# Drought Proofing and Rain Water Harvesting in a Micro Region: Issues of Access, Efficient Use and Multi-Level Planning

***Amita Shah***

Gujarat Institute of Development Research, Ahmedabad (India)
E-mail: gidr@ad1.vsnl.net.in and gidrad1@sancharnet.in

**Abstract**: Frequent occurrence of droughts in large tracts of dryland regions in India has a significant bearing on poverty and people's livelihood strategies. Over the last 50 years, droughts have occurred almost once in three years. While there has not been any significant changes in rainfall pattern in the country since more than a century, there seems to be an increase in the severity of the impact of droughts on people's livelihood. Apart from the demographic factors, increased severity of the impact of drought can be attributed to the two interrelated factors viz; inequal distribution and inefficient use of water. As a result, droughts not only lead to transient poverty among a large number of rural households—both landed as well as landless—but, in the long run, may also result in perpetual decline in ground water resources. This might happen because the drought relief operations are undertaken as fire fighting measures and with little concern for the irreversible impact on aquifers. The outcome is increased dependence on transported water.

Alternatively, a large number of initiatives have been undertaken in some of the dryland regions in India to construct small water harvesting structures like check dams, farm ponds, nala bunds etc. These initiatives have received a special policy thrust under the modified watershed projects, which since the mid- nineties, have assumed primary responsibility of drought proofing in the large tracts of dryland regions in India. The consecutive droughts in most of these regions during the last two years have provided further phillip to the concept of in-situ harvesting of rain water. Hence a large number of water harvesting structures have been built with financial support from the state especially, under relief works programme. It is expected that these structures will reduce, if not completely solve, the problem of water scarcity initially during the normal years and eventually during the drought years. This, essentially, signifies locally managed self sufficient system of water resource management and drought proofing in these regions.

This paper looks into some of the recent experiences from water harvesting measures and discusses their implications for sustainable management of water as well as for effective drought proofing in a major dryland region in Western India. The analysis is based on secondary data pertaining to various programmes for soil water conservation in the state.

## 1 Introduction

In-situ conservation of rain water is increasingly recognized as a more effective mechanism for managing water resources in a sustainable manner. This is primarily because of the two reasons: (i) it is technically more sound as it regenerates, rather than disturbs, the existing aquafers; and (ii) it can check over exploitation of water possibly through local level arrangements like water budgeting and sharing.

Driven by these two objectives especially, the first, a large number of initiatives have been undertaken in some of the major dryland regions in India for constructing small water harvesting structures such as check dams, farm ponds, nala bunds etc. These initiatives have received a special policy thrust under the modified watershed projects, which since the mid-nineties, have assumed primary responsibility of drought proofing in the large tracts of dryland regions in the country. The consecutive droughts in most of these regions during the last two years have provided further phillip to the concept of in-situ harvesting of water. Hence a large number of water harvesting structures have been constructed with financial support from the state especially, under relief works programme during droughts. It is expected that these structures will reduce, if not completely solve, the problem of water

scarcity initially during the normal years and eventually during the drought years. This, essentially, signifies locally managed self sufficient system of water resource management and drought proofing in these regions.

This approach, prima facie, there are certain limitations. These pertain to the issues like adhoc planning, looking only at the micro level resources and needs; feasibility of achieving self sufficiency in water resources development at village level; and concentrating more on conservation rather than on distribution of water across different uses as well as households etc. To a large extent these difficulties are likely to arise because of the existing property regimes governing ground water resources, high incidence of state subsidies, and perhaps, accessive thrust on decentralization and self sufficiency in water resource management at micro/village level. The drought relief operations make the situation worse.

This paper looks into some of these aspects in the light of the various local level initiatives towards water harvesting structures in Gujarat which is one of the major dryland regions in western parts of India, and discusses their implications for a sustainable management of water as well as drought proofing in the long run. The analysis is based on secondary data pertaining to various programmes for soil water conservation in the state. The paper is divided into three sections including this introduction. The second section presents profile of the various schemes for promoting water harvesting structures in Gujarat. The last section discusses the major issues that emerge out of the actual implementation of a water harvesting scheme in the state and draws policy implications.

