Rethinking Policy Options for Watershed Management by Local Communities: Combining Equity, Efficiency and Ecological-Economic Viability[1]

Household survival in semi arid and arid regions involves considerable ingenuity in hedging risks to evolve portfolio of opportunities precariously balanced with the ecological endowments. This balance is quite fragile as has been evident by the continued degradation of natural resources in these regions. Once the cycle of degradation begins, the opportunity matrix becomes narrower. The time frame and decision making horizons get constricted. Sustainability in such a situation becomes an infeasible option.

However, such is not the case in many situations where disadvantaged communities have continued to survive without allowing the ecological balance to disrupt too much. Credit for this goes entirely to the local institutions and technological innovations. These institutions I have argued are like grammar, and technologies like words (Gupta, 1990). We cannot visualize communication without a sound vocabulary as well as proper use of grammar. It is a healthy recognition, though belated, among the technologists and policy planners that need for social institutions is being realized in the context of soil and water conservation. However, the conceptualization is limited in its scope, if it restricts itself to merely invocation of people's participation in plans and projects designed by outsiders, generally local level bureaucracy.

In this paper, I argue for certain basic re-thinking in the policy options for viable watershed management by combining local knowledge with the formal science through rejuvenated or revitalized traditional institutions. In part one, I review the policy environment in the light of some of the recent reports in India which have a major bearing on watershed development programs. I argue that natural scientists have committed a fundamental error when they assumed that major challenge in watershed management was transfer of technology instead of development of technology on people's lands and in their neighborhoods. Given the ecological heterogeneity evident to soil scientists and people working in these regions, there was no way standard solutions could have been replicated over large areas. The need for action research in generating viable options through collaborative thinking is necessary. Various other weaknesses of the existing programs are identified in this section. In part two, I discuss the theory of portfolio options which can provide an effective alternative to the current approaches to watershed management. I also suggest that people's knowledge about biodiversity, historical land-use and various conservation measures needs to be supplemented with modern science and technology in an experimental manner so that limits of both the knowledge system - formal and informal - become opportunities for innovation rather than constraints. In part three, I discuss various policy changes in research, public administration, decentralized system of self governance, and interface with voluntary organizations and people's institutions. I conclude that large scale efforts in restoration of productivity of eroded regions have to be appreciated without ignoring the fact that spreading resources thinly may give political advantage but would not generate any durable change in the resource management situation.

Part One

Policy Environment Where have we gone wrong?

The policy environment for management of land-use in India has been quite muddled. Part of the reason is lack of accountability among senior level public administrators, policy planners and various constituents of the existing institutions who decided not to complain even when institutions strayed away from their goals. As a member of National Land Use and Conservation Board, when I resigned few years ago, I asked the then Deputy Chairman of Planning Commission as to what was the purpose of an institution which did not have any will to perform. Recently, when a

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committee of secretaries from five important ministries was appointed to look into the existing arrangements for land-use, the background note implied as if a great deal had been achieved. Obviously the committee seemed not too dissatisfied with the state of affairs. Three boards dealing with wasteland development, afforestation and land-use and conservation were supposed to report to National Land Use and Watershed Council to be chaired by Prime Minister. Neither the council ever met nor the land-use Conservation Board met more than once or twice during last decade. The state land-use boards chaired by the Chief Minister of each state performed no better. They either never met or if met, did not have much effectiveness.

What does this state of affairs indicate? Either the top political, bureaucratic and scientific leadership is not too bothered about the state of affairs. Or the lack of concern at the top level has permeated down producing all around indifference towards any strategic thinking and action.

National Technical Committee on Drought (of which I happened to be a member) reviewed various arrangements with regard to drought proofing and decided to focus major attention on the watershed approach to resource conservation. The committee recognized that drought prone area programme and desert development programme despite having been in operation for almost two decades have not created a substantial impact. The beneficiaries of various water harvesting structures had not assumed responsibility for maintenance after the works were completed even when the benefits were substantial. The people's participation "was conspicuous by its absence either in the preparation of plans or in their implementation" except in rare cases where results were much better.

