fodder needs; the "guarding intensity" is low; and the Forest Department has no information about what is happening to the overall extent and character of the tree cover in the catchment (AFC, 1988).

That these weaknesses plague the small-scale watershed programmes generally is also abundantly clear from the proceedings of the national workshop of 1988 (SPWD). For the most part the watershed plans seem to be no more than a collection of departmental schemes. There is nothing like an integrated plan. Inter-department coordination has remained elusive: For example, the attempt of the Haryana and Punjab Governments to replicate the successful Sukhomajri/Nada models by creating coordination committees at various levels failed: the workshop noted that "the State level committee was not able to meet frequently as the members had many other priorities. The district level committee met more frequently but was not very effective because the funds were not under its control. As the State level committee rarely met the coordination among the Government's Minor Irrigation, Forest, Soil Conservation and Revenue Departments was not very good. The Sukhomajri model was totally dependent on a sociological perspective which was not acceptable to the technical departments of the Government".

"Lack of coordination and lack of integrated fund support go together.... individual departments, each with its own limited schemes and funds, initiated unrelated projects in the same villages. There was no movement towards a common objective". The workshop further noted that "watershed development work taken up by the Government tended to suffer from bureaucratic ways like standardisation and setting targets". Lack of technical expertise, so essential for demonstrating the value of the new approach to the people, was also a problem.

The lessons of this experience hardly seem to have registered. They have not deterred even more grandiose projects for integrated watershed development from being floated. Two such instances are the CLUMP and the NWDPRA. The former, prepared by the Karnataka Government, envisages a Rs. 6,000-crore project for integrated development and optimum use of land, water, animals, energy and forest on a watershed basis in 5 districts. It has all the ingredients of 'integrated watershed development' and some more (eg. upgradation of bovine stock through cross-breeding and stall feeding, agro-industrial complexes, planning of rural energy and improvement of habitation). But it is firmly cast in the mould of "schematic" approach, based on norms for each of the major components, their scale and unit cost per mandal. This may well be justified on grounds of convenience in presentation but one would have liked to see some indication that the mix of treatments and unit costs are apt to vary from watershed to watershed; and that we do not quite know enough to be able to assert the magnitude and timing of benefits with much confidence.

The plan has little to say on the lessons learnt from the earlier watershed projects for dry lands, in terms of the organisation and expertise available for the preparation of the plans, the quality of the plans, the efficacy of the State and district level councils and the watershed development teams as coordinating mechanisms or on the skill and motivation of the personnel. And yet the organisational arrangements proposed are much the same as in the earlier programmes. The document does not indicate how, if at all, the village community will be involved in the formulation of the plans, or how the "optimum pattern of resource utilisation" will be enforced on the beneficiaries individually and collectively.

The NWDPRA (Mark II) is even more radical than CLUMP in that it visualises active involvement of beneficiary community in all phases of the project. "Stimulating and promoting peoples participation in project planning, project preparation, implementation and post-project management of project assets will be an integral part of the approach and strategy". This is to be achieved either through establishing decentralised democratic institutions like the village panchayat or promote development of specific organisations to participate in all these plans especially "post-project maintenance and operation of community assets". A significant role is visualised for NGOs in creating awareness, training and evaluation and monitoring. Converting watershed development project from a Government scheme to people's movement is the ultimate objective. However, in the immediate future, the project will be largely planned and implemented by the Government agencies. The guidelines speak of learning "a lot from the village community and unlearn some of their orthodox views and technical assumptions about people's capabilities. In the ultimate analysis science and technology from research institutes, technical and managerial know-how of the project staff and accumulated experience of the village community shall be systematically integrated". Unexceptionable sentiments, but one would have liked some more concrete indication of the mechanisms of interaction between communities and the departments; between committees and individuals; and between departments concerned which will improve on the past record.

Compared to the governmental programmes those involving non-governmental and voluntary organisations reveal an approach which is very different, much more exploratory and open-minded. Marked by diverse social philosophies and approaches to local mobilisation, they show much greater awareness of the need for flexibility in both technical and organisational solution in the light of specific local conditions; of the tension between equitable distribution of the benefits from the development and the logic of local social and political configurations; of the problems in evoking community interest and participation and sustaining it; the need for innovative adaptations and the importance of learning from experience.

Many of these projects have also shown keen concern for evolving better, more cost-effective treatments, for improving the effectiveness of investments (eg. through proper choice of species, natural regeneration instead of plantations, reducing costs of raising nurseries and improving the survival rates of planted saplings). There are also instances of experimentation with new designs and materials to reduce costs of structures, evolving multi-tier crop-cum-tree systems to make more effective use of soil moisture and simultaneously augmenting the moisture storage capacity of the soil, and developing low-cost water distribution systems using local materials and skills. There is a great deal more appreciation — some times to the point of a fetish — of the need to utilise local knowledge and experience and necessity to adapt programmes to circumstances which are highly variable.