## 2 Promoting water harvesting structures in gujarat: some recent experiences

Three consecutive droughts in the late eighties have triggered pro-active policies for promoting small water harvesting structures through a series of programmes supported by the government in Gujarat. These include special schemes for constructing farm ponds on private land, deepening of village tanks on public land, construction of nala bunds, trenches and percolation of small check dams on drainage lines, and treatment ravenous land in various river basins in the state (Shah, 2000). Most of these schemes have been in operation for a long period of time though these schemes received a special boost since early nineties during which the state had experienced sub-normal rainfall situations in five out of ten years. This in turn, had resulted into highly fluctuating and a negative rate of agricultural growth (Mathur and Kashyap, 2000) thus exerting adverse impact on people's livelihood especially, in the dryland regions. What is however noteworthy is that apart from scanty and uneven distribution of rainfall, the problems of livelihood support and scarcity were also seen as man-made, owing to severe depletion of ground water following the droughts in the late eighties. For instance, between 1984 and 1991, utilizable ground water reserves had declined by 29 per cent though, there was a marginal increase of 4.65 per cent during 1991—1997. During this period, water table had declined by 50 per cent or more in majority of locations in the state (Hirway, 1999).

To a large extent, depleting ground water resources in Gujarat (and in other parts of dryland regions in India) could be viewed as a coping mechanism by farming community to survive under the uncertain rainfall conditions in the state. This kind of a rather short sighted response from farmers is not surprising especially under a property regime where land as well as water beneath that are privately owned and/or controlled[1]. To this, the state's response was to promote harvesting and conservation of water through a series of schemes noted above. While most of these schemes are designed as independent interventions, the policy thinking of late, has been shifted in favour of linking them up under an overarching policy of the integrated watershed development programmes (WDPs) which has gained significant importance since the mid-nineties[2].

[1] According to the existing property rights in India, farmers have ownership of land and has exclusive access to and control over the ground water beneath the land that one owns.

[2] Integrated Watershed Development Programme is now being accepted as an overarching strategy for development of natural resources at village level though, its integration with irrigation and other line departments is yet to be achieved.

By now, the state government has implemented a wide range of schemes/programmes under the broad objective of soil water conservation. The latest among these is the scheme for small check dams on drainage lines as well as river streams. These activities, constitute a part of the minor irrigation schemes and/or watershed programmes, were often undertaken as relief works programmes, hence had limited coverage. The rapid depletion of ground water and frequent failure of monsoon during the nineties however, made it inevitable to harvest whatever scanty and uncertain rainfall, the region receives. This was realized more clearly due to scarcity of drinking water and fodder during the droughts in 1999—2000 and 2000—2001, which resulted into large scale migration from dryland regions to the other parts of the state (Shah, 2001).

Guided by these considerations, the Government of Gujarat has launched a campaign for checking run-off of rain water and thereby help (a) improving ground water table; (b) reducing scarcity of drinking water; and (c) mitigating incidence of crop-failure through survival irrigation. The scheme, commonly known as '60—40' had been introduced during 1999—2000 which was the first of the two consecutive droughts that turned out to be the century's worst drought in terms of their adverse impact on the various life support systems.

Evidently, the scheme has received overwhelming response from various quarters viz; people; non-government organizations (NGOs), and the state bureaucracy. The scheme envisages a participatory approach and is fairly simple in its design. There are three important steps for implementation of the scheme. First the community at village level, has to get together, identify a possible site for a water harvesting structure like check dam, and collect 60 per cent of the estimated cost of the proposed structure. The next step is to approach the state's implementing machinery (i.e. Irrigation Department) at the district level which would assess technical feasibility, and approve the proposal structure accordingly, and provide the remaining 40 per cent of the cost. The final step consists of actual execution of the structures by pooling financial resources from people as well as the state in proportion of 60 : 40. There is of course, some kind of an upper limit for the maximum permissible cost per structure and also for the number of structures to be sanctioned per district or region. Such checks are necessary to ensure a regionally more balanced spread of the scheme. Over the past two and half years, the scheme has made significant achievements (Shingi and Asopa, 2001) though, there are problems of cost-cutting (and thereby reducing the actual contribution by the people), which at times might lead to poor quality of the structures[3]. Notwithstanding these limitations, the positive achievements of the scheme can be described as follows[4]:

- In the first two years about 24,000 check dams were proposed in Saurashtra region in the plains with a geographical of 64.3 thousand square kilometers of which 17,000 were sanctioned and 12,000 were executed. The estimated cost for the check dams sanction was Rs. 3.56 million (i.e. 71,000 US $).
- To a large extent the check dams had helped recharging of wells in the radius of 0.5 kms. This helped recharging of hand pumps and also some of the wells that had gone dry. Of course, these impacts are conditional upon the soil type and the rainfall pattern.
- Increased availability of wells helped reducing the need for transported water for domestic use by about 30—40 per cent.
- If properly designed, these check dams can harvest at least 250 mm of rain water and thereby increase cropping intensity as well as cultivation of more remunerative but more water intensive crops.
- Most of the proposals have been made by the owners of wells; those who did not own wells started thinking of constructing new wells in the vicinity of check dams.
- The increased yield and profitability may lead to revival of interest in farming among those who had already migrated in search of alternative sources of income/employment.