The report further accepted the need for greater attention to people's own strategies and indigenous technologies and knowledge about local biodiversity in various plans for mitigating drought. The need for value addition in local resources relying on indigenous innovation as well as external technologies was also recognised. The treatment plans for watershed, the report suggested should include all kinds of lands governed by different ownership arrangements. It was recommended that watershed development teams will be constituted for the purpose comprising at least five women members out of total ten members. All adult members of a watershed area will constitute the general body. The representation to Scheduled Caste and Scheduled Tribes would be in proportion to their population. At least two of the local level development officers will assist the team besides an educated village youth selected by the team to carry out its instructions. The micro-watershed with about 500 hectare was supposed to be taken up in the first year. The functionaries were to be given a multi-disciplinary training for first three months. The drought relief work were supposed to be integrated with area development programmes to conserve soil moisture and generate other employment opportunities. The voluntary organizations were also to be involved wherever they were available. The state level committees for promotion of voluntary action for Drought Prone Areas Program (DPAP) and Desert Development Program (DDP) were to be constituted. Similarly, district level committees and block level committees were recommended. The state governments were to hand over various assets created under the programme to the community for eventual maintenance. The subsidy on programme works was recommended for everyone regardless of size of land holding. In all about Rs.1,500 crores every year was expected to flow towards watershed based development of dry regions. This allocation is a substantial increase from about Rs.2,000 crores allocated over last twenty years.

Having described the key recommendations, it is useful to note that the criteria for selection of the districts was unfortunately chosen in such a manner that even district like Nalgonda and Nellore (two of the most prosperous Andhra Pradesh districts) would be included while Rewari in Haryana would be excluded. It is well known that large parts of many other districts proposed to be included are highly irrigated and therefore the committee recommended that blocks with less than ten percent area under irrigation and resource degradation due to high slopes (six to thirty per cent) may also be considered. In general, blocks to be included should have less than 30 per cent irrigation in arid regions, 20 per cent in semi arid and 15 per cent in dry sub-humid region with some exceptions. However, the major weaknesses of this report are:

a) Instead of focusing on the most disadvantaged regions and saturating them in the phase one before taking up other regions, attempts have been made to take up micro-watersheds all over. The idea that once model watersheds were developed, people would develop remaining watersheds on their own is neither feasible nor warranted. If that was true, then people should have developed various micro-watersheds around the developed micro-watersheds in past. Not only that people did not do that, people did even maintain the developed watershed structures once these were handed over to people, as noted in the report. Perhaps the question should be asked as to why did we not make this assumption in the canal irrigated areas. Once the main canals were drawn, one should have expected that people would develop secondary and treasury canals on their own. Those who are familiar with irrigation development in developing countries know that even below the outlet development on farmers fields is supported by the project authorities through users committees in some areas. The continued role of the state in supporting watershed development in arid and semi-arid regions has to be recognized.

b) The allocations made would be insufficient to cover more than a marginal area in every block. And thus no perceptible impact on drought proofing may actually be obtained.

c) Though the committee has suggested coordination among various ministries and their programmes, the programme guideline issued so far have not resulted in any modifications of the guideline issued by Wastelands Board or by the Ministry of Environment & Forests.

d) While the Committee took note of indigenous innovations as well as the need for value addition, the guidelines issued by the Ministry of Rural Development have not incorporated these ideas in any substantive manner in the process of watershed development.

e) One of the major weakness of the report and subsequent guidelines is regarding training and research in this regard. The major responsibility for training has been given to institutions like MANAGE which have done no research on the subject and thus can obviously not provide any quality training in this regard. Similarly, many ICAR institutions and agricultural universities are very competent in scientific aspect of watershed but are weak in social science aspect of the institution building as well as forging linkage with non-farm sector to generate value added products from watersheds. Even on scientific issues, it has not been recognised that considerable research remains to be done in different agro-climatic zones to develop functional relationships on parametric basis. The Committee in fact suggested that Ministry of Rural Development should support the research institutions for providing R & D back up to these programmes. The need for long-term longitudinal research somehow was not emphasized by the Committee though it is extremely crucial. No significant theoretical development can take place unless at least 20 to 30 year long experiments are designed and comprehensive monitoring is done. So far as training on participative approach is concerned, excessive emphasis on short cut methods like RRA-PRA though critiqued by certain members of the Committee were still recommended. I personally believe that these approaches are totally inappropriate as practiced and as developed in the internationally aided NGOs because they lack appreciation for historical perspective, ability of people to process complex information and need for longer term interactions with rural communities to understand mutual inadequacies in the areas of watershed development.

f) It was recognized during the deliberations of the Committee that efforts to improve coordination at grass roots level will be futile unless coordination at the top level was improved. No specific action seems to have been taken in this regard. This is a problem in most other countries as well.

g) Even though the concept of agro-industrial watershed was developed way back in 1980s by senior leaders in the discipline, (Bali, 1980), the Committee could not integrate this as a major instrument of policy change. The idea is that changes in the income or the productivity are likely to be of very small order (10 to 15 percent on average) in the early years even if everything was done ideally. On the other hand, if the produce of the watershed whether fruits, vegetables, crops like pulses or oilseeds, is processed into intermediate or final consumer product, the increase in the income can be many times more. Further, the catchment area for processing plants need not

be coterminus with the boundaries of catchment of watershed. The fluctuations in the market place can also be reduced through value addition at local level. At the same time, the need for systematic market research, linkages and other support measures remains.

h) The need for macro policy reforms to provide market incentives for generating sustainable portfolios at the household level was also not emphasised by the Committee. It was, for instance, not realized that if import of wool or rags depresses the real prices of wool, then shepherds would have no incentive to improve productivity of their herd through quality improvement. Also if their access to improve pastures and their share in the value addition in leather does not increase, they can hardly be blamed for increasing their herd size of small ruminants of low quality. If environmental degradation is enhanced in the process, the reason is obvious. Therefore, an important weakness of the Committee Report was to ignore the linkage between macro economic policy and micro level decision making incentives or disincentives for households to modify their portfolios.

National Commission on Development of Backward Areas (NCDBA) in 1981 had committed similar mistakes when the technologies developed by ICRISAT were considered indicative of the direction for future development in dry regions. As the experience has shown, the expectations were misplaced. Further, while looking at the organizational models for developing these regions, the examples were drawn from well developed irrigated regions. This was another assumption which was to prove inadequate. The emphasis on watershed approach has been expressed in most policy statements around the world. The entry point may be trees, grasses, soil conservation, water conservation etc. The key weaknesses of the existing watershed development approaches are:

a) Lack of attention to the interaction between property right regimes, and degree of degradation, nature of investment required and the time frame for developmental options.

b) In an action research study on linking banking and technology on watershed basis in two districts of Karnataka, it was learnt that bankers were seldom involved in the design and planning stage of watershed projects. There were expected to provide supporters for crop development once the watershed project had been developed. Large number of bankers in fact had never visited a developed watershed project.

c) In a joint watershed project designed and implemented by International Centre for Research In Semi Arid Tropics (ICRISAT), Central Research Institute for Dryland Agriculture (CRIDA), Indian Farmers' Fertilizers Co-operative Limited (IFFCO), State Bank of India (SBI), State Department of Agriculture and other local authorities, it was discovered that (i) most people did not have updated land records, (ii) most people had some or the other outstanding loans (generally overdue) against them either from state government or from banks, (iii) the scientists invested more in the village where people were apparently more courteous but less careful in use of inputs and repayment of loans whereas the bankers found the more backward village with more assertive people to be more careful in repayment of loans, (iv) the retail centre for providing fertilizer had to be closed down because it could sell hardly 30 tons per year whereas it required sale of at least 300 tons per year to recover its recurring cost, (v) the technological trials were primarily driven by scientists and subsidies in the beginning though later people were encouraged to bear the cost(Gupta, et al 1989).

The need for upgrading land records, generation of local saving and credit groups for dealing with small investments and development of viable input distribution system are areas which remain relevant for any future project.

d) In all the districts in India, there is a District Level Coordination Committee (DLCC) to coordinate the activities of bankers and district level officials. There are four standing committees dealing with agriculture, industry, trade and services. In another district, there is a standing committee on science and technology with a result that most developmental projects do not draw

upon the latest scientific insights available with the concerned institutions located in and around a district. In watershed projects this weakness becomes even more apparent.

e) None of the watershed projects have been used as an on-farm research site with experiments designed and implemented jointly by scientists and farmers for developing location specific technology. In a few places, there are trials of new varieties. But, very seldom advanced lines of different crops are taken up for experimentation in these watersheds. Similarly, no effort has been made to interrelate design of different structures as modified by the farmers after using it for some time in different agro-climatic conditions within a region. The result is that science of fitting structural designs with the specific micro environments is far more speculative than scientific.