The NGOs are acutely conscious that such extensive local resource development programmes cannot succeed without the consent, involvement and active participation of the beneficiary communities. Their efforts to secure community involvement run into the problems created by differing perceptions and conflicting interests of various groups. A great deal of time and effort goes into tackling these problems. One also notices a marked concern for equitable sharing of the benefits of the programme particularly by the poor and disadvantaged groups. Some remarkable examples of success in tackling these problems have been reported — eg. Sukhomajri, Ralegon Siddhi, Pani Panchayat of Salunke, to mention but a few. But as the 1988 workshop showed there are serious difficulties in securing people's involvement and ensuring equity; at any rate, there is no single general pattern.

It is also apparent that the social orientation of the NGO groups is often much stronger than their technical skills/experience, that a great deal of their effort is spent in mobilising funds and liaising with concerned Government departments who are not always favourably disposed to such initiatives.

That integrated watershed development is an excellent and eminently rational concept is hardly in doubt. Piecemeal treatments to address particular categories of land and particular aspects of the problem will not do. Soil conservation of farmlands or construction of irrigation ponds will be of limited value unless restoration of vegetative cover on degraded upper slopes are also taken up and maintained properly. Appropriate treatments for all categories of land in the watershed is essential for lasting improvement in productivity and ecological stability. The watershed is the basic natural unit for planning, while the village is the basic social unit. But there need be no hiatus on this account. As Ralegon Siddhi shows the lands in every village are made up of one or more small watersheds each of which can be planned taking into account the village's needs and priorities.

The technical ingredients of such an integrated programme are reasonably well known in broad terms. But given the great diversity in terms of topography, terrain, agro-climatic conditions, extent of degradation and existing land-use patterns, the specific treatments and techniques cannot be reduced to a standard pattern to be applied uniformly. The kind of measures needed in the upper Himalaya catchments will obviously be very different from those in the Western or Eastern Ghats; the arid and semi-arid tracts of the Deccan and Rajasthan will call for different approaches compared to, say, Chhotanagpur and much of central India; the problems of the Gangetic plain and the deltas are of an altogether different character. It would perhaps help in determining relative priorities and differentiating the appropriate treatments if watersheds can be classified into distinct types in terms of the relevant characteristics.

Data Base for Planning Watershed Development

Watershed planning calls for a great deal of information on all the above-mentioned dimensions in respect of each selected watersheds. The inadequacy of the organisation and skills needed for collecting and interpreting the data has been widely noted. It would take an inordinately long time and be far too expensive if we were to rely exclusively on organisations like ICAR research institutes, All India Soil and Land Use Survey, and Survey of India . Speedier, less expensive,

techniques and organisation have to be evolved. A two-pronged approach is desirable.

First, much greater use should be made of remote sensing methods for mapping basic land forms, land-use, vegetation and water resources on a micro-watershed basis. This is a powerful technique whose range and precision is constantly being improved. The real bottleneck seems to lie in the capability to interpret the imagery, prepare the maps and verify the information on the ground. Interpretative capability exists in the NRSA, ISRO, space application centres in several States and in universities and research institutes. The NRSA has set up a special unit (NRDMS) to collect data needed for micro-level spatial planning. But the scale is limited and the resources appear fragmented and the problems of applying the technique on a large scale, including those of ground verification, have not been effectively resolved.

In order to harness the potential of remote sensing for watershed programmes it is essential to have a comprehensive review, involving both the experts and the users of the data, to assess the specific types of information relevant to watershed planning that this technique can generate; the kind of ground truth verification needed to firm up the information base; the level of precision and costs; the scale on which this activity can be undertaken with available personnel and equipment; and the rate at which these capabilities can be augmented. The senseless restrictions on making the satellite imagery available to the public also need to be removed if the technique is to be of much use for watershed planning.

This still leaves a great deal of other data (for example, status of land use contours; nature, depth and fertility status of soils; degree of erosion in different parts of the watershed, extent, nature, and use of tree and grass species grown locally; distribution of land ownership, the extent of common land and its legal status) to be collected in each watershed. At present such data— to the extent they are at all collected— are compiled wholly through the Government bureaucracy. This is neither desirable (because of the time and cost involved), nor necessary.

Much of the information can be collected by reasonably educated members of each community after some training: relatively simple and inexpensive techniques for contour mapping, permeability measurements and soil analysis are available. A recent pilot experiment at the Centre for Eastern Sciences in Kerala has shown that trained volunteers from the community can produce reliable and detailed maps of high quality with the help of cadastral maps and some supervision. Such techniques — implicit in the idea of 'barefoot' ecology workers advocated by Anil Agarwal — should be pursued seriously. Apart from the saving in time and cost, it could be an extraordinarily effective way of educating people in each community about the basic concepts, the techniques of measurement and their significance. And it will make for more informed local participation in formulating and implementing the actual programme.

It is, at the same time, essential to recognise that one cannot wait for all the relevant information before starting on the projects. The information available, especially in the initial stages, is bound to be incomplete and even unreliable; nor is there sufficient experience in other similar contexts to fall back upon. Under these circumstances a certain amount of trial and error, learning from experience and gradual step-by-step upgradation of the programmes is imperative and must be conciously built into the design of organisations for watershed planning.

