Chapter - IV

AN ALTERNATIVE APPROACH TO DROUGHT AND DROUGHT PROOFING[1]

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1.0 INTRODUCTION

Legend has it that Vithoba, the popular, dark deity of Maharashtra, once came down to earth and assumed the form of a low caste messenger to rescue Damaji, a custodian of the king's granaries who had thrown them open to the people during a severe drought. Drought and famine have ravaged populations in India since ancient times and have been the stuff of legend and folklore. The frequency of famines increased during colonial times, and the last decades of the nineteenth century was marked by a succession of famines (and the plague epidemics) and though it dropped during the twentieth century, the great Bengal famine of the 1940s has left an indelible mark on Bengali literature.

With Independence, famines have all but disappeared, but now, at the dawn of the new century, the increasing frequency and scale of drought is a matter of concern. For example in 2001: drought affected about 120,000 villages; around 160 million people; about 20.5 million ha crop area; covering about 180 districts in the eight states of Rajasthan, Himachal Pradesh, Chhattisgarh, Orissa, Gujarat, Madhya Pradesh, Maharashtra and Andhra Pradesh; and the monsoon rainfall was 59% to 18% below normal (Mahapatra, Richard `Drought of Relief' Down to Earth, Vol. 10, No. 2, 2001). In 2003 severe drought led to a virtual war between the two linguistic nationalities – the Kannadigas and the Tamils over the release of water from the dams in Karnataka for irrigation in Tamil Nadu. How we deal with drought may well determine the shape our countries and our politics may take in the twenty-first century.

2.0 DROUGHT AS A SOCIAL EVENT TRIGGERED BY `FAILURE OF RAINS'

Though drought is a common enough term, it is not the easiest to define. Don White of the National Drought Mitigation Center, in Lincoln, US, has said that there are virtually hundreds of definitions of drought! The three most widely recognised definitions are: a) agricultural drought, defined by soil moisture deficiencies; b) hydrological drought, defined by declining surface and groundwater supplies, and c) meteorological drought, defined by precipitation deficiencies. There are also sophisticated indices like the Palmer Drought Severity Index that quantify drought. However, most of these definitions have

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[1] This is a chapter from the book, Jairath, Jasveen and Vishwa Ballabh (Ed.), 2008, *Droughts and Integrated Water Resource Management in South Asia: Issues, Alternatives and Futures*, Sage, New Delhi

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one thing in common: they are all of them almost exclusively technical, asocial definitions.

In their context and, no doubt, all these definitions are appropriate in their own context, however, drought is as much a social phenomenon, something that goes beyond mere soil moisture or precipitation deficiencies. We prefer to define drought for the purposes of this exploration as a social event -- as a severe disruption of the subsistence cycle of activity of large populations in an area *triggered* by what is commonly perceived as `failure of rains' that could be a combination of either of the three kinds of drought defined above.

This has other important dividends. The narrower understanding, firstly, tends to minimise human intervention (in the form of the overall mode of production, state policies and development packages) as causative factors, and secondly, tends to minimise the differential impact on different social sections, especially landless, small and marginal farmers and women. Drought as a social event triggered by a `failure of rains' allows us a better understanding of drought and gives us the needed analytical tools to understand drought, its impact and coping mechanisms for the different social sections who are placed at with different positions in terms of access to recourse, access to non-farm incomes, access to employment, because of class, caste and gender. Such a framework may help us see better how aspects of patriarchy in these respects make women more vulnerable to droughts and famines.

3.0 DEFINING DROUGHT-PRONE AREAS: A BROAD ASSESSMENT

The `drought-prone'ness of an area then may be seen as essentially made up of the juxtaposition of two distinct subsystems: a) an ecological system characterised by scarcity of water resources and an uncertain and variable rainfall pattern (and therefore characterised by a single crop economy) and b) a subsistence cycle that depends heavily on a single rainfed crop. The counterpart of this characterisation is the lack or the virtual absence of non-agricultural incomes in the area, a characteristic that also has a definite role to play in the matter of managing drought.

This characterisation shall be our departure point in order to develop a general perspective of the problem. We would emphasise that a full treatment of the problem will finally require an area-specific analysis of the problem. To develop a general perspective, we shall use approximate methods that shall help us form broad estimates and also, illustrate the analysis that needs to be carried out with more precise values.

We begin by broadly evaluating the rainfall regime of an area against the requirements of a single rainfed agricultural crop.
If we take the average value of pan-evaporation as E_p = 7 mm/day and a pan factor of 0.7, the reference or theoretical crop evapotranspiration rate would be

$$E_{to} = 7 \times 0.7 = \text{say, } 5 \text{ mm/day}$$

The crop pattern in most such areas is dominated by so-called coarse cereals like millets or sorghum, for whom the crop factor under stressed conditions may be taken as 0.6. We then have the average crop evapotranspiration rate as

$E_c = 5 \times 0.6 = 3$ mm/day

Assuming about 100 effective growth days under these conditions, we arrive at a total minimum water requirement for such a crop under stressed conditions as 300 mm of water use.