f) From the point of view of invoking cooperation of different segments of a village, one has to use a pluralistic approach to technological change. In many watershed projects, excessive emphasis on only lands in micro watersheds alienate other communities or people who do not have any land or only marginal land in a watershed. Therefore, those technologies which may perform if not optimally at least better than the existing technologies in non-watershed area may be made accessible to other farmers as well. Similarly, those farmers who have only limited land and watershed may have lesser incentives to cooperate than those who have more lands. To overcome this problem, development of common funds for common facilities particularly in the form of farm implements may have some advantage.

g) The participation can be monitored in terms of the shift that comes about in the design of watershed project in the light of learning made at the end of people as well as the professionals through their interactions. If the design does not undergo any basic change, then either people have no comparative advantage in knowledge or the system is too rigid or inflexible (Gupta and Mathur, 1983). Participation in people's plans would imply ability of development officials to acknowledge inadequacy of their understanding. The blue print approach gives tremendous power and authority to the officials and thereby some time mutes the articulation of the people.

h) Institution building for watershed management is one of the most neglected part of all the watershed projects. The very concept of `handing over' of project to people implies that ownership has changed. However, if officials were to participate in people's plans, the question of handing over wouldn't arise. The institution building process involves generation of self renewing capability in the organization and also ability to align missions and goals with the emerging changes in the environment without losing basic ethics and spirit. One cannot invent institutions without building upon long traditions of conservation which have indeed become weak in most places. Though not all. The leadership if based on performance and competence is likely to generate a different kind of dynamics than a leadership based on clout and political influence. Many times scientists do not realize the impact such decisions can have on the project. The self renewing mechanisms require building learning capacities in the organization. Therefore, if per unit cost of different structures goes down over time, then efficiency is increasing through innovations. Unfortunately in governmental system, the cost must escalate because there is no incentive for learning or innovation. In people's organization also similar weaknesses can exist if attention is not paid to these aspects.

i) There is a general neglect of local knowledge about indigenous soil taxonomy, biodiversity, soil and water conservation structures and traditions and experimental ethic of the local communities. There are only a few examples where watershed projects have required significant compromise in the prescriptive model compared to farmers' suggestions. For instance, in a particular watershed project, the drainage lines were drawn along the field bunds instead of contour lines without any significant difference in the efficiency (Sanghi, 1991). Similarly, in another project, the gullies were used for digging wells and creating farm ponds instead of plugging them through conventional treatments (Subramaniam, 1989). It is possible that local knowledge may have its limits (Gupta, 1993). However, using it as a building block helps in generating mutual respect and overcoming the fear of unknown.

Part Two

Property Rights, Portfolio and Design of Participative Institutions

The property rights may be precise or ambiguous, customary or legal and single layer or multiple layer, seasonal or permanent, product or use specific or indifferent in nature. For instance, in a common property catchment area, several people may have rights depending upon their nature of residence in a village, or ownership of private residential or cultivable land in that village or on their contract with the village council or individual owner having a right in the common property. Not everybody's right may be precisely defined. If a group of shepherds have been passing through a particular way for decades or centuries, the rights of passage and halting may become customary. Sometimes a private resource such as well becomes a common property for drinking water purposes in a drought year. Nobody can refuse water for drinking purposes. Once the market for drinking water emerges, this right may undergo a shift. The right of access may still remain but not without price. Private agricultural lands after harvest of the crop may become either open access or common property grazing lands. The nature of boundary as well as the system of allocation would indicate the kind of property rights that may exist. Within a forest, the boundaries for collecting different kinds of products may vary over time. The boundaries may be fuzzy and may contract or expand in different years. For example, in Senegal, it was noted that the boundary of area from where gum arabica was collected varied over the years depending upon the millet prices and thus ability to hire the labour for the purpose.

Incentives

The implication of varying property right rules for developing management institutions for watershed are very complex and yet very important:

a) Assume that there are three groups in a village A, B and C having varying dependence on the common lands for their survival. The ratio of dry matter obtained from commons, public or open access resources (road sides or revenue lands, canal bunds, etc.) or private property may vary in the portfolio of three groups. Assume that group `A' has only ten per cent dependence on private property as against group `C' which may have 90 per cent dependence on private resource. The herd composition may reflect the variance in dependence on resources governed by different property right regimes. In general higher the risk and lesser the assurance of dry matter from private sources, greater is the probability of a herd having larger number of smaller ruminants of low quality but high adaptability to poor and variable nutrition.