Technology Inputs

Technically investment in watershed project involves the following categories of activity: (a) soil conservation (b) restoration of tree/grass cover (c) measures to improve soil moisture storage; and (d) percolation ponds and minor irrigation structures. Each one of these involves a combination of several measures. And project planners must choose the right mix of measures and proper design (from the engineering viewpoint and in terms of cost effectiveness) of each. It is recognised, in principle, that the mix as well as the design of specific treatments must be adapted to the conditions of each watershed with due regard to cost and effectiveness. However, the emphasis on schematic budgets, and the poor mechanisms of monitoring make one doubt whether there is adequate sensitivity to these aspects, not to speak of innovation. At any rate there is hardly any systematic analysis of experience of the government watershed programmes in this respect.

Considerable controversy exists on the appropriate type of structures, materials and construction techniques to be used. There is a great deal to be said in favour of local materials; but not for relying wholly on traditional technology and skills. Tradition does not provide technologies to solve all problems; it certainly does not always provide the best solutions to problems involved in watershed development. It is unwise to deny the programme the benefits of different approaches and different technologies (including modern techniques) evolved elsewhere. A combination of local materials with modern engineering techniques may often be technically superior, cheaper and also serve as a means of upgrading local skills with on the job training.

The limited experience so far has thrown up several interesting possibilities for innovative design using critically reinforced local timber and such other materials along with modern reinforcement techniques to permit traditional materials like mud to be used in constructing structures; and newer products of modern materials technology (in the form of geocrete, geomembranes, filter fabrics, ferrocement, etc.). which improves performance and'/or custs costs. Illustrative calculations of designs using alternative materials suggest potential cost savings ranging from 30 per cent to 80 per cent especially in construction of small dams, embankments, ponds and water distribution. (Datye etal 1988).

Similar opportunities for innovation exist in the context of natural vs artificial regeneration of forests, choice of species for planting, techniques of raising nurseries, techniques for more economic and productive use of water. Several projects (especially that in which NGOs are involved) have conciously explored alternative cheaper solutions to these problems. The solutions, it may be noted, are not always technical. Often (as in the case of natural regeneration, nurseries and tending saplings) they require institutional measures. Examples of technical innovation include the multi-tier cropping system, and cheaper water conveyance systems: for instance, if crop and tree species are so chosen as to combine or alternate shallow and deep-rooted species, the volume available for storage of moisture in the soil and the effectiveness with which this storage is used for producing biomass is greatly increased even as the recycling of biomass could contribute significantly to improving the quality of the soil. The nature of the crop pattern and the water distribution system has a significant bearing on the volume of benefit in terms of additional output per unit of water and therefore on how widely the benefits can be shared.

One need not accept all these claims as valid to recognise that there are exciting possibilities

of creative combination of traditional materials and skills with those of modern technology. Will this not make the watershed development dependent on outside expertise? Clearly engineering design/developing/adapting newer materials or reinforcement techniques will require the support of highly trained technical personnel and institutions. But if they are brought into a continuing interacting relation with the beneficiaries, with good networking for dissemination of information regarding new technical developments and the experience of their actual application, there need be no danger of dependence; it should be possible to develop a matually benefical and creative relationship in which universities and research institutes can also be meaningfully involved.

Costs and Benefits

At present watershed development, like much else in rural development, is funded mostly by the State. The quantum of resources available for such activity is very much larger than the amount properly spent on so-called "watershed projects"— a great deal of the expenditure being, as we have already noted, spent on particular components of activity which figure in watershed projects but in a totally piecemeal, uncoordinated way. By shifting to the integrated watershed approach the available resources can be put to far more effecitve use and that is by itself a very strong argument for such a shift. However, apart from considerations of equity which argue for limiting State funding of improvements/treatments on individual farmer's lands, there is need to look more closely at costs of watershed projects.

Data for 16 of the ICAR model watersheds suggest that the cost per hectare of watershed area varies over a wide range: between Rs. 1,000 to Rs. 9,500 (Dhruvanaryana, 1990). Typically these include soil and water conservation works, vegetative protection measures, and measures to raise productivity of crop and animal husbandry in the watershed. Not surprisingly, the relative importance of different elements of treatment also varies. The estimated cost per ha for the CLUMP project proposed by the Government of Karnataka is around Rs. 12,000 per ha., but this includes many more activities than the estimate for ICAR projects.

There are several difficulties in using these cost figures. Apart from the fact that they relate to outlays on projects started and completed at different times in a period of rapid price inflation, one has to allow for differences in the degree of degradation and prior investments in land improvement when projects started. The precise scope of these estimates are often unclear: for instance, do they include cost of all improvements or only what is spent by the State? Is there a uniform convention about the treatment of outlays on maintenance of conservation structures, trees and grass plantations, and replacing saplings which die? Or about the outlays on programmes for raising productivity crops, and livestock?