We still need to correlate this requirement with rainfall. In low rainfall areas, a general observation is that about 60% of the rainfall can become available for utilisation by the plant. In that sense the minimum rainfall that is needed to satisfy this requirement may then be taken as

$R_{min} = 300/0.6 = 500$ mm

So, what we find is that the annual rainfall should be above $R_{min} = 500$ mm if there is to be no drought.

However, to determine drought prone-ness, we still need to correlate it with the dependability of rainfall. This is an important question and may merit a little more discussion. What do we mean by drought prone? We adopt a definition in which a mildly drought prone area is an area where one year, out of five years, is a drought year, and a severely drought prone area is one in which every alternate year is expected to be a drought year. This is tantamount to saying that a drought prone area is one where the rainfall with 80% dependability (R_{80}) is less than 500 mm, and if additionally the rainfall with 50% dependability is less than 500 mm then the area may be called severely drought prone, else it may be classified as mildly drought prone.

To round off the generalisation, we use a ratio of the rainfalls with 50% and 80% dependability with the average rainfall (R_{av}) derived from the 100 year series for a typical peninsular region, the Jhabua district in Madhya Pradesh. For Jhabua, R_{80} is 0.76 times R_{av} and R_{50} is 1.03 times R_{av}. On this basis, we have the critical values of R_{av} as 658 and 486 mm respectively. Since we are dealing with broad and illustrative trends here we may round these off to 650 and 500 mm respectively.

We then have the following broad chracterisation of drought prone areas:

A: Mildly drought prone areas $500 \text{ mm} < R_{av} <= 650$ mm

B: Severely drought prone areas $R_{av} <= 500$ mm

4.0 FAVOURABLE FACTORS FOR MANAGING DROUGHT

Most of the drought prone areas have always had drought prone climates and it would be interesting to see how they may or may not have coped with the problems of drought in the past. Here there are two general features of these areas in Peninsular India that we find quite striking.

The first general feature is the high per household watershed area (PHWA) in these regions. (This is equivalent to lower population densities). The PHWA is typically of the order of 2 ha or more in all these areas and has traditionally been even higher in the past. This does not mean a high cultivable area per household. Agricultural land is limited, but non-agricultural land is generally very high and it typically supported scrub forest with thin vegetation, extensive low grade pastures and concentrated patches of high-grade pastures. This seems to have given rise to a strong pastoral tradition of flexible livestock rearing (cut down your herd in bad years, increase it in good years), whether cattle or sheep and goats; and in good years, a sizable amount of irrigation for narrow strips of low lying land.

The second general feature is the wide prevalence of non-agricultural skills and occupations, albeit often only part time, ranging from warfare – some of the most martial communities have come from the most severely drought prone regions – to business – again some of most successful business communities in India have come from these areas. A fascinating example is provided by the drought prone Khanapur Taluka in Maharashtra, which can boast of persons involved in *sona galne* (occupation of gold purification) in every major town in India, literally, *every major town*! Thus there is a store of non-agricultural skills and enterprise and tradition that can be a vital factor in managing drought.

5.0 THE STANDARD SOLUTIONS: FIRE FIGHTING AND EXTERNAL INPUTS

The first simplistic standard strategy against drought is a set of fire fighting measures consisting of concessions, loans and recurring subsidies of one sort or the other. Since they do not form part of a long term strategy of gradual withdrawal, they tend to become permanent fixtures that do little to solve the underlying problem except perpetuate them.

The other standard strategy is a heavy dose of external inputs that may take two forms. The first, and most common, is simple: bring water from large systems from water surplus basins, if need be, by building the Ganga-Cauveri link! We would be the last to deny the necessity of water from large systems for drought prone areas; there is, however, the question of what role such water should play. External water should supplement and strengthen the local water resource and water regime. Instead, what usually happens is that local water resources begin to be neglected and deteriorate rapidly and the area becomes more and more dependent on external water from already overstretched systems. The second form is a more ambitious one, that of bringing industry to backward areas, and while it was in vogue a few years ago, it is not much talked about nowadays.

6.0 MANAGEMENT OF LOCAL AND WATERSHED RESOURCES

External water and industrial inputs both have a role to play, but only when integrated within a broad strategy that bases itself on the strengths of these areas. The first of these strengths is the high PHWA that these areas have and the starting point is the conservation and enhancement of the local watershed resource base. There is now quite a

bit of literature and experience generated over the last two decades in this respect though there is need to adapt it to specific physical-natural as well as the socio-economic local conditions.
Though the `ridge to valley' approach in the development of watershed resources is no doubt important, it is also important to plan the development programme as well the sharing of benefits according to the distinction between conservation zones, infiltration zones, recharge zones and the valley portions. Studies have shown that in the absence of institutional mechanisms for sharing the benefits, though the development works mostly take place in the upper portion of the watershed, the benefits accrue (mostly in terms of irrigation) to people in the lower part of the watershed.