b) The time that each group would spend on common land would vary, the quantity of dry matter they draw also varies and their respective stake in conserving the common property may also vary depending upon whether access to other kind of resources is tied to their contribution to the common property resource. For instance, imagine a watershed project in which the commons form three-fourth of the catchment area, and therefore require everybody's cooperation in terms of closure. Group `A' being most dependent on commons has most to lose by not grazing its animals on the commons. On the other hand, the group `C' has least to lose. At the same time since group `B' and `C' have much more land holding, any improvement in catchment in terms of water conservation and recharge is likely to improve the recuperation rate or water level in their private wells. Even otherwise, catchment treatment may reduce the velocity of run-off and thereby help in conserving their private lands. Under such circumstances how should costs and benefits of developing catchment be distributed among different beneficiaries. For instance, if orchards are planted on the commons, should the income from the fruits be distributed equally among all the beneficiaries, or unequally so that larger share goes to those who supplied the most restraint (if one unit of animal not grazed on commons is equal to one unit of restraint, then units of restraint are proportional to number of animals conventionally grazed on the commons). Part of the income

from private wells in which gain of the water table accrues because of collective contribution of the community which supplied restraint, should go to a common fund for maintaining various structures after the project support is over. This funds can also be used for augmenting various common facilities and generating entrepreneurial opportunities.

The distributional matrix thus one can argue has a close bearing on the use matrix and vice versa. Both together provide necessary conditions but not sufficient conditions for sustainability.

Organizing `Inequity': The key to Sustainability

Portfolio approach thus implies that equity should not be aimed at enterprise level or at a segment level. One can not have equity in distribution of each benefit and yet aim at sustainable outcome. It is obvious that land based investment is likely to help the landed people much more, at least in the short term. At the same time without cooperation, involvement and commitment of landless or marginal farmers' having livestock in greater numbers, one can not expect a durable solution to the problem of soil and water conservation. Thus should not one aim at generating `iniquitous' situation by providing greater access and share to such livestock dependent communities in the biomass produced in the Common as well government lands. The NGO or any other support agency may also help trigger experiments with regard to decentralized fodder banks at least in each watershed so that stakes of landless livestock owning communities in the conservation of soil and water can be institutionalized. The common water points particularly for drinking water purpose (human as well as for animals) have to be an inalienable feature of watershed projects. It is pity that National Drinking Water Mission does not seem to coordinate well with the watershed wing of Department of Rural Development as well as Ministry of Agriculture to ensure this.

The credit, input and marketing support for Non-farm employment activities opportunities once integrated in watershed projects can also be used to offset some of the inequities linked with land based investments.

The equity, I am arguing has to be achieved at portfolio level and not at enterprise level because the latter is neither feasible nor viable and sustainable. The portfolio will include land and non land based investments, farm and non farm activities, and short term and long term transfers of benefits. Thus equity may also have to be achieved over time.

The accounting of various services (ecological, economic and social) provided by a watershed project will help generate the mental preparedness among the communities for adopting portfolio approach to partnership and equity in watershed projects. This will also help in conceptualizing the issue of subsidy properly. It may not be out of context to mention here the provision of Non-Actionable Subsidies under GATT. Under this, the areas which have per capita household income or GDP per capita not above 85 percent of the territory or region and unemployment rate at least 110 per cent of the region are eligible for subsidies which can not be questioned or objected under GATT. Most of the disadvantaged dry regions would be eligible for this support for farm and non farm purposes.

Information

The subsidies in watershed projects have to be seen not just in terms of physical structures but also in terms of creating appropriate infrastructure for information, technologies, on farm research and value addition and marketing of the outputs besides a reasonable household portfolio insurance system.

To illustrate how information can help, example of marketing of silk cocoon and mango seedlings from Karnataka may help. In the case of silk rearing, it was noted that farmers from Shimoga and Chitradurga had to send their produce to far off market. In the absence of proper information about various markets, the small farmers had to often sell their produce to intermediaries at discount price. If the watershed project in collaboration with National Informatics Centre project

could provide access to information about various markets to farmers, the incentives for mulberry plantation as well as for other investments may increase. Similarly, the project authorities discovered that mango seedlings were in great demand by farmers for plantation in catchment areas. The collection and dispersal of information about this led to emergence of a buoyant enterprise of raising mango seedlings in low cost makeshift greenhouses.