Cost per hectare of area covered by each treatment could help management to explore ways to cut costs. Comparative analysis of costs for similar treatment across projects can also be useful provided care is taken to allow for the effect of variations in topography, soil, water supply and other conditions. The SPWD paper on the Jawaja project illustrates the kinds of insights which such analysis can provide. Such analyses are, however, very rare. For the purposes of cost benefit comparisons, it would be more appropriate to relate initial investment costs (including costs of tending forests and grasslands to the stage of bearing and of irrigation structures both on common and private land) to the area of watershed; specifying the composition by category of treatment

rather along the lines adopted by ICAR; and converting costs to a comparable price base. (For an illustration of cost-benefit analysis of watershed projects see Chopra, Kadekodi and Murthy 1988.)

Costs, however, do not have much meaning except in relation to benefits. It is here that the gaps in information are most glaring. There seem to be hardly any systematic baseline surveys of land-use and production of crops, timber, fuel, fodder and animal products before the project. Assessment reports of a few watershed projects give the estimated crop yields, usually for one year, compared to non-treated areas and occasionally pre-project yields. Estimates of fuel, fodder and animal products are seldom available. A proper assessment must compare land-use, cropping and production averaged over at least 3 years before the project and after completion of the treatments. Single year data, being affected by volatility of weather condition, can be quite misleading. Also these assessments have to be done for some years after the treatments are complete because the full benefits take time to manifest and there is always the danger that the facilities created are not managed properly on a continuing basis.

Evidently the arrangements for compiling such data on a scientific and objective basis are very weak, if they exist at all, even in the case of the ICAR model watershed projects. It is obviously difficult, both in terms of organisation and cost, for the Government to conduct such elaborate surveys in all watershed projects. The Government should undertake rigorous, independent, monitoring both during and after the completion of treatments only for a select sample of the projects typical of different situations. For the rest, each watershed community must be encouraged to undertake, systematically and on a continuing basis, surveys to collect data on the implementation of all important aspects of the project in their respective localities and the change in land-use, tree and grass cover, water availability, and yields before and after the project. Educated people in each community with some training can undertake this work and help the community to review the results in an informed manner.

Governmental Organisation

We have already seen that the watershed development programme is dominated by the bureaucracy with far too many departments being involved and integration and planning being conspicuous by its absence. There is near unanimity about the desirability of bringing all the concerned activities under a unified control at the watershed level. All the watershed development programmes have devised, on paper, arrangements to get the concerned departments to work together in achieving this goal. But clearly these arrangements have not succeeded in breaking the parochialism of line departments. The proliferation of programmes under which watershed related activities are taken up has added to the confusion. Changing the narrow departmental outlook of line department staff and getting them to view their particular segment in relation to other aspects of watershed development will need drastic action.

In order to get the process going two things are essential. First all watershed related schemes should be merged into single unified project focussed on a particular watershed, each with a consolidated budget. A great deal of the existing programme categories like soil conservation, minor irrigation, social forestry etc. will give place to a large number of area specific watershed projects each of which will include these elements.

There is really no need for separate programmes for soil conservation, social forestry and minor surface irrigation works, nor for separate area programmes like wastelands development, DDP and DPAP. A good part of the tribal area development and the various rural employment programmes can also be merged into local area development programmes centred around the watershed. A pooling of resources under a single programme will help reduce the duplication, fragmentation and the resulting waste which characterise the existing dispensation. It is on this logic that the approach paper to the 8th Plan proposed that all local area development and employment programmes be merged into a single pool and transferred on the basis of well-defined criteria to the zilla parishads and other elected local government institutions through the States. A substantial part of this— the exact amounts to be determined in the light of local conditions— can then be used for watershed development as part of local area plan.

Second, and as a corollary, the field staff of concerned line departments at the district level and below should be brought under the unified control of a watershed project manager selected for his managerial rather than specialised technical skills. The higher echelons of the line departments will then be mainly responsible for promotion of research, collating findings of research as well as experiences gained from projects all over; organising independent technical assessments of the design and performance of works done in various projects and disseminating them to the watershed project managers as well as people at large; and maintaining high standards of the technical personnel through training (Bali, 1988). The senior personnel of line departments could also play very useful role in periodic supervision of the implementation of the area specific watershed projects (Bali, 1988).

Such an arrangement is obviously quite a radical departure from existing patterns. Administrators, especially in the States, do not react favourably to the idea. But the experience of the committee system of coordination in rural watershed programmes as well as the Command Area Programme — which was another attempt to achieve integration — make such a departure inescapable if we are really serious about integrated watershed development.

Ideally both the State agencies and the NGOs, should play the role of a catalyst in stimulating village communities' interest in watershed development and in providing them the necessary technical and financial support. But this approach cannot be effective unless the benefits of this approach are convincingly demonstrated on a sufficiently large scale and in diverse situations. Also given the weakness of democratic institutions of local government and the fact that village communities are often segmented by caste, land holding and other factors, no single pattern may be feasible. It is important to recognize that we are still in an experimental stage both technically and institutionally, and therfore, ample scope should be given for trying out different approaches.