The general maxim for soil and water conservation is often summed up as `Make water walk, not run'. There are indeed many ways of achieving this and the readers can refer to the vast literature available on this (for example: Mahnot and Singh undated; MANAGE undated; Paranjape, Joy et al 1998). Here we only discuss a few points about how to combine them optimally.

The first point that needs to be considered is the need to re-orient watershed development programmes more explicitly towards productivity oriented hydrological planning. For example instead of complete run off suppression, it may be better to adopt a strategy of run-off guidance to control soil erosion in high run-off areas and collect it for crop or productive use in designated infiltration areas. Similarly, it is important to convert as much as possible of the unproductive component of the water balance (evaporation for example) to productive use. Similarly, though the effort should be to convert as much run-off into groundwater as is possible, it is important that it should also become available for use in the watershed and become a reserve for bad years.

Generally the surface storages in drought-prone regions are planned at 50% dependability. This is good, but planning of water resources should aim at 80% dependability for the basic service. For most of the years there will be `variable' water available over and above the `assured' quantum (see section on assured and variable water below).

7.0 EQUITABLE ACCESS TO ECOSYSTEM RESOURCES: THE LANDLESS AND THE WEAKER SECTIONS

Equitable access to water especially and to ecosystem resources generally is an important component of managing drought and creating sustainable and assured livelihoods for the rural population. In its absence the poor and the landless are often at best neutral or apathetic and at worst hostile to watershed development. Unless the poor acquire a positive stake in the development of ecosystem resources, no ecosystem development can be sustainable. However, for this, we must change our conceptions of who has a right to what resource. And the first example is that of water.

In the conventional approach, the right to water is seen as joined to land. Water access is then weighted heavily in favour of large holders especially those who are close to the water source and the landless are automatically excluded. By contrast, the pioneering alternative concept explicitly brought forward by Pani Panchayat, and developed further by the Mukti Sangharsh Movement (both in Maharashtra) it is mediated by livelihood need. Water is the basis of livelihood, and therefore every household, irrespective of the size of its holding, has a right to water necessary for livelihood.

It also implies that equitable access is not simply a matter of mechanically sharing all water equally. It is much more a matter of establishing priorities of needs: Drinking and domestic water needs for everyone stand at the top. Next come the needs of the cattle and the minimum regenerative needs of the ecosystem, that is, water for greening and nurseries, fisheries, etc. Next comes basic service, the minimum water that needs to be assured to everyone making a living dependent on agriculture including landless labourers. Only after these prior rights are met can water be made available for commercial production over and above these needs.

The first issue often raised is why the entitlement for the landless. These are steps that flow from a philosophy of positive discrimination, or what can be called as affirmative action. The landless are yesteryear's farmers who have lost their land. If they had land they would till it, and the share of water recognizes this potential. With a right to water they may now bargain with the larger holders and lease in land to use that water, perhaps eventually buy some land as well, or they may sell their share of water, though not the right. With this philosophy further special provisions could be specifically aimed at: a) ensuring livelihood for the landless and marginal farmers, b) independent source of income for the women and c) expanding processing and value adding activity for the craftsmen and the landless.

Many arrangements are possible: for example, a) the landless families may work out suitable arrangements for annual or seasonal leasing; b) the landless and marginal farmer families may be provided with wasteland, either private or common, for biomass production and a right to annual biomass yields through produce sharing arrangements; and c) the women may be provided with small agriculture plots along with requisite amount of water for seasonal, post kharif production of high value products.

Equity has an environmentally regenerative aspect often overlooked. Equitable distribution of water between all sections of the people living in an area also automatically tends to disperse water much more extensively over the region or the ecosystem. The conventional irrigation practice tries to concentrate irrigation on a much smaller area, not only concentrating the benefit but also different types of environmental problems like water logging, salinisation, etc. further accentuated by intensive use of inputs like energy, fertilisers, pesticides, water, etc. However, if water is distributed more extensively and equitably then the water not only reaches everybody’s land, it is also dispersed throughout the ecosystem, does not create ‘ecological islands’; and instead, becomes the basis for the general upgradation of the ecosystem as a whole.

8.0 ASSURED AND VARIABLE COMPONENTS OF WATER

Another issue raised is whether, with this type of prioritisation of use, the enterprising farmer and the larger landholder will get extra water at all. For that we need some understanding of the neglected issue of dependability planning and the distinction between assured and variable water. Mostly there is no dependability analysis and average values are used. In effect, planning is done at about 50% dependability! In stark terms, it means that planning is liable to fail every alternate year! For large projects it is customary to plan for 75% dependability. Our discussion with farmers has led us to believe that 80% dependability or four out of five years creates a much greater assurance.

The answer is that planning with a dependability of 80% *itself* assures us of a surplus in most years for the larger holders and the more enterprising farmers, *without* disturbing the assured basic service. This may be better explained with a hypothetical numerical example.

