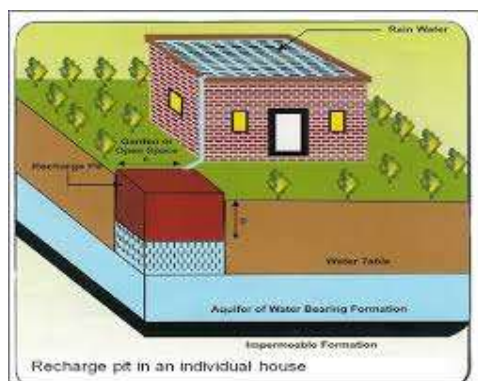


Madurai 20.

Rain is a vital resource that fills our rivers and replenishes our surface and ground water supply.

Unfortunately, concrete and other impervious surfaces that make up much of today's (sub) urban landscape interfere with the hydrologic cycle and prevent the natural infiltration process from occurring.



SOAK PIT



TRENCH

Rain Water falling on roof top is soaked through soak pits or Trenches to recharge Ground Water (courtesy: CGWB)

India has 16 per cent of the total population of the world. But the country has only 4 per cent of the water resources present on the earth. Further, the country has only 2.5 per cent of the area, out of the total geographical area of the world. The country receives approximately 1100 millimeter average rainfall annually, that too irregularly and only during limited period of two to three months. Two –thirds of all the water goes to irrigate crops .This use of water is massively unsustainable . Today, more than 21 million Indian farmers tap underground reserves to water their fields, and two-thirds of the crops are irrigated with underground water. This water is running out and unlike the rivers ,it will not be quickly replaced. The International water management Institute, part of a worldwide network of agricultural research centres funded by the world bank, recently estimated that about 250 cubic kilometers of water are abstracted for irrigation each year .This is at least 100 cubic kilometers more than the rains put back . It feeds India. But as every year passes, the aquifers get depleted.

Watershed development for raising yields of rainfed crops and widening of seed revolution to cover oilseeds ,pulses, fruits and vegetables should be made .Farming system research to develop location specific technologies must be intensified in the rainfed areas. Strategy to make grey areas green will lead to second green revolution, which would demand a three –pronged strategy – watershed mananagement, hybrid technology and small farm mechanization.

According to an estimate of the Central Ground Water Board , if we continue to exploit our ground water indiscriminately , then in the next 20 years ,15 states of the country may face acute shortage of underground water. In our country, out of 40 crores hectare metre of rainfall and snowfall received in a year ,only 17 crores and 8 lakh hectare metre of water is properly tapped by the soil due to land topography and other problems.

Effective economic and management policies are needed to prevent the crisis that threatens India in the coming years. **Good Management of the country's water resources will effectively reduce the amount of pollution and over –exploitation that is currently plaguing the nation's surface, ground and costal waters. The consequent improvement in water quantity and quality will also have repercussions in terms of ameliorating human and environmental health.** In the past few years, the government has recognized the importance of promoting the sustainable management of India's water resources and has placed water development as one of its main priorities in the coming decades.

The ground water boom is turning to bust. Fifty years ago, farmer in northern Gujarat used bullocks driving leather buckets lifting water from open wells dug to about 10 metres. Now tube wells are sunk to 400 meters and they still run dry. Half the traditional hand –dug wells and millions of tube wells have dried up across western India. In Tamil Nadu, two- thirds of the hand –dug wells have failed already and only half as much land is irrigated as a decade ago, In Punjab also more than 70 percent of irrigation water is supplied through tube wells and this has resulted in continuous decline in the water table. In 2004, more than 20 per cent of the centrifugal pumps went dysfunctional. In some areas, even submersible pumps had to be lowered more than to feet. This strongly points to the fact that the present crop production system is not sustainable if withdrawal of underground water is not tapped with the natural water recharge. In a water symposium held at Stockholm in Sweden, in August 2004, World's leading water scientists warned that this crisis could cause widespread famines in the decades to come.

In the last four decades, farmers in India have drilled approximately 21 million tube wells into the saturated strata beneath their fields. Every year, farmers bring another million wells into service, most of them outside the control of the state irrigation authorities. Indian farmers have invested some \$ 12 billion in the new pumps but they constantly have to drill deeper to keep pace with falling water table. As in majority of the states farmers get electricity at the subsidized rates, water is pumped day and night to irrigate thirsty crops like rice, sugar cane and alfalfa.