There are many other examples. Agave has been taken up for plantation in various watershed projects but often without linking its cultivation with processing. Even where processing has been done, it is only of fibre where as Indian Institute of Science scientists had identifies more than six products from agave including tannins and waxes besides fibre. Information about such possibilities has to be pooled and made accessible to various watershed projects. Otherwise investment options will remain sub-optimal and thus returns from investment inadequate. The structures created with great care may be wasted.

The information about various technological choices about farm implements, agro-forestry options, indigenous technological and institutional innovations such as the ones documented by Honey Bee Network and SRISTI (Society for Research and Initiatives for Sustainable Technologies and Institutions), markets etc., can make considerable difference to the incentives that different watershed teams may have for building sustainable institutions.

Institutions:

The institutions provide the self regulating character to any human endeavour. I distinguish between institutional behaviour and organizational behaviour by looking at the extent to which regulation is internal or external. When human beings act in a particular manner because of their internal values and beliefs or rules which have been internalized, the behaviour is institutional in nature. As against this, when a person performs the way he/she does only because somebody is supervising, the behaviour is organisational.

In real life we follow internal rules in some matters and require external rules in other matters. In a watershed project, coordination among various stake holders cannot be achieved only through external supervision. There has to be internalization of the values and ethical concern for renewability of resources. The economic benefits are necessary but not sufficient inducement for triggering chain reaction of watershed projects. When we look at some of the old but still functional soil and water conservation institutes such as VIRDA in Kutch or KHADINS in Jaisalmer, we notice a combination of technological and institutional innovations. Some of the key lessons that can be inferred from the study of traditional institutions are:

a) The rules are not constant though process may be more durable. In other words, when violation of a particular rule takes place, the sanctions need not be necessarily specified in advance. What may be known is that there would be sanctions. But precise sanctions may follow after considerable deliberations on the merit of each case. Thus, subjectivity and objectivity are blended through an open and participative process.

b) These institutions often are multifunctional. While modern institutions are segmented, sectoral and less flexible, the traditional institutions may deal with more than one resource or region, may be multi-sectoral in nature and may be quite flexible.

c) These institutions have a variety of leadership models ranging from hereditary to entirely on the basis of excellence in a particular skill.

d) The tasks distribution is based much more on competence rather than status. For instance, for aligning a water stream in a hill area, people may rely on a shepherd's knowledge of terrain rather than on a mason's knowledge of structures (though both knowledge systems are important).

e) The compliance to a common order is achieved often through blending of secular goals with sacred symbols. In most situations, where natural resources have been used in a sustainable manner for hundreds of years, the sacred symbols and institutions seem to have played a significant role.

f) The concern for other sentient beings such as wild life, birds, other animals is expressed through various customs and rituals.

g) The diversity of eco-system and biological resources within it is maintained in some pockets more than others but is seldom eroded in any traditional institution, and

h) The rules regarding boundary (who is in, who is out), resource allocation (who guides, what, where and when) and conflict resolution (who compensates whom, when, how much and why) are evolved through experimentation over a long period of time.

Institutional performance in watershed projects of crucial significance and requires lessons from traditional institutions, technologies and also cultural repertoire.

The incentives, information and institutions as seen above interact to produce a portfolio level equity over a longer period of time to generate sustainable outcomes. The theory predicts that balancing of books of accounts among different actors can seldom be achieved in short term or in single market. Multi-market, multi-level solution (Gupta, 1985 in Ostrom, Feeny and Pischt, 1990, Ostrom, 1993) coupled with a variety of decision criteria may help in generating optimal institutional arrangements in different cases. In watersheds which have predominantly private lands in the catchment, the coordination may be required much more in resolving second generation problems rather than first generation challenges. For instance, a diversion channel may start eroding or cutting into a field of a poor farmer because of the pressure of the water and this problem though affecting an individual may require collective solution because the benefits from the diversion channel are collective in nature.

Similarly, when technologies are introduced for seed production, cultivation of plants with medicinal, herbicidal or pesticidal properties or some other commercial use, production may be pursued individually, the quality control and marketing with or without value addition may have to be pursued collectively. At the same time, it is also possible that some of the value adding or marketing functions may be better performed by a trader or a farmer entrepreneur instead of a collective institution. The scientists and local communities will have to appreciate the viability of the whole range of institutional arrangements rather than making a pre-determined choice.