Assume a 300 ha watershed with 200 households and a rainfall regime as described for a mildly drought prone area with R_{80} = 500 mm, R_{av} = 650 mm. Assume that over 5 years it has a rainfall of 700, 575, 675, 500 and 800 mm respectively. Assume that 300 mm of the rainfall is utilised for the single rainfed crop, 35% of the rest of the rainfall is intercepted and used. At 80% dependability this means that 35% of (500 – 300) mm over 300 ha is available for 200 households (hh), that is, 210,000 cu.m. of water for 200 hh, thus a basic service of 1000 cu.m./hh. How much extra or variable water is available for extra needs? The table comes out as follows.

Table 4.1: Availability of assured and variable water under different rainfall regimes: An illustrative example

Watershed area (ha)	300	300	300	300	300	**Five year Total**
No. of households (hh)	200	200	200	200	200	
Rainfall (mm)	700	575	675	500	800	
Total Precipitation (cu.m.)	2,100,000	1,725,000	2,025,000	1,500,000	2,400,000	**9,750,000**
Utilised by rainfed crop (cu.m.)	900,000	900,000	900,000	900,000	900,000	**4,500,000**
Available – 35% of residual (cu.m.)	420,000	288,750	393,750	210,000	525,000	**1,837,500**
Utilised for basic service – Assured water (cu.m.)	200,000	200,000	200,000	200,000	200,000	**1,000,000**
Water for extra needs – Variable water (cu.m.)	220,000	88,750	193,750	10,000	325,000	**837,500**

Source: Personal data collected through fieldwork, 2001

As the five year total shows, over the five years, there is as much variable water for extra needs as there is for assured needs. The enterprising or large farmer need not fear, since they would be in smaller number, over the long term, they will get *more* variable water than everyone gets for assured basic service.

9.0 BIOMASS AND ITS MANY ROLES -- THE OTHER PLANK OF THE STRATEGY

Biomass is the other major plank of the strategy outlined here. By biomass we mean here the total dry mass of vegetative matter produced within an ecosystem. All parts of a plant, and thus its total biomass, participate in the processes that tie the ecosystem resources into a food chain. Life within an ecosystem is a perpetual cycle and how many life forms, including human beings, can be sustained by this cycle depends on the total plant matter produced in the ecosystem. Biomass productivity of an ecosystem in this sense thus refers to the total vegetative dry mass within an ecosystem.

In the alternative strategy, biomass has many roles to play. Firstly, biomass has been the main provider of human needs in the past and continues to be so for most of the rural population. Biomass is used to meet needs directly in various forms like food, fodder, fuel, timber, oils and resins, fibre, etc. It is also used to satisfy needs indirectly when it is sold with or without being processed in order to meet the cash required to meet other livelihood needs. Secondly, the biomass productivity of an ecosystem is the natural measure of ecosystem productivity as all biological activity within an ecosystem is regulated by the total photosynthetic production by primary producers.

Potential biomass productivity represents the total photosynthetic potential within the system while partitioning of this biomass between different products gives us different use values. The former is determined by factors like soil conditions and moisture holding capacity, the water regime, the biomass and nutrient circulation, etc., common ecosystem conditions. On the other hand, degree of realisation of potential biomass productivity and its partitioning into different use values depends much more on individual decisions like species selection, crop and water management, nutrient management practices, etc.

From the point of view of sustainability, it is important to think beyond simple productivity and distinguish between primary and secondary productivity of an ecosystem. Primary productivity of an ecosystem may be defined as the productivity that an ecosystem will have if all external inputs were to be withdrawn from it. Secondary productivity is the increment in productivity that results from the use of external inputs. Aggregate productivity is the sum of primary and secondary productivity. Rising aggregate productivity need not necessarily mean a rising primary productivity. This distinction between primary and secondary productivity is close to the distinction between `natural stock of capital' and `human made capital.' Sustainability then would mean maintaining or enhancing primary ecosystem productivity or the natural stock of capital.

Sustainability, thus, does not necessarily deny the use of external inputs and the associated increment in productivity, without which it would be difficult to ensure the livelihoods of the rural poor in India. External inputs can also help increase primary ecosystem productivity that is falling due to environmental degradation. However, sustainable practices allow only such level and manner of external input use that would not disrupt basic productivity conserving and enhancing biological cycles and processes within the ecosystem. Low External Input Sustainable Agriculture (LEISA) is a good example of such sustainable practices.

Sustainable resource use thus need not exclude external inputs, need not be limited to organic farming methods or to rainfed farming. This has important consequences in assessment of livelihood opportunities. The approach suggested here therefore develops a plan that aims at progressively raising potential biomass productivity through an ecosystem resource development supplemented by limited but assured quantities of external input including water.

