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Water Management Issues for Punjab with Special Reference to Water Conservation and Rainwater Harvesting

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INTRODUCTION

Water is the most essential natural resource for life, next to air, and is the most important input for all development activities. Rapid increase in population has resulted in increasing water needs day by day for meeting the domestic, agricultural, industrial and power generation demands. With the growing requirements of water for diverse purposes, water is becoming a scarce natural resource. Increasing water pollution due to rapid urbanization, large scale industrialization and use of fertilizers and pesticides for increased agricultural production is causing water quality deterioration in both surface and groundwater and is affecting the net availability of fresh water for consumptive uses. Sectoral availability of water may decline significantly in future, if the limited water resources are not managed properly. Thus, it is necessary to develop, conserve, utilize and to economically manage this critically important resource on an integrated basis so as to meet the ever-growing demand of various users.

Global consumption of water is doubling every 20 years. According to UN, more than 1 billion people on the earth already lack access to fresh drinking water, 40% people live in countries where water is scarce. By 2025, this is expected to rise to 66%. Polluted drinking water kills 2.2 million people every year in the developing countries. The main cause of famine remains to be drought.

In Punjab State, surface water resources are being fully utilized and the ground water is being over-exploited by various users without integrated planning for coordinated development and maximum benefits, to meet their requirements. Agriculture is the backbone of the State economy, which is highly intensive and heavily dependent on water. As such, water is the life line of farmers of this region.

WATER MANAGEMENT ISSUES

The water management issues of concern are depletion of water levels in sweet water zones, rise of water levels and water-logging in saline areas (Swarzenski, 1968; Saini et al 1983; Singh, 1990; 1998; 2001 and others) and degradation of surface and groundwater quality (Singh and Tiwana 1998; Singh and Parwana, 1999 and others). The present paper is concerned with depletion of water levels, water conservation and rainwater harvesting.

Water Table Depletion

The number of shallow tubewells in Punjab has increased from 1,92,000 existing in the year 1970 to more than 13 lakhs in the year 2010. This has resulted in the depletion of water levels @ 23-50 cm per year in the entire sweet water belt. In critical areas like Moga, Sangrur and Patiala, the depletion rate varies from 69cm to 90cm per year. According to Directorate of Water Resources, Punjab and Central Ground Water Board, Govt. of India and, out of 137 blocks, 103 blocks are over-exploited (exploitation more than 100% of annual recharge), 5 are critical (exploitation 90 – 100% of annual recharge), 4 are semi- critical (exploitation 70-90% of annual recharge) and 25 safe (exploitation less than 70% of annual recharge). The safe blocks are confined to Kandi area at the base of Shiwalik hills and to saline areas in south west parts where groundwater can not be exploited

due to quality constraints. In order to regular groundwater use, Central Ground Water Board, Govt. of India has declared 6 areas forming parts of Ludhiana, Moga and Sangrur districts as notified blocks (Ludhiana area, Moga-I, Moga-II, Sangrur, Mehal Kalan and Ahmedgarh blocks).

Problems caused by depletion of water levels

The depletion of water levels in Punjab and Haryana states has caused the following problems:

i) Decrease in well yield due to increase in suction lift.

ii) Lowering of existing pump sets by deepening of pits.

iii) Increased power consumption.

iv) Drying of springs and dug wells.

v) Under prolonged conditions replacement of horizontal centrifugal pumps by submersible pumps.

vi) Degradation of chemical quality of water in selected pockets where fresh water is underlain by saline water.

Methods / remedies for control of depletion of water levels

A straightway approach to arrest the declining trend of ground water is by carrying out artificial recharge. Trench and shaft structures with or without wells (recharge structures) can be constructed in old abandoned drains. Old river courses identified by LANDSAT and IRS data offer suitable sites for carrying out artificial recharge (Singh et al. 1980). Construction of check dams in Kandi area at the base of Shivaliks (Singh ,1992) has helped in improving the hydrological regime. More check dams need to be constructed. Rainwater harvesting needs to be promoted in a big way. The author is of the opinion that the following water conservation measures in agriculture, industry and public health sector which aim to cut down the demand should be promoted.

a) Agriculture Sector :

i) Promotion and use of sprinkler and drip irrigation systems (saves 30 to 50% of water compared to conventional methods).

ii) Diversification of cropping pattern (paddy to be substituted by crops requiring less water such as oil seeds, maize etc.).

iii) Timely plantation of paddy to cut down ET demand from 77cm (sowing in early May) to 62cm (sowing after 16th June)

iv) Change in irrigation policy with balanced water allowance in waterlogged areas (present 3.5 cusecs/1000 acres in Sirhind feeder system – 5.5 cusecs/1000 acres in eastern canal system) and areas where ground water levels are depleting (present 1.75 cusecs/1000 acres in Bist Doab canal areas).

b) Industrial Sector :

i) Recycling of industrial waste water for industrial use.

ii) Reuse of industrial waste water for irrigation.

c) Domestic Sector (use bathroom 75%; kitchen 18%; laundry 17%) :

i) Use of flush systems requiring less water; put a brick in toilet cistern to reduce amount of water used per flush; check plumbing leaks, washers and repair them; use showers instead of bath tubs; do not keep the tap open while brushing; avoiding use of dish washers; recycle water used for water vegetables and fruits for watering plants.

ii) Rainwater harvesting in urban & rural areas.

iii) Promotion of awareness programmes regarding conservation of water by NGOs.

All the above measures should help in demand management by cutting down the demand and controlling depletion of water levels.

Rainwater harvesting

To arrