

# **Water: the ground reality**

## **Factors that caused the crisis**

**by Rajesh Kochhar**

**T**ODAY 10 crore Indians and their six crore cattle, spread over a number of states, are victims of a severe drought, the worst in the last 100 years. Rivers, lakes, wells and tanks have dried. There is no water, no food, no fodder. Cattle are dying and people starving. And rains are still far away.

Here is a disaster that was waiting to happen. For years now, there has been widespread drawal of water from deeper and deeper layers for irrigation and for use by ever-expanding cities. Digging wells that are a kilometre-deep and pumping out precious water for squandering is an abuse of science. Greed and arrogance have led man to belittle nature and disturb its equilibrium. And now nature has struck back.

Since the monsoon months bring torrential rain, we have tended to believe, in a suicidally erroneous manner, that India is a water-blessed country. It is only the plains of India, fed by the Himalayan snows, that have plenty of water at all levels. Some soils, in fact, would benefit from dewatering. The rest of the country, however, cannot take water for granted. Even when overall rain has been normal or slightly above normal, regions like Saurashtra, Kutch, Vidharbha, Marathwada and Telangana have suffered (at various times) shortfalls as substantial as 20-30 per cent. India, taken as a whole, is a water-deficit country.

There are two kinds of water available for civilisational purposes: surface water (coming from rivers, canals, ponds, tanks and rains) and ground water. Ground water is the rain water that went underground because of gravity. Rain water is used up in different ways. Part of it is absorbed by plants. Another part is retained as moisture by the top one and a half metres of soil. This layer is called the crop-root zone. Water that ends up still deeper and becomes extractable is called ground water. This water has been traditionally drawn out, using human and animal muscular power, for irrigation, drinking and other purposes.

The annual rain recharges the ground water. The amount of recharging varies from ground to ground. In the flat, alluvial Sindh-Ganga plain, the fraction is typically 20 per cent while in the arid areas like western Rajasthan it is as low as 1 per cent. The fraction stands at 5-10 per cent in the rocky Deccan region. Some rainwater evaporates. The remainder runs off to the ocean. This surface run off depends on the slope of the land and the vegetation cover. By constructing suitable check dams, the run-off can be minimised. This way, more water can be made available for recharge. (Canals and man-made water reservoirs also push up the water-table, sometimes right into the crop-root zone causing waterlogging).

Rainwater harvesting is as old as agriculture itself. When human beings took to agriculture, they were still in the neolithic age. The use of metal, copper and iron came later. The neolithic farmers were not technologically equipped to deal with mighty rivers or tropical forests. They settled in semi-arid areas, depending on seasonal rains for agriculture, and surface and ground water for sustenance.

In the pre-machine age, human knew their limitations. The only source of energy available to them was their own muscular power and that of their animals. Their capacity to dig wells and draw water was limited. They knew the value of water and devised ways of conserving it. It was not so much the question of making hay while the sun shone as recharging the wells while the rain poured.

Things changed with the manufacture of machinery. Pumpsets permitted large-scale use of ground water for irrigation. In the 1930s as many as 1500 tubewells were dug in the Ganga alluvium and more than three million hectares (mha) irrigated. After Independence, in the early 1950s the USA offered to assist India in installing a large number of tubewells. In 1954 a central Exploratory Tubewell Organisation was set up. India had entered the era of indiscriminate use of ground water.

In 1969, the Government of India, stung by "the drought conditions in the last four years in several parts of the country and the continued food shortages", concluded that "the maximum exploitation of both surface and ground water resources within the next four to five Plan periods needs greater emphasis and attention." In 1972, an Irrigation Commission was set up. Consistent with the wisdom of the times, it did not distinguish between surface water and ground water. Rather it set up the category of major and medium irrigation vis-a-vis minor irrigation, comprising wells and tanks.

Ground water irrigation has a number of attractive features. It is available on demand and gives a feeling of personal proprietorship. More importantly, it gives a 30-50 per cent higher crop yield as compared to canal irrigation. The Green Revolution was, no doubt, made possible by the development of high yielding varieties of seeds, but there is no gainsaying the fact that it was a child of the pumpset technology.