[3] A general experience of this kind of a contributory scheme is that, the cost as per the official 'schedule of rates' is often over-estimated say by 30—40 per cent. Moreover, there is often a temptation of cutting down of the cost by reducing the quality/quantity of material used. As a result, the actual contribution by the beneficiaries becomes almost marginal.

[4] Based on the initial observations of an on-going study by Shingi and Asopa (2001), hence tentative in nature.

## 3 Emerging issues and policy implications

While the scheme of check dams has received overwhelming response from various stakeholders, and at the same time, has yielded fairly positive results even in the short run, a close look at its actual implementation may raise certain important issues-technical, socio-economic and institutional.

### 3.1 Technical feasibility

As noted earlier, the present schemes of small check dams is demand driven hence, is planned according to people's perceived needs, willingness to join collective action, and ability to pay for a part (i.e. 60 per cent) of the total cost of the structure. While these are laudable objectives from the view point of participatory approaches and decentralized governance, there seems to be certain limitations in the technical planning of the scheme. This refers to dis-jointed approach for designing of the check dams, often a series of them on a stream, without linking them up with the larger planning for water resources management within a specific river basin. This is despite the fact that the surface water resources especially, in dryland regions, have been extensively tapped through a large number of small and medium sized dams which serve the needs of irrigation and drinking water. At present there are 79 such dams on 71 rivers in Saurashtra which constitutes a major part of the dryland region in the state. Together these structures cater to 4.59 lakh hectares accounting for 23 per cent of the total culturable command area in Gujarat.

Unfortunately, both these sources seem to have created some problems for groundwater management in the state. For instance damming of the non-perennial rivers seem to have led to drying up of many streams and rivers, downstreams, and also resulted into further depletion of ground water and thereby damaging the geo-hydrological systems in the region. This has been demonstrated in the case of increasing salinity and degradation of a unique grassland in Kachchh. A similar phenomenon is also noted in the case of Sipu river where drying up of the downstream aquifers has raised the issue of Riperian Rights[5]. Given this backdrop, small check dams can be executed to help recharging the ground water table and also help solving the problem of drinking water supply at least during the normal years. But, this can be attained only when such structures are planned by taking a comprehensive view of the water resources development and management on the basis of a river basin (Patel, unated).

Contrary to this, the present approach does not adhere to any kind of a macro level planning for harvesting of rain water and recharging of ground water in a systematic manner. Not only that this kind of planning is generally absent, there are difficulties in execution because of the involvement of multiple agencies (and schemes) in construction of various small water harvesting structures in a scattered manner. This is particularly true of the present scheme where decision of constructing a check dam is being guided by 'who demands first' rather than what is required for adopting the 'ridge to valley' approach at least in a broad sense. What is therefore likely to happen is that a series of check dams constructed in the upper stream may further dry up water resources in down streams without making sufficient provisions for distribution of harvested water between upstream and downstream. In that case it may accentuate rather than resolve the problem of depletion of ground water resources caused by the existing irrigation structures and the unchecked drawal of ground water in the region. The issue is particularly concerning because the scheme, like the mainstream watershed development programmes, does not involve any kind of planning for utilization of the replenished ground water resources. In absence of this, the scheme is likely to create intra-regional conflicts over availability of ground water within a region.

There is however, possibility of a correcting mechanism whereby the scheme does not allow construction of structures at particular locations and/or beyond a certain size. But, this restriction does not seem to work as an effective check. The initial experiences suggest that in most cases the structures have been approved on the proposed locations, and often on 'first come first serve' basis. It is in this context, the scheme needs a fresh thinking with respect to technical feasibility of the individual structures

[5] Refers to the rights of the people whose stakes are adversely affected by such structures in the upper stream of the catchment area. The right has a legal standing.

by adopting a more comprehensive strategy for water resources development in the state (Government of Gujarat, 1997).