It is useful in this context, to distingush between three types of situations: (1) those watersheds which consist predominantly of forests or which are situated in the upper reaches and higher elevations of river catchments and where soil conservation and afforestation will be the main component of watershed treatment, (2) those where substantial part of the area is, or should be, under forests but a sizeable human population depends in various ways on the forests for their living, (most tribal areas fall in this category),(3) all the rest where a large part of the land is under settled cultivation. The range of treatments required, as well as the nature of the technical and institutional problems to be resolved in these three situations are different.

The first category can be largely left to the responsibility of the forest departments. The necessary complement of expertise from the other relevant disciplines (soil conservation, civil engineering) can be inducted into the department. In the second category, which is also likely to be in predominantly tribal areas, the Forest Department will clearly have a major but not exclusive role in as much as important issues regarding the right of the tribal population in relation to forests and the optimum development of land use to meet their needs consistent with ecological balance have to be addressed. In the third category the changes in land-use pattern and soil conservation measures will have to be primarily concerned with achieving the maximum sustainable level of productivity (in terms of food, fibre and timber) to meet the needs of the population dependent on the watershed.

People's Participation

Consolidating all local land, water and forest programme area development projects with the watershed as the basic unit and bringing the Government personnel involved in this programme under a unified command at the field level are necessary but not sufficient. The watershed teams should be prepared not only to carryout projects on their own, but also to help NGOs and village communities who may be interested to do so. In all cases the State agencies should actively explore (a) ways in which local people's knowledge, experience and sense of priorities can be combined with the available scientific and technological knowledge to mount a more meaningful and therefore more effective programme; and (b) ways in which a credible (i.e., enforceable) collective consensus on the content of the programme, its management and the sharing of the benefits can be forged.

Even now there exists a broad consensus on the desirability of people's involvement in watershed programme, yet in reality there is very little of even consultation with the beneficiary communities, not to speak of any meaningful participation in any phase of the programme. The Government bureaucracy is simply not used to the idea and is frankly quite skeptical whether it will at all work. (They are not, it should be said in fairness, the only ones to be skeptical.) Many reasons are cited: the illiterate villagers cannot grasp the technical complexities of engineering and managing such a complex activity; the communities are so divided and full of conflict that they can seldom agree on a common programme; and handing over large sums to such communities will either lead to waste or be used to the advantage of the already better off and powerful segments of the rural communities. Similar arguments have been made against democratic decentralisation.

Some of this—especially questioning the relevance of villagers' knowledge concerning their immediate environment for planning local development works and the notion that villagers will use resource more wastefully and less equitably than the State agencies—is palpably wrong. Further more the projects prepared by the State agencies are often less than satisfactory, partly because of insufficiency of expertise and motivation, partly to poor attention to the specific local conditions. Having said this one cannot also make the mistake of romanticising the beneficiary communities' capacity to conceptualise what it takes to develop the local resources, what the appropriate technical solutions and their implications are; and how different facets (technical and social) of this process relate to each other. Nor can any one wish away the existence of conflicts in village communities.

Merely leaving things to be decided by village communities will not do. Involvement of external agencies (both Governmental and non-governmental) is essential to make the community appreciate the necessity for watershed development and its implications; to bring in relevant knowledge to tackle the problem; and, where necessary, to safeguard the interests of the weaker and poorer segments of society. This last mentioned intervention is needed especially when democratically elected representative institutions of local government are yet in a fragile fledgling state and the poor are not in a position to press their interests effectively. Since the bulk of the funding of the watershed programme is provided by the State, the Government agencies can legitimately intervene to protect the interests of the poor. The question is what kind of a role these agencies should play.

That this can be done is amply borne out by the experience of several NGOs which have persisted in getting the community involved without being daunted by failures. It is perhaps unrealistic to expect such dedication in a large bureaucracy, but the State bureaucracy working in collaboration with NGOs could make a significant difference, provided there is acceptance of their complementarity and a mutually supporting relation is established between them.

While this takes effort on the part of both the State and the NGOs the State agencies have perhaps to exert much more to change their long entrenched attitudes towards non-governmental initiatives. One implication of this is to permit a great deal of latitude for deciding the scope and content of particular area programmes, for experimentation and gradual learning from experience. Schematic budgets, rigid specification of scope and content, insistence on targets and "norms" for unit costs—are all inimical to such an approach and should be drastically changed.

The problem of securing an enforceable collective consensus is considerably more difficult. What is good for the community and what equitable distribution of benefit should be cannot be decided by an external agency. At any rate such a fiat will not be enforceable: it will be frustrated in a hundred ways if the centres of local power where they are strong do not find it acceptable.

A group of people will agree to cooperate for the collective good provided (a) such action is expected to bring a substantial magnitude of benefits to the group as a whole both in relation to the size of group and to the costs involved; (b) the sharing of costs and extra benefits resulting from such collective action is seen by the group to be "fair"; and (c) the arrangements for ensuring that the agreed sharing of costs and benefits will be effectively enforced.