The biomass approach also helps us quantify the livelihood requirements of a household. A first estimate is that it requires 18 T of biomass for a typical small or medium farmer as given in the table below:

Table 4.2: Estimated biomass requirements of a typical family

Use/need	**Dry weight (in T)**
Food and allied needs (cereals, pulses, oil seeds, vegetables, etc.)	2
Firewood	2
Fodder (for one pair of bullocks)	5
Recycled biomass (fallen leaves, brushwood, roots, and other compostable materials)	6
Biomass for cash income (surplus biomass)	3
TOTAL:	**18**

Source: Personal data collected through fieldwork, 2001

Note that sustainability planning needs to include recycling of part of the biomass produced. As a thumb rule it is assumed that a throughput 1/3 of the biomass that is produced would maintain the primary productivity hence, a provision of 6 T for this.

All these requirements are reasonable and broad upper bounds according to internationally accepted norms and there is ample scope for optimisation. For example, if the cattle herd is rationalized and two families share one pair of bullocks, then, there would be biomass saving of 2.5 T in fodder. Switching over to various fuel saving and fuel efficient devices and methods can save about half the fuel. Thus there are different ways at optimisation of biomass requirements and bring down the total requirements or put it for alternative uses.

The provision of marketable surplus of 3 T is most commonly fruits, vegetables or other high value agriculture produce that is, very often, perishable in nature and also a prey to market fluctuations. If it is produced in the form of non-perishables like small timber, bamboo, fibre, oils, or medicinal plants, significant values addition options become possible and are discussed later in the paper.

9.1 Biomass and Biomass Pools: Their Role in Drought Proofing

Biomass also has a special role to play in managing drought, and in making optimal use of water resources in an area. As we have seen earlier (see Table 1), even in drought prone areas, there are appreciable quantities of variable water. The best way to use it is to use it for perennial tree species especially those that produce bulk biomass. When a seasonal agricultural crop fails due to `failure of rains' it fails drastically. Perennials, however, simply adjust their growth: when there is less water they grow less, but when there is ample water they grow faster. Trees so to speak, pool the biomass across the

years, never failing drastically in bad years but also taking full advantage of the extra rainfall in the good years. This is an essential element in a drought proofing strategy, pool risks to reduce risks. And biomass pooling is at the very heart of the strategy.
One way of pooling water risk over bad and good years is to turn it into biomass and pool that biomass. We do not directly use *all* the water we use in the form of water. Drinking water for humans and animals, water for cooking, water for washing and cleaning ourselves, our surroundings and our cattle -- all this water we must have as water, and that too as water of adequate quality. But water that we utilise to grow food or fodder is not used as water directly. We can store the extra food that we produce from the extra water we may have in good years, reducing the need for a corresponding amount of *water* in bad years. This is what a so-called grain bank (or more broadly a biomass bank) is all about; it pools the extra *water* we receive in good years.

Pooling works in a similar manner across social sections. If we pool grain from those who produce more than they need and provide it to those who produce less at a fair price, or as food for work, we have built a local PDS or a safety net. PDS today relies too much on the centralised godown system and ignores this base of the pyramid. A true PDS would be one that builds from the ground up: as much of the grain need as possible is handled within the village by pooling across time and across sections, only the residual need has to be transferred upwards.

9.2 Exogenous and Local Water

The biomass approach also helps quantify water need. At present let us assume that standard farmer household requirement is 18 T of biomass, though it could be brought down by optimisation. Studies of biomass stands and rain fed crops in good years show that man managed stands can be expected to have a biomass productivity of 30 kg/ha-mm or 3 kg/m^3. So to produce 18 T of biomass, a household should have access to 6000 m^3 of water use while an additional provision of 400 m^3 would be adequate for all other direct water needs.

Consider a mildly drought prone area with a PHWA of around 1.5 ha and a typical average family holding 1.5 ha. So we may have a water use of about 300 mm x 1.5 ha through the rainfed area. We further assume that about 35% of the unutilised rainfall may be utilised as applied water.

In that case we have

Water use available from rainfed area	
1.5 ha x 300 mm	4,500 m^3
Applied and stored water available from local area	
0.35 (500 - 300) mm x 1.5 ha	1,050 m^3
Total available from local sources	5,550 m^3
Requirement	6,400 m^3
External water supplement required	850 say 1000 m^3

What is important here to note is that the external water supplement is worked out as a *supplement to overcome the shortfall* in basic service. It is *not* assumed that all water needs for the given households will be served from the external water. This also implies an integration of external and local water resources, or if you will, a pooling!