Part Three

Policy Implications for Participative Portfolio

Management in Watersheds

I have argued elsewhere (Gupta, 1991) that farmers use a playful portfolio approach to risk adjustment. There is a combination of serious institutional effort and playfulness in resolving various problems. The role of fun and light heartedness is not often realized in building social institutions. Any student of social change would be able to recall many examples where people transform the meanings of acronyms used for designated different development programmes. Through metaphors and acronyms , the people communicate their actual feelings about programme and their contents. The watershed teams can benefit a great deal by building upon a rich reserve of local legends, fables, myths and humor. When we were deciding the precise villages in which to take up more detailed investigations in an action research project in Karnataka, the first question we asked in every village we visited was information about the initiatives or activities that people in the village had taken up on their own collectively without outsiders' help. It was very interesting that in different villages different kinds of initiatives had been taken in past. In

one village, people had used the discount money of a local chit fund (rotating saving and credit association) to buy mats for a primary school, public address system for a temple in another village and building a small place of worship in still another village. These collective actions were useful to recall because then the concept of watershed and inherent coordination did not have to be told from outside. Also the outsiders could demystify their contribution in the matter. The key policy lessons that may help in participative design and management of watershed are summarized below:

1. Watershed projects, as K.M. Munshi said in 1952, are a means of land transformation. As he suggested, the hydrological cycle, the nutrient cycle and the village institutions had to be linked together in an organic manner. The principle of land transformation is so vital and yet so feeble in its actual operation that people have often a very low image of state induced interventions. The vitality of land transformation, Munshi had suggested could be maintained by organizing a land army of unemployed youth, disciplined and dedicated to bring about change in a time bound manner. Unfortunately, the experiments on the concept of land army were never seriously taken up for long enough period (a beginning was indeed made in Karnataka in late 70s). First policy implication therefore is to convert watershed programme into a social movement blending it with different cultural and institutional cross currents so that it has a widespread appeal.

2. The social movements begin in heart and not just in mind. Therefore, the consciousness about watershed approach and sustainable natural resource management will have to be raised in the minds of young students at an early age. This will help build commitment among future leaders.

3. The incentives for cooperation sometime may emanate from the access to indicators of social ecological change. These indicators can also help in monitoring the extent of ecological recovery and, therefore, the success of various investments. Instead of monitoring inputs, output indicators whether in terms of grass or shrubs, insects or birds or changes in the soil microbial properties measured through quality of humus or other means etc., may help in keeping track of investments in watershed projects. Different kinds of indicators would require different kinds of benchmark. The land-use maps depicting biological diversity and indigenous soil taxonomies may help monitor the changes effectively. Identification of these indicators could be through organization of biodiversity contests as attempted by SRISTI and Honey Bee network in different parts of the country or through surveys of innovations through extension workers, farmer innovators or students in summer vacations.

4. Participation in people's plans requires respecting their knowledge and experimental ethic. There are very few examples illustrating documentation of indigenous innovations and on-farm and on-station research on the validation of or value addition in the same. The scientists as well as the administrators at the top level have to unlearn various presupposition in this regard. In any meeting on the subject, one often hears only a few NGO led examples of watershed developments. No reference is made to large tracks of well conserved resources in dry regions as well as in hill areas by people on their own. The result is that projects are located around the NGOs instead of encouraging evolution of peoples institutions where they have already performed well. Excessive emphasis on NGOs may provide false satisfaction about the issue of people's participation. There is no escape from involvement of decentralized institutions of public governance such as panchayati raj institutions in India. This means that political parties and their various organs have to be involved in understanding and articulating the agenda for land transformations through their cadres. The scientists will have to interface with the leaders of various parties so that camps can be organized to help them take lead in this regard, obviously in a non-partisan manner. Perhaps the Parliamentary institutions can be involved in interfacing the interaction between scientists, NGOs, people's institutions and political leaders.

5. The portfolio approach to participative watershed development implies attention to inter-sectoral linkages which manifest in the form of interactions among enterprises and social classes over time and space. The portfolio approach has an advantage that not each enterprise in a portfolio has to be viable. For instance, the direct benefit from summer ploughing and other such operations may

be limited but indirect advantage through in-situ conservation of moisture as well as harvesting of residues during summer may be much more. These benefits may not accrue always to those who bear the cost. Thus, just as households cross subsidize different enterprises, watershed groups may have to cross subsidize different social segments relying upon lands or other resources governed by different property rights regimes. The equity may be achieved at the portfolio level rather than at the enterprise level. The ecological economic accounting of watershed projects can help in conceptualizing the contribution of subsidies appropriately. Since it is unlikely that state would have resources to invest in large areas in near future, specific contractual arrangements between value adding firms in private and public sector and groups of farmers may have to be negotiated. To avoid exploitation of poor farmers, these contracts should be monitored by federation of watershed teams for their fairness and ecological friendliness.