### 3.2 Socio-economic equity

The above issue becomes particularly complex because of the existing property regime where the use of ground water is completely left to the free-will of private owners of these resources. This has been recognized in the light of the past experiences with respect to farm ponds as well as micro-watershed development programmes. The recent evidence indicates that the increased availability of water due to small water harvesting structures has led to increased use by shifting to more irrigation intensive crops like cotton, spices, oilseeds etc. (Shah 2000a). This might be a rationale choice under the existing property regime where an individual can maximize the returns, at least in the short run, by over exploiting the resource. For, if he/she does not use, there is every chance that someone else in the neighbourhood will exploit it. Frequent failure of monsoon since the late eighties seem to have led to a situation where decisions for water use are taken with a short-term perspective; in the long farming does not appears to be a sustainable proposition for a large number of farmers.

What makes this situation worse is the fact that only a minority of the village community tends to benefit that through this process of over exploitation of ground water resources. For instance, a small check dam in a village may help recharge about 8—10 wells and households covering about 30—35 hectares of land in the vicinity (Shah, 2001a). In absence of any mechanism for distribution of the replenished water to those whose farms do not get covered in the command area of a check dam, the scheme may lead to further inequality across households. This eventually, may hamper evolution of participatory processes within a village community.

### 3.3 Institutional sustainability

Developing participatory institutions for sustainable management of water resources essentially requires economic incentives and an effective sharing mechanism. The present scheme seems to satisfy the first but not the second condition. For, despite being 'demand driven', the implementation process does not explicitly envisage any mechanism for water use management and benefit sharing among different stakeholders within the community. What is worse is that the cost sharing arrangement between the state and the community if at all, actually implemented, remains confined only to those who are likely to receive direct benefits in terms of irrigation from such structures. In that case not only that the scheme results in further intensification of water use among a small sub-set of farmers, such intensification seems to be taking place with the help of the state's subsidy. This suggests, misplaced emphasis of the state support which neither ensures environmental sustainability nor social equity. Community based participatory processes are difficult to nurture under these kind of operating environment.

Of course, these are some of the early signals hence need a closer scrutiny before the scheme is replicated on a larger scale. Meanwhile three important observations may be noted for consideration of the future policy. These are:

(1) While it is useful to promote 'demand driven' processes for small water harvesting structures, the technical feasibility has to been seen in the context of a larger planning for water harvesting and water use within a river basin. Haphazard structures, if created in large number, might accentuate rather than solve the problem of ground water depletion.

(2) Recharging of ground water table has to be accompanied by a systematic planning for its efficient use so as to check further depletion of water resources. Private ownership (or control) of ground water, in absence of an effective pricing system, is not conducive for promoting water use efficiency. This could be achieved by evolving a collective decision making process where all kinds of water resources are being put under public ownership and control.

(3) Participatory institutions require shared understanding on sustainability of water resources, and at the same time a sharing mechanism which could ensure equity in across households within a village community. Cost sharing for creating small water harvesting structures is an useful arrangement, but it

has to along with a process of negotiations within the communities-both in the upper as well as down stream regions.

**References**

Shah, Amita (2000), Watershed Programmes: A Long Way to Go', *Economic and Political Weekly*, vol. **35**, Nos. 35 and 36.

Mathur, N. and Kashyap, S.P (2000), 'Agriculture in Gujarat: Problems and Prospects', *Economic and Political Weekly*, vol. **35**, Nos. 35 and 36.

Shah, Amita (2001), Water Scarcity Induced Migration: Can Watershed Projects Help?, *Economic and Political Weekly*, vol. **36**, No. 35.

Hirway, Indira (1999), Integrated Environmental and Economic Accounting: The Case of Gujarat (Mimeo), Centre for Development Alternatives, Ahmedabad.

Government of Gujarat (1997), Water Resources Planning for the State of Gujarat, Narmada and Water Resource Development, (TAHAL Committee Report), Gandhinagar.

Patel, P.P (undated), Water Problems of Gujarat: Resource Development and Management (Mimeo), M.S. University, Baroda.

Shah, Amita (2001a), 'Who Benefits from Watershed Development? Evidence from Gujarat', Gatekeeper Series No. 97, International Institute of Environment and Development, London.

Shah, Amita (2000a), Promoting Small Water Harvesting Structures in Dryland Regions: A Case Study of Farm Ponds Scheme in Gujarat', Working Paper No. 115, Gujarat Institute of Development Research, Ahmedabad.

Shingi, P.M. and Asopa, V.N. (2001), 'Interim Report on Independent Evaluation of Sardar Patel Sahbhagi Jal Sanchay Yojana' (unpublished), Indian Institute of Management, Ahmedabad.