

# Water Harvesting and Recharge: A Misinterpretation

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The issue of upstream-downstream water balance is an important one and there is a need to understand the feasibility of water harvesting and groundwater recharge in upstream areas. Kumar et al (EPW, 30 August 2008) highlight this issue, but they overemphasise the negative aspects.

Kumar et al's article "Chasing a Mirage: Water Harvesting and Artificial Recharge in Naturally Water-Scarce Regions" (EPW, 30 August 2008) has raised a pertinent question about the feasibility of water harvesting structures (whs) and artificial recharge in the upper reaches of water-scarce regions and closed basins. In a closed basin, diversion of water from its current use is technically not feasible. Given this argument, the authors' questioning of the efforts at upstream water harvesting and water recharge is justified. However, in arguing their points, the authors have overplayed the negative aspects of the above measures. Further, the way they have interpreted their reviews, displays their inward-looking bias.

## Interpretations

The paper is based primarily on insights from the observations made in the Saurashtra region; it is also limited to a small river basin having a catchment area of less than 6,000 ha. With selective additional information from existing literature, generalisations have been extended to other water-scarce regions/closed basins of India. The validity of such generalisation is questionable.

Regarding the situation in north Gujarat, the authors have said that area has very high variation in rainfall, and hence, the system is not reliable (p 65). A rough estimation from the graph provided in Figure 3 of the paper indicates that there is a 75% probability that rainfall is above 500 mm, which is about the same as the average annual rainfall of the area.

Extreme conditions do occur, but ordinarily plans for crops and water harvesting are not supposed to cater to the extreme situations. According to the authors, to capture the highest amount of runoff, the cost of a structure would be many hundred times more than what is required to capture the lowest runoff. This looks like a theoretical

question distantly placed from the actual practice. The cost of a small whs mainly depends on things like the height of bund and width of surplus, which is determined on the basis of availability of pondage area and peak rate of runoff.<sup>1</sup> Factors like rainfall intensity, duration of rainfall, topography of the area, soil texture, sunshine, vegetative cover, etc, rather than the amount of rainfall, play a key role in design of such structures. Hence, comparing the highest rainfall and runoff with the lowest is not relevant.

## Costs and Benefits

The authors have raised a genuine question regarding the economic feasibility of water harvesting. The small whs which provides supplementary irrigation may not be economical. It happens particularly in the Saurashtra region (and probably other arid areas) that the structures do not store or divert enough water that can bring additional area under irrigation. My own observation is that they help in recharging the tube-wells and wells which provide one or two rounds of irrigation. But then the authors have also mentioned that water harvesting has an environmental cost too.

One of the important citations building the arguments in the paper is that higher the degree of development, the social and environmental cost of water harvesting would be higher (Frederick 1993).<sup>2</sup> While the case for social cost has been described (because of higher negative externalities), it is not clear how "harvesting" water harms the environment: Frederick's work (1993) cited by the authors mentions the environmental costs in a different context, where pollution and over-drawing of water create environmental externalities. He rather says that groundwater storage has an advantage over surface reservoirs because of low evaporation loss (ibid: p 19), and advocates conservation of water when the demand grows faster than supply (ibid: p 43). But in a water-scarce region, how can water harvesting and groundwater recharge damage the environment? The authors should have specified the nature and extent of the environmental damage.

The paper refers to a study which finds that the gross return from various crops is

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less than that of the cost of water harvesting. The insights have come from Hoshangabad, Jabalpur, Narsingpur, Dhar and Raisen, which cannot be compared to the situation in an arid area like Saurashtra. Valuation of water must take into account its opportunity cost. Alagh et al (1995) had valued water at its cost of desalination. Such alternative valuation would be helpful in understanding the real price of water in water-scarce regions.

Even without considering the opportunity cost of water, so far there has been no strong evidence of upstream water harvesting significantly affecting downstream agriculture. From the reference provided by the authors, it seems that the only paper which has some relevant results is that of Ray and Bijarnia (2006). The result of that paper is only indicative. It cannot be considered definitive because the study recorded the yields of 2002-03, which was preceded by continuous drought years in the area.<sup>3</sup> There is a possibility of bias of effect of drought.

### Equity and Management

In the Section 5 of the paper, the authors have made a strong criticism of the “social justice and equity argument” for decentralised WHS. I would limit this discussion to the equity aspects only, as the concept of social justice is too loaded to be covered here. The authors clearly say that equity is not achievable through decentralised water harvesting. I think the authors are fascinated by the views of those whom they call as “proponents” of small WHS, and have not gone deep into the issue. Decentralised water harvesting is not about bringing equity in society. Rather equity is a requirement of water resource management. According to Frederick (1993), equity is a major criterion for measuring the performance of water-related institutions.