In the case of watershed development the magnitude of likely benefits and their time-phasing cannot be predicted, in the current state of knowledge, with a reasonable degree of precision, even by experts. This being the case, it would not be easy to convince potential beneficiaries that their acceptance of the obligations (= costs) in collective projects is worth their while. In this context the State and the NGOs have an important role in demonstrating that well-planned, integrated watershed projects can indeed make a substantial increase in the overall productivity of land.

Even if the State were to meet the bulk of the initial investment cost, the members of the beneficiary community have to accept obligations (for proper maintenance of bunds and other physical structures, taking care of the trees and making sure that the rate of cutting of timber and grass is regulated within well-defined limits) involving restraints on the existing pattern of access

and use of common resources, and also contributions for maintaining the organization. The willingness to accept these depends critically on how the participants view the "fairness" of the burden sharing relative to the benefit sharing and how they evaluate the ability of the organisation for managing the programme to enforce this sharing (including dealing effectively with the so-called free riders).

Where—as is typically the case in Indian villages—there is no prior experience with institutional arrangements to handle such problems, the community's assessment is likely to be strongly coloured by past experience regarding the way community institutions function. That these institutions are not "fair" to the lower castes and to those without any asset base will surely affect their attitude to fresh collective efforts especially in relatively uncharted areas. In view of all this it would seem worthwhile for the State and the NGOs to make a special effort to select areas for demonstration projects where the potential for intra-community conflicts is also low. This is apt to be the case when the community is marked by relatively low class/caste differentiation and/or a strong, generally respected, local leadership.

The uncertainties about benefits, legal problems and their sharing are compounded by the present legal position regarding the Government, the village community and the individuals over land not under private ownership. One problem relates to forests: ownership of all forest land is by law vested with the State. Prior to the coming of the British the forests were an important source of livelihood for those living in and around them. This "constructive dependence" of people on forests began to weaken when the British declared forests, which were traditionally controlled and regulated by the local communities, as State property. During the last three decades of planned development, clear felling has destroyed forests and reduced area accessible to forest dwellers. And the traditional rights of tribals to collect a variety of produce in protected forests have been restricted by reclassifying large areas as reserved forests (Gadgil, 1989, Fernandez, 1988). Under these conditions the beneficiary population is unlikely to have much of an interest or stake in watershed development and without their cooperation the programme is unlikely to make much headway.

A similar problem also exists in non-tribal areas. Data on distribution of land by legal title is hard to come by. A recent survey in selected districts from different parts of India suggests that the ownership of "idle" land is distributed between the cultivators, village panchayat and the Government. The proportion owned by cultivators (i.e., private property) varies from as little as 17 per cent to 100 per cent; that owned by panchayat from nothing to 58 per cent and Government-owned land between nil and 48 per cent (Raheja and Banerjee 1988). The ownership of uncultivated land is thus fragmented: part of it may be already encroached and effectively under private control. The development and access to forest land is controlled by the Forest Department which is quite reluctant to give up their control to the village community; the status of village commons to the extent they have not been appropriated by private individual, are ill-defined and the rights of exploitation are not clearly codified.

The complexity of the rights over such land and its effect on land improvement projects is illustrated by the following account concerning a district of Bihar:

"To carry out official afforestation programmes the Forest Department has issued a notification

to form village forest committees, give further and carry out joint forestry programmes with the villages. The Revenue Department has also issued authorisation under rural development programmes to give pattus and form a different type of village forest committees. Both these notifications totally ignore the Chhotanagpur Tenancy Act 1910 and khaitam Part II operative in S.Bihar which has already recorded rights of individuals as well as villages to jointly use forests. Since the Tenancy Act and recorded rights are in force.... the notification cannot be implemented without running into serious legal problem (Chattrapathi Singh, 1988).

These anomalies and confusion can be substantially mitigated by the following measures: The Forest Department should be made solely responsible to protect "areas which are genetically rich and ecologically fragile and which must.... have an undisturbed natural forest cover" (Agarwal and Narain, 1989) and also areas, such as in upper catchments of rivers and in hilly tracts, which are (or should be) mostly under forest cover. In the former, "mining and all the other such human activity should be banned or extremely restricted". However, regulated usufructory rights to fuel, fodder, medicinal herbs and other produce essential to people living in and around the forests should be permitted/restored. This is especially important in tribal areas.

All other degraded and uncultivated land - which are now "owned" by the Government or the village community - should be brought under the control of village communities taking care to clearly demarcate the boundaries of common lands vesting with each village, making it legally obligatory for them to use such land for growing trees for the common benefit of its members. It has been suggested that the panchayat should be legally accountable for negligence in discharging this responsibility and that, to this end the maintenance and regeneration of forests on common lands should be the first charge on revenues earned from such land. All this calls for a thorough review and recasting of laws relating to common lands, forests, forest conservation and rights of individuals to the produce of such lands (Agarwal and Narain 1989; Chattrapathi Singh, 1988).