The last half a century has belonged to the well. In 1947, at the time of Independence, India has a net, or geographical, sown area of 100 mha, out of which less than 20 per cent (19.4 mha) was irrigated. In the next 50 years, by 1995, the net sown area had increased to 143 mha; and the fraction of irrigated part had moved up to 35 per cent (50 mha). Today, this irrigated 35 per cent area produces 55 per cent of India's foodgrains, while the remaining rain-fed area (65 per cent) produces only 45 per cent foodgrains.

A part of the net irrigated area is multiple-cropped. If we count this part as many times as it is cropped, we arrive at the gross, or crop, sown area. This figure is directly proportional to the water used. In 1992 the gross irrigated area stood at 72 mha, serviced equally by surface and ground water. The figure rose to 81 mha in 1997. The break-up is not available, but it is reasonable to suppose that most of the new water came from the wells. It can, therefore, be said with confidence that more than half of the irrigation today is provided by ground water rather than by surface water.

We have data on the net irrigated area for the period 1947-1987. In 1947 the net irrigated area was 19.4 mha which rose to 20.9 mha in 1951 and to 43 mha in 1987. As can be expected, the increase from 1947 to 1951 was rather modest. Irrigation, especially ground water irrigation, became top priority with the launch of the First Five Year Plan. From 1951 to 1987, while the surface water-fed area increased by 63 per cent, the ground water-fed area went up by 252 per cent. The figures are almost similar in the case of Pakistan. More specifically, the growth in irrigation in the two

Punjab has followed the same pattern. In 1960 the net irrigated area in Indian Punjab was 2.02 mha, but it rose to 4.03 mha in 1997, showing a 100 per cent increase. In Pakistani Punjab, the figure for 1960 was 6.70 mha which went up to 13.57 in 1997.

More than the rest of India, both Punjab and Haryana (especially Punjab), have been guilty of over-exploitation of their ground water resources. Six districts of Punjab — Kapurthala, Jalandhar, Sangrur, Patiala, Ludhiana and Amritsar — are facing ground water depletion. Keeping them company are Kurukshetra, Karnal and Mahendragarh. Chandigarh, senselessly built away from a natural supply of water, did make a half-hearted attempt to raise its water-table by creating the artificial Sukhna Lake. In the early years, digging of tubewells was banned in Chandigarh, but finally expediency got the better of good sense. Chandigarh has been living off its ground water ever since.

The lust for ground water has been sought to be legitimised through a quantitative sleight of hand. In earlier estimates only 70 per cent of the ground water recharge was earmarked for irrigation. The remaining 30 per cent was meant to take care of other requirements: "(1) maintaining off-season 'base' flow in rivers; (2) natural utilisation by forests, shrubs and other natural vegetation; and (3) non-irrigation uses like drinking water and industrial purposes." In recent times, this sensible formula has been changed to the detriment of ground water. It has since been ordained that as much as 85 per cent of the recharge may be drawn for irrigation, leaving a paltry 15 per cent for other purposes. The basis on which the limit was pushed up from 70 per cent to 85 per cent is not recorded.

Another dubious practice has been the listing of aggregate ground water potential. It is difficult to appreciate numbers that run into millions and billions, the more so when they have units like metres cubed. Even more importantly, the total volume of ground water is a meaningless concept. Water is a local commodity. Clubbing a water-logged district with a water-starved district does not make both of them normal. Important facts should be stated starkly. The key parameter in discussing the water problem is the local water-table. Is it rising or falling, and at what rate?

The reckless extraction of ground water has been worse compounded by the utter disregard for the time-tested practice of rainwater harvesting. In the drought-prone areas the water-table has been pushed so deep that it has become almost impossible to draw water. The poor people, who have been depending on their own and their cattle's muscular power for their water supply, have been literally deserted.

We have at hand a real crisis. India, no doubt, has the remarkable capacity to tide over a crisis. Unfortunately, it then starts waiting for the next crisis. Let us take a vow that we will not permit another water famine to occur. The solution to a problem lies in the mindset and not in the procedures.

Let us realise that there has been a problem and let us set out to solve it. More specifically, Punjab and Haryana should immediately address the twin problems of water-depletion and water-logging. As for Chandigarh, it can atone for its past profligacy by showing results before the monsoon sets in. All government buildings and campuses should collect rain water and store it in sumps and wells. People in comfortable chairs should now be raising the water-table under their seats.