9.3 Biomass Processing, Energy, and Income Generation: Going Beyond Subsistence

Finally, the crucially important role of biomass and biomass pooling, is as a provider of stable and rising non-farm incomes in the strategy for drought proofing. Lack of non-farm occupations is the other side of the coin to the dependence on a single rainfed crop. Moreover, we believe that agriculture alone cannot ensure sustainable livelihoods for all the rural population and especially resource poor sections of the drought-prone regions. The approach therefore cannot limit itself to sustainable assurance of subsistence alone. It must provide for a transition to a dispersed industrial society based on biomass and local resources of renewable energy along with judicious use of non-renewable energy and external inputs. Industrial development here does not mean the present centralised, energy intensive, profit driven capitalist mode of industrial development based on non-renewable energy and materials; but a biomass-based, dispersed industrial production system tied to social needs based mostly on resources created within the ecosystem. The key resource here is the biomass surplus of the order of 3 to 5 T per family, which represents both an energy and capital stock. Used strategically, along with local sources of energy, materials and local labour, it opens up an alternative path to a dispersed and self-reliant industrial development. [2]

The main characteristics of these technologies are (i) equal performance or function as compared to the conventional technology; (ii) cost reduction; (iii) energy saving in a big way and the non-renewable energy consumed directly or indirectly is smaller typically by a factor of 5 or more; (iv) appreciably higher component of local labour and local materials and generate substantial employment and incomes to the local population; (v) amenable to modular design and components can be fabricated or manufactured in dispersed rural industries or work places and assembled at site; and (vi) provide opportunities for local skill upgradation and development. The new technologies become part of a process of acquisition of skills by the people in a participative manner. The skill upgradation and development that takes place through the extensive use of these technologies would be of immense value in all future developmental efforts, and is an important step on the road to sustainable prosperity.

Such alternative technologies are available in most of the infrastructure areas like (i) water (diversion structures - both overflow and non-overflow; storage structures and pipelines); (ii) buildings (two-storeyed earth-quake resistant residential buildings; large sized community buildings; building products like beams, posts, roof elements doors,

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[2] For further details of the technologies and their applications the readers can refer to: (1) “Sustainable Technology: Making Sardar Sarovar Viable” by Suhas Paranjape and K. J. Joy, 1995; and (2) “Banking on Biomass - A New Strategy for Sustainable Prosperity Based on Renewable Energy and Dispersed Industrialisation” by K R Datye, 1997 (both published by Centre for Environment education, Ahmdebad, India)

windows, etc.); (iii) roads (asphalted roads with bamboo and/or timber reinforced base); (iv) energy (hybrid generation systems like solar - bio-fuel and wind - small hydro). The potential and characteristics of these alternative technologies are given below through an illustrative example.

The techniques that we are talking of are distinctive by their sue of treated small dimension timber (with diameters of the order of 75 to 100 mm), natural fibre and reinforced soil techniques to develop applications whose composite elements are designed and optimised by their function. The required small dimension timber takes only about 5 years to reach usable size and can be easily grown as short duration farm forestry or as part of the wasteland development programme. Allotting wastelands to the rural disadvantaged sections acquires an entirely different significance in this context.

Finally, let us look at the value addition potential. For small dimension timber it is possible to have a value addition of up to Rs. 7,000/T after paying the producer and paying for the cost of chemicals, treatment facilities and other allied expenses. We are here talking about the applications with minimum value addition potential; the income generation (and also energy saving) involved in other energy replacing uses of processed biomass (medicinal plants, pesticides, non-edible and edible oils, chemicals like resins and other intermediates) are much higher.

10.0 A THREE-PHASE PROGRAMME

The strategy for drought proofing proposes a three-phase programme for assuring livelihoods through regenerative use and equitable access. The three phases, loosely defined below may be expected to have some overlap. The first phase constitutes the main phase of watershed development, lasting for about three years and a one or two year preparatory period. The second phase, lasting two to three years consolidates and continues the watershed development work, focusing on the larger terminal storages and a distribution system capable of delivering limited but assured quantities of water. In the third and phase lasting for another two to three years, the local system, now mainly completed, is allocated a share of external water from major/medium sources and finally makes livelihood assurance for all a real possibility.

10.1 Phasing of the Programme

Progression from one phase to the next phase of the programme is not automatic. Only watershed groups and associations who fulfil certain pre-negotiated and mutually agreed performance norms in relation to physical work, regenerative use and equitable access qualify for the next phase of the programme based on simple quantitative indicators to be decided mutually between the NGOs, the government and the watershed groups or associations. It is important that receipt of public funds and external inputs beyond a certain limit, be dependent on fulfilment of minimum conditions of regenerative use and equitable access.

Also, in each of these phases significant amount of new ecosystem resources will be generated while existing resources will be improved. It is important that the rights to these resources be discussed and decided upon *before* those resources are actually generated. The importance of this point cannot be overstated, for once the resource is created *without* an explicit consensus about its access and regulation, what follows is an often fierce competition to capture access to the resource and acquire rights over it, which once acquired become extremely difficult to dislodge. This also has an important bearing on equity issues, and it is our experience that if issues of equitable access are discussed prior to resource generation (and therefore prior to resource rights being established), there is a much more favourable attitude to these issues and a consensus more favourable to the rural poor and landless is more likely to emerge.