6. The watershed programmes cannot grow if they continued deal with only soil and water conservation leaving technology development for land-use choices in farm and non-farm sector entirely to market forces. In each watershed clusters, some on-farm research experiments should be designed by the people and monitored and interpreted jointly by local communities and outsiders. Depending upon the results, further action plan should be drawn. It is a pity that none of the coordinated commodity programmes in crop, livestock or farm implement sector, watersheds are used as on-farm research site. The crop improvement programmes in dry regions can gain a considerable head start if watershed teams are invited to the university farms and asked to make selections of advanced lines suitable for their region. The biodiversity may so be increased and at the same time the pace of technological change can be enhanced.

7. There is world wide concern for declining biodiversity in most regions particularly the ecologically fragile regions. The biodiversity prospecting or accessing for developing drugs, herbal pesticides, weedicides, anti-oxidant compounds, vegetative dyes, etc., is becoming an extremely promising field of global negotiations and collaborations. The moisture conserved in many watershed projects becomes so precious after making huge investments that growing food crops may not help in cost recovery. Therefore, by strengthening the public distribution system for food, the pressure for cultivation of local food surplus can be reduced. Instead processable commodities such as medicinal plants, oilseeds, pulses, vegetables, flowers, etc., may be encouraged wherever feasible to give economic incentives for watershed programmes to diffuse. Given the low population density, the cost of logistics is indeed very high in dry regions. Various incentives similar to freight equalization will have to be developed to encourage markets to move closer to clients in watersheds.

8. Seed production has been recognized as one of the very important land-use option because of possibilities of maintaining good isolation and also lesser diseases and pests for certain crops. A memorandum of understanding would need to be established between federations of watershed teams and seed producing institutions in public and private sector with proper arrangements of quality control and buy back.

9. The value addition in agro-forestry products, livestock or other activities taken up in the watersheds is a necessary condition for improving returns to watershed technology. To ensure this, the collaboration between agricultural and industrial research organizations is very important.

10. There is a need for long term research programmes to be started in different agroclimatic zones linking crop, livestock, trees and tools as discussed in the multi-tier workshop on management of research in rainfed regions organised jointly by us with ICAR. These workshops had provided valuable insights about the areas of weakness in inter-disciplinary research and ways of strengthening them. It was noted for instance that there was very little emphasis in post-graduate research to identify the scope of such linkages and measuring their effectiveness. If young scientists do not get exposed to these ideas, it is unlikely that when they assume leadership, they will be able to commit themselves to these ideas. The unfortunate imbalance between resources for extension vis-a-vis on-farm research needs to be corrected if theories applicable to variety of agro-climatic conditions have to be developed.

11. The macro economic policy has an important bearing on the incentives or disincentives for households to use resource conserving portfolios. There is a need for top level monitoring of macro economic policies to draw their implications for the micro level land-use choices. This will require use of various technologies including remote sensing, market intelligence information data bases and simulation models. We do not have a strong research base in this direction.

In this paper, I have covered whole range of issues involved in linking equity, efficiency and ecological economic dimensions of sustainability. I have also argued that the goals of conserving diversity and improving economic opportunities for poor people can be combined by building upon local creativity and innovations. It is possible that many of the local innovations may have become dysfunctional or sub optimal because of various reasons. Bridges between formal science and informal knowledge will have to be built to generate sustainable options.

The watershed management programmes provide arena for confluence of several technological and social change programmes. If watersheds can be conceptualized as crucible of creativity, then various research programmes should aim at locating their experiments in these watershed projects. The bankers have to be involved in the design stage itself so that their commitment to the philosophy can be achieved. The participated design of institutions cannot be crafted in isolation of traditional institutions and local knowledge system even if these have become weak in many areas. It is true that many of the traditional institutions were not very fair or democratic. But one has to blend the strengths of the traditional systems with modern approaches. While there are many traditional resource management institutions which have worked in a sustainable manner for hundreds of years, there aren't many examples of modern institutions which have worked with similar efficiency over such a long period of time in the field of natural resource management. Therefore, blending the rules that regulate human behaviour from within with the rules that are enforced from outside may help in generating viable and sustainable institutions for watershed management.

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