There are also legal problems impeding local initiatives in constructing small irrigation and water harvesting works (Agarwal and Narain 1989; Datye, personal discussion). Under the existing law all rivers including streams and rivulets, are government property. No individual or village community can use them to store water without the permission of the Government. There are several documented instances of objections from the PWD or its refusal to grant permission preventing the construction of such small storage or diversion structures by community effort. While the Government does have a responsibility to ensure that available waters in a river basin are optimally utilised and in such a way as to distribute the benefits in a reasonable fashion between different parts of the basin, the present restrictions on small, purely local works should be substantially reduced in the interest of promoting watershed development.

Distributional Aspects

A clearer, simpler enunciation of legal rights in relation to common lands and local water conservation works will clearly help. But there is still the problem of getting an agreement in the community about the sharing of costs and benefits and of devising mechanisms by which this sharing can be enforced. Some have taken the view - on the basis of experience of projects like pani panchayat and Sukhomajri - that a strictly egalitarian sharing of the benefits arising from the development of common lands is not only desirable but essential to generate peoples' participation

and contribution. I am not p[illegible] ted to a universal principle.

In Sukhomajri, for instance, everyone had an equal share in water. Those who didn't have land sometimes leased in land in exchange for their water rights; some sold their share of water to others with land. In the nearby village Dhamala there was, however, not even an attempt at egalitarian distribution: only the landed got water in proportion to their land holding. But this did not lead to the society falling apart. Complete equality is thus not necessary for the success of cooperative effort. Viable collective institutioins are feasible provided all parties are persuaded that the new arrangement will make them better off in some way and that rules regarding the maintenance and use of common resources are properly defined and enforced. The quality of local leadership is, therefore, a critical factor (Chopra and Kadekodi, 1988).

Given that village society is divided by caste and by command over productive assets, the sharing which a particular community considers reasonably fair for all concerned may well fall short of the ideal. The acceptable and enforceable compromise will necessarily reflect the extent of social and economic inequality in each community, the level of general poverty/deprivation, and the character of the leadership. If a compromise needs to be made between the workable and the ideal, the choice should perhaps tilt towards the workable, for, without that the prospects of raising the overall productivity of the watershed's land and water resources may be jeopardised.

At the same time, we need to incorporate in the project ways in which a fairer distribution of benefits and costs in favour of the poor/vulnerable segments can be promoted. First and most important is to insist on all aspects of the issue being openly discussed in the community before drawing up the watershed plan. The necessity to give the poorer segments a sizeable share of extra fuel, fodder and water generated by the project could be explicitly made as one of the conditions of State assistance for the project. The Pani Panchayat technique of giving equal share in available water (in spite of whether or not a person owns land) is one way. Reserving the benefits, of wage employment during the developmental stage exclusively for the disadvantaged groups, and leasing of forest and grassland to be maintained by poorer groups in exchange for rights to exploit and market the produce are some others. In some cases the poor have been given access to certain designated quantities of fuel and fodder. As far as possible sharing rules should be such as to create incentives for their observance by individuals and groups so that reliance on enforcement by fiat is minimised. Relying purely on fiat is in any case unlikely to be effective.

Requiring individual beneficiaries to meet all or a good part of the costs of improvements effected on their private lands, while the State or the community bears the cost of improvements to common land clearly helps equity. Yet another technique, which is reported to have been fairly successful in Sukhomajri and Daltonganj is to require a substantial part of the incremental produce for further investment in community assets. A variety of such devices have evidently been tried out especially in projects in which NGOs have been active. Government projects have been far less sensitive to this aspect of practice, if not in concept. It would be worthwhile for an organisation like SPWD and on-going community projects to delve deeper into the nature and extent of rights and obligations of various individuals and groups in relation to the development of common resources, the manner in which they were maintained and their effectiveness. This may give valuable clues for improving the organisational design of watershed projects.

Conclusion

Let me conclude by highlighting some of the main points emerging from this review: watershed development is a good concept and must form the basis of planning soil conservation, land improvement and afforestation. Ideally the programme of local watershed development should be left to be planned, implemented and managed by democratically constituted panchayat raj institutions, with technical support from the Government and the NGOs. But since these institutions are not in place everywhere and the programme is still in an experimental stage, the governmental agencies and NGOs will have to play a significant role in demonstrating the efficacy of the approach, educating village communities about its rationale and encouraging them to adopt it. Government should recognise and actively encourage NGOs to play a wider role. The quality of planning and implementation has to be greatly improved if it is to demonstrate convincingly the benefits from watershed approach to planning. This and a rigorous evaluation system as the basis for learning and adaptation are essential to spread the approach widely. No quick results should be expected. By its nature, these projects will take 10 years or more to make their full impact felt.

Integration of all the departments concerned with various aspects of watershed development is an essential pre-condition. Professional personnel who are willing to commit themselves to the programme and be assigned for sufficiently long periods in the same area should be chosen to implement demonstration projects all over the country. In all projects — whether it be by Government or NGOs — the people of the affected watersheds should be consulted to take advantage of their knowledge of local conditions and problems as well as to let their collective sense of priorities shape the projects. The necessity of trying out diverse approaches should be explicitly recognised. Critical review of experience from different projects as the basis for improving design and implementation of future projects should be institutionalised.