The problem is severe and keeping in view the fact that agriculture is the backbone of our economy, the question now is what are the ways to come out of these crises. Some states are placing thousands of small dams across riverbeds in a bid to replenish ground water by infiltration. Central Government has recognized water harvesting as a thrust area and some centrally sponsored schemes are already in operation. Central Government has accelerated continuous higher budgetary support in recent years to rainwater harvesting and watershed schemes to recharge our underground water sources.

Until the early 19th century much of India was irrigated from shallow mud –walled reservoirs in valley bottoms that captured the monsoon rains each summer. These structures were called in some parts of India as Tanka, a word adopted into English as tanks. Some individual success stories of rain water harvesting with remarkable results are really showing the way and Rajsamadhiya is one such unique village in Gujarat. In this village one individual, Haradevsingh Hadeja, has redesigned the village's drainage system to slow the passage of monsoon rain long enough for it to collect in specially dug ponds where the water passes from one pond to the next in a slow cascade. The villages do not use the water directly from the ponds, but allow it to percolate into soil to refill underground reserves and replenish their wells. As a result, the village has twice as much water at only 7 metres down, whereas once the water hauled up more than 30 metres.

Rain water harvesting is of course a focus area for sustainable agricultural production, but attention should also be paid for efficient management of the available resources. There is need to encourage modern methods of irrigation like drip irrigation. Micro management is also needed for efficient use of the irrigation water. Farmers should avoid one time flood irrigation in their fields and instead should give more number of irrigation at interval for higher output. Weeds should be managed effectively in annual and

Perennial crops. Moisture Conservation techniques like mulching should also be used in crops. Waste water of kitchen and toilet can also be recycled and channeled for farming or charging of the underground water resources. Flood management is another key area to work on so that we can management of floods will result in deposit of groundwater aquifers and also result in deposit of fertile silt on the soil. There is lot of discussion these days for linking of the existing rivers to create a kind of national water grid but the cost of such a scheme is estimated to be as much as \$200 billion ,thus making this a daunting task.

Excess digging of wells should be avoided or restricted in severely affected areas.

Permission for digging of wells should be linked with construction of water harvesting structures .In urban areas, harvesting of rain water should be made mandatory so that the water stored could be used for other than drinking purposes. Of course there is no more water than before ,but local harvesting does seem to be key to using it more efficiently and on sustainable basis . we have to keep in mind that we cannot make more rains, so we have to manage water better. It might just rescue us from hydrological anarchy and also sustain the desired higher growth in agriculture

Replace concrete sewer and tunnel infrastructure- which convey storm water too swiftly into waterways with low-impact development techniques that replenish ground water. These include onsite storage that allows the water to infiltrate permeable native soils or bioengineering techniques that facilitate evaporation and transpiration of storm water and allot more money and time to research and analysis of the impact of development on water resources ,and make this information accessible to the public .

By carefully considering how to design communities sustainably and how to better plan for future growth and development ,municipalities can implement innovative techniques that could extend , the life of their water supply ie..., sustain ground water aquifers steady base flows for rivers and reduce their reliance on water supply dams and river diversions .

India will be required to produce more and more from less and less land and water resources .Alarming rates of ground water depletion and serious environmental and social problems of some of the major irrigation projects on the one hand and the multiple benefits of irrigation water in enhancing production and productivity ,food security and poverty alleviation ,are too well known to be further elaborated here : In India ,water availability per capita was over5000 cubic metres per annum in 1950.It now stands at 2000m³ and is projected to decline to 1500m³ by2025. Further the quality of available water is deteriorating. Also , there are gross inequalities between basins and geographic regions. Agriculture is the biggest user of water, accounting for about 80 per cent of the water withdrawals. It is projected that availability of water for agricultural use in India may be reduced by 21 per cent by 2020, resulting in drop of yields of irrigated crops, especially rice ,thus causing price rice and withdrawal of food from the poor masses. . Policy reforms are needed from now to avoid the negative developments in the year to come. There reforms may include the establishment of secure water rights to users , the decentralization and privatization of water management functions to appropriate levels, pricing reforms, markets in tradable property rights, and the introduction of appropriate water saving technologies .

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