10.2 Right to Work, Food for Work and Employment Generation Programmes

Today there are many rural employment generation programmes that can serve a long term purpose if they are taken up as part of the first phase of the strategy as discussed above in the phasing of the programme. A good example of its potential is afforded by the Mukti Sangharsh Movement which successfully pressed for a change in the character of the Employment Guarantee Scheme (EGS) work in Maharashtra's drought prone region from an emphasis on road construction and breaking of stones, to more productive and regenerative work. Access to minimum gainful employment (say, 250 to 300 person days per family) needs to be recognised as a right and the State EGS programmes should be flexible enough to allow people to take up soil amelioration, soil and water conservation measures of various types, nursery, plantation, creation of small surface storages, and other type of productive assets. People may form their own SHGs for this purpose and regulate the work and payments themselves.

10.3 Performance Oriented Disbursement and Allocations

Many of the features presently cannot be incorporated because of the kind of norms that govern watershed funds, especially government funds. The guidelines are strict about the *amount* of expenditure to be incurred every year failing which funds often lapse. It is first of all necessary to make provision that these funds do not lapse at least over an additional period of say two years. Thus the project should be allowed to utilise the same amount in six years if it so desires. This is important in the light of the requirement earlier emphasized by which for example, building a consensus on resource access and regulation may take a longer time than what the guidelines allow. Unless funds are allowed to be carried over, resource generation will take place without a proper consensus on access and regulation.

Another area that needs consideration is the process of sanction and release of funds. Delay in scrutiny and sanction of instalments very often disrupts a process that may just be acquiring cohesion and momentum. A model tried out fairly successfully by officials and the women participating in one of the IFAD micro-credit programme districts in Tamil Nadu may be of relevance here. The programme treated the entire programme as a loan programme and made recoveries accordingly, and only at the end released a lump sum payment of the subsidies/grants involved helping development of good repayment habit, fiscal discipline and ensuring asset building. Somewhat along those lines, it may be suggested that disbursements be made initially as loans, without going through the complicated procedures causing unnecessary delays. Later on the basis of mutually agreed upon performance norms for physical activity the appropriate portion of the expenditure could be converted into assistance. This would obviate delays as well as build in a performance orientation to the programme.

10.4 Assistance and Recoveries

There have been differing views on the degree of assistance, with opposite ends of the spectrum calling for full assistance and full economic recovery, respectively. The strategy proposes a phased introduction of recovery components. The first phase of the programme is based mainly on assistance. In the second phase, it is expected that users come together and contribute sufficiently to cover, firstly, the operation and maintenance costs of the systems that will be put in place, and secondly provide for depreciation and repair of the systems. It is in the third phase that extra economic service really comes into play, and in which recoveries may cover operation and maintenance including repairs and depreciation as well as differentially charged capital cost recovery.

11.0 KNOWLEDGE: COMBINING PARTICIPATIVE AND SCIENTIFIC RESOURCE MAPPING, EVALUATION AND ROBUST MODELS

Such a strategy requires a much better assessment of needs and resource availability in an area and an evaluation of resources and resource use options. All of these processes depend crucially on the capability of people understand their resources and their capabilities, to make informed choices between options, to organise their own efforts and their own lives as well as on their understanding of what constitutes regenerative use and equitable access. It involves a process of building and maintaining a database through combination of participative and scientific process of resource mapping and resource evaluation.[3] This distinctive approach attempts to overcome the limitations of the usual PRA methods (lack of comparability with other data and poor quantification) as well as standard secondary databases of scientific information (lack of sufficient detail, lack of detail on present social situation, distance from local understanding and lack of participation). It combines participative methods and secondary scientific information on the basis of robust resource evaluation methods and models so that fairly good first approximations can be obtained and progressively refined with selected primary data gathered through participative methods. Resource need and resource use potential is assessed through the concept of livelihood baskets.

The process serves a twofold objective. First, it results in the capability building of the local people and secondly, it draws the local population into the process of determining their own water allocation. If these twin processes are successfully conducted, we have

[3] This approached is detailed in some of the SOOPECOM papers on natural resource data management systems (NRDMS) especially the paper, "Natural Resource Data Management System (NRDMS)" by K. R. Datye, 2002

then an informed consensus on the resource availability and the needs, how they match and what if any shortfall is there. It also involves an understanding of the various components of water resources in a region and an assessment of their availability (*in situ* use, surface water, groundwater, assured water, variable water, etc). The process of actual determination of water allocation and use including the quantum of exogenous water is then visualised as a process of negotiation between the state and the regional entity.

12.0 IN CONCLUSION: SOME KEY ISSUES RELATED TO SOCIAL AGENCY

Finally we consider here briefly some of the issues of social agency and arrangements that have been raised in respect of the strategy.

12.1 Too Many Parts Have to Mesh Together in Too Many Ways

The first issue often raised is that the strategy consists of too many parts; it needs too many parts to mesh together in too many ways for everything to work. There are many ways of approaching this issue. First, the `meshing' of everything together is needed for full assurance of livelihoods, but if we are thinking of substantial improvements and disregard for the time being that full livelihood assurance is not created, then every component of the strategy has a role to play by itself. This means that the more aspects are incorporated the more substantial the benefit.