It may not always be possible to get communities to accept integrated plan covering all lands and treatments to begin with. It may often be necessary to start with those components in which the community is interested and can agree upon. The scope can then be expanded progressively building on the concrete experience, at every stage, of the benefits of the programme and the feasibility of managing complex tasks which it involves. Innovative methods of involving local people in collecting and interpreting data and of exploring cost affective improvements in collaboration with technical experts from outside — should be consciously encouraged.

For the viability of community effort not only should people be convinced that overall benefits will be substantial but also that everyone stands to gain in some degree and that sharing of costs is fair. A variety of devices need to be used to ensure that poorer and vulnerable groups got a fair share of the benefit. But it may not always be possible to achieve the 'ideal' distribution of benefits; certainly it cannot be enforced by outside agencies purely through the medium of the watershed projects. Genuinely democratic institutions will help, but may not always lead to greater equity at any rate immediately. Nor is an egalitarian distribution always necessary for [illegible] effort: the aim should be to get as wide a sharing of benefits especially among the [illegible] unity can be got to accept as reasonable so that an enforceable consensus [illegible] can be achieved thereby paving the way for implementing integrated wa[illegible] wide scale.

References

1. Annonymous — nd : Ralegan Siddhi : An experience in Watershed Development (mimeo)
2. Agarwal, Anil and Narain, Sunita — 1989 : *Towards Green Villages :* A study for Environmentally Sound and Participatory Rural Development. (Centre for Science and Environment, New Delhi).
3. Agricultural Finance Corporation — 1988 : Report on Evaluation Study of Soil Conservation in the River Valley Project of Nizamsagar (Bombay)
4. Bali J.S. — 1988 : A Critical Appraisal of Past and Present Policies and Strategies of Watershed Development and Management in India and Role of Government and Non-government Organisations in Small-scale Watershed Development, (mimeo)
5. Central Research Institute for Dryland Agriculture — nd : Status Report on Model Watersheds 1986-87 (mimeo, Hyderabad)
6. Central Soil and Water Conservation Research and Training Institute — nd : Operational Research Project on Integrated Watershed Management : Progress Report Feb. 1987 (mimeo, Dehra Dun)
7. Chattrapathi Singh — 1989 : *"Forestry and the Law"* in Singh, (ed), 1989
8. CASAD — 1988 : Gram Gaurav Pratisthan (mimeo)
9. Chopra, Kanchan, Kadekodi, Gopal K and Murthy MN — 1988 : *Sukhomajri and Dhamala Watersheds in Haryana* : A Participatory Approach to Management (Institute of Economic Growth, Delhi (mimeo)
10. Datye K.R., Gore VN, Paranjpe Suhas and Patil R K — : Techno Economics of Small-scale Watershed Development in Major Agriculture Regions of India (mimeo)
11. Dhruvanarayana V V, Sastry G, Patnaik V S — 1990 : *Watershed Management* (ICAR, New Delhi)
12. Fernandez, Walter — 1989 : *"Tribals, Wastelands Development and Community Organisation"* in Singh (ed).
13. GOI, Min. of Environment and Forests — 1989 : Report of the Working Group on Wastelands Development sector in the Eighth Five Year Plan (New Delhi)
14. Govt. of Karnataka — 1988 : Comprehensive Land-use Management Project : A Profile (Bangalore)
15. GOI, Dept., of Science and Technology — nd : Natural Resources Data Management System : A computer based decision support system for micro-level spatial planning (New Delhi)
16. Joshi, B K — 1988 : *A Socio-economic study of the Tejpura (Bangor) Watershed Development Project* (Giri Institute of Development Studies, Lucknow)
17. Joshi, Satish — 1988 : *Integrated Community and Area Development Project. Depur, Dholpur, and Shyampur :* A Case Study (mimeo) Seva Mandir, Udaipur
18. Kadekodi, G K and Chopra, Kanchan — 1989 : *Cyclic System of Development :* A monograph (Inst. of Economic Growth, Delhi) mimeo
19. Kartar Singh — 1988 : *Dryland Watershed Development and Management :* A Case Study in Karnataka (mimeo)
20. Raheja S K and Banerjee A R — 1988 : *Survey Methodology for Planning Watershed Development,* in Yadav (ed) 1988
21. Singh, Pramod (ed) — 1989 : *Problem of Wasteland and Forest Ecology in India,* (Ashish; New Delhi)
22. Society for Promotion of Wastelands Development — nd : National Workshop on Small-Scale Watershed Development at Surajkund 30 October to 1st November 1988. Proceedings (New Delhi)
23. ,, ,, — 1989 : A study of Jawaja Project (mimeo)
24. Upadhyay J N — 1988 : Case Studies of Small-scale Watershed in Punjab and Haryana (mimeo, New Delhi)
25. Yadav, Hridai Ram (ed) — 1988 : *Dimensions of Wasteland Development* (Concept, New Delhi)