The contentious part of the paper is the categorical statement that “demand for water should be the guiding principle for intraregional water allocation within the basin” (p 68). Unfortunately, the authors have posed this “principle” (which is no more than a criterion) to counter the “age-old argument” that people living in the upper catchment are excluded. Even if we take the demand-based criteria at its face value, the argument of the authors is nothing more than a narrow justification

for market-based water management. The water market is a highly distorted one.<sup>4</sup> In this context assessing a small WHS with a set of market-based criteria is not suitable, particularly in a distorted market. Even large dams in the lower reaches were not always based on sound economics. Otherwise, why are they not able to raise even the maintenance cost? I hope the authors will not pitch the “the-way-they-are-managed” argument here.

The argument of the authors can be compared to a situation where there is a monopoly of a big dam that claims to be Pareto efficient, and hence, there is a lobby for a barrier to entry for small players. The downstream has the irrigated area, and the upstream has the rainfed area. To say that the downstream has higher demand than the upstream is tautological. The issue is whether the distribution is proportional or not. The authors have concluded that the “optimum level of water harvesting” should be the key, thus swiftly overlooking the issue of “optimal proportion of distribution”.

The paper contains a sweeping statement that “in no case in India farmers have (sic) invested on water harvesting from their own funds” (p 69), which needs to be looked into. According to Agarwal and Narain (1997) structures like tanks, private canals and wells (mostly funded through non-government sources) are major contributors to total irrigation in India. Of course, the number of check dams built through government funding has been tremendously high in the last two decades. But private initiatives are slow processes, and cannot be compared to large-scale government initiatives. Further, there are non-economic reasons (e.g., drainage lines are mostly government land) behind farmers not investing in water harvesting. But in India, there are examples of people contributing as much as Rs 10 million for the Chikrapadasalagi barrage (Anonymous 2008).

I think the authors have not tried to understand the larger context and the ground reality. It is not so much that the small WHS brings in equity and sustainability, for which they are being promoted. Rather they are probably the best option. The need is to increase their efficiency, and as rightly pointed out by the authors to make them technically sound. There is no point disregarding them. The interesting

thing is that the authors have exaggerated the virtues of medium and large irrigation systems forgetting the latter’s impact on ecology and relocation.

This is not to negate some points Kumar et al have raised. The lack of managerial and technical skills among organisations involved in implementing such activities is one pertinent issue. But such key points have been mentioned only as passing remarks. The key issue raised by the paper probably is the need for proper planning of water resource management in water-scarce region, so that the storage capacity does not exceed the precipitation. Rather than limiting the arguments to this point, the authors have tried to touch all aspects of water harvesting and recharge from a narrow perspective.

### NOTES

- 1 The peak rate of runoff is considered for the expected lifespan of the WHS (which is generally taken to be 10 years for a small WHS).
- 2 This is to be noted that Frederick’s paper only touches on the relationship between basin development and cost. It is basically a paper on demand management.
- 3 The area Ray and Bijarnia (2006) have studied was under severe drought during 1999-2002. There is every possibility that the continuous drought changed the cropping pattern. Further, the paper only says that crop yield increased by 5%-16% in the upstream areas (incremental yield 0.30 quintal to 0.55 bigha, roughly one to two quintals per ha) over 14 years. In the downstream area the crop yield remained almost the same over the same time (ranging from 5% decrease to 2% increase, incremental change almost negligible). The study has not mentioned the macro-level changes in the irrigated areas in the upstream and downstream of the basin, which would have given a better idea of the overall situation.
- 4 The work of Frederick (1993) which the authors have cited in their paper is full of evidence that even in a developed market economy a blind demand-driven withdrawal of water has brought negative externalities.

### REFERENCES

- Anonymous (2008): “People’s Unique Irrigation Project: Chikrapadasalagi Barrage, URL”, <http://bagalkot.nic.in/barrage.htm>, access: 9 September.
- Agarwal, Anil and Sunita Narain (1997): *Dying Wisdom: Rise, Fall and Potential of India’s Traditional Water Harvesting Systems* (New Delhi: Centre for Science and Environment).
- Alagh, Y K, R D Desai, G S Guha and S P Kashyap (1995): *Economic Dimensions of Sardar Sarovar Project* (New Delhi: Har-Anand Publications).
- Frederick, K D (1993): “Balancing Water Demand with Supplies: The Role of Management in a World of Increasing Scarcity” in Kumar et al 2008.
- Kumar, M Dinesh, Ankit Patel, R Ravindranath and O P Singh (2008): “Chasing a Mirage: Water Harvesting and Artificial Recharge in Naturally Water-Scarce Regions”, *Economic & Political Weekly*, 44 (1), pp 61-71.
- Ray, Sunil and Mahesh Bijarnia (2006): “Upstream vs Downstream Groundwater Management and Rainwater Harvesting”, *Economic & Political Weekly*, 10 July.