Also, we may separate the components of the strategy into two layers in two ways. In the first way we separate the components, which require external input and those, which do not. And similarly, we separate the part that is crucially dependent on the dispersed energy generation component and that which is not. Then the second part (in both types of division) is essentially similar to a watershed programme. There are no new activities or resources involved. It is just a new way of doing the same activities with the same resources, which anyway is being done everywhere within watershed development programmes. This is mainly a task of advocacy and interaction within the community of activists and voluntary organisations taking up watershed development activity. The crucial part is the part that is left out of this. This will require a change at a much larger, policy level intervention and assent. Here the task is not only advocacy and support within the group mentioned above, but also at a much higher level. This does increase the time horizon of its feasibility.

12.2 Who Is To Do This?

The second issue often raised is about which organisations would be interested in doing this. In this respect, certain changes taking place in the organisation of social action need to be given greater attention. Earlier the divide between those committed to equity issues and those committed to environmental issues was very large. Similarly, the divide was very wide between what could be called mass organisations who were well rooted in certain deprived sections and more often had an agitational outlook, and what could be called voluntary organisations who had a more conciliatory and development oriented approach which did not include any great concern for equity. Similarly, those organisations that have seriously engaged in watershed development work are discovering that many more things are needed if the gains of the programme are to be preserved. There is a growing recognition of the need for common ground and common activity that touches on all these spheres and for integrating concerns about the environment and equity and livelihoods and quality of life. This section indeed will be the initiators of this strategy.

12.3 And What Is The Social Agency?

The last issue that we shall consider will be the issue of social agency. One of the pertinent questions, which has often been raised in respect of the proposal presented here, is -- can one identify a social carrier for this perspective? Those who ask the question do not deny the desirability of the goals that are pursued or that they are in the long term interests of the rural poor. We need to consider whether there are social processes, which will bring those sections to accept the kind of proposal, which is being put forward. Of special interest is the tension between equity and consensus -- how does one ensure that a consensus, which therefore includes the better endowed, will evolve around equitable access to ecosystem resources, particularly, water?

In this respect we would like to point out a number of recent developments in Maharashtra. Over the last few years a movement has grown up covering thirteen talukas of five districts in Maharashtra around the distribution of the waters of the Krishna river. In Maharashtra most of the irrigation development in the Krishna basin has taken place on the Krishna banks leaving the higher reaches in the Krishna basin, especially in the severely drought prone region on the left bank starved of any water. Meanwhile, because of the Bachawat Award, which was set up for the proportionate allocation of Krishna waters amongst the contending three states of Maharashtra, Karnataka and Andhra Pradesh, the Maharashtra government has been in an unseemly haste in building capacity in the Krishna Basin. The movement demands that the water system be restructured so that firstly, any additional irrigation should be done only in the drought prone regions of the basin, and secondly, that the existing system be restructured so that the drought prone areas received a fair share of the Krishna waters. Interestingly, the movement also stands by equitable access to water and promises that the water it receives will be used equitably within the area as well. In this case, the drive for inter-regional equity in water access has forced the recognition of intra-regional equity in water access.

In general, one could say that in a situation in which water rights have not been widely established, where the area is generally water starved, if the issue of access to newly developed common water resources is raised prior to the creation of that resource, it is very difficult to deny the rural poor a minimum assured basic service. However, we would point out that it is important that the discussion/negotiation around equity take place prior to the creation of new resource and establishment of rights over it. If creation of the resource takes place before such a discussion/negotiation, what generally takes place is a race to establish right over the resource with the better endowed monopolising the resource and foreclosing any equitable option. Growing awareness of this aspect and adequate policy support will go a long way towards ensuring equitable and sustainable use.

It is necessary to reiterate that an assessment of functioning of donor agencies and financial institutions such as World Bank shows very clearly that they have failed to strengthen and promote social initiative for regenerative and efficient resource use with livelihood assurance and phased, progressive improvement of cost recovery. Hence it calls for a reorientation. It is also high time that the top down process of policy change and structural reform with exclusive reliance on implementation through governments, corporations, consultants and contractors is abandoned. Foreign direct investment has very little to contribute to this process and even the role of Indian private sector is indirect, mainly through the emergence and strengthening of small, dispersed private and community enterprises.

Initiatives for reforms and policy changes can best be brought about through an interactive process of development planning and implementation where there is an equal partnership between local institutions on the one hand and the regional district administrations and development agencies and financial institutions on the other. This interactive process cannot work without hydraulic decentralisation and dispersal of energy generation. Importance needs to be given to policy and financial support for decentralisation of the energy, water and infrastructure sector and advancement of biomass, renewable energy and local materials based technology. Similar interactive process has to be initiated and sustained in the political area where the members of the civil society work in tandem with the formal elected representatives and administrators. For this we need to bring about a complementarity in the functioning of the Panchayat Raj (decentralized, village level) institutions brought in through the 73rd and 74th amendment of the Indian Constitution and the functioning of instruments of direct democracy such as Gram Sabhas (general body consisting of all adult members in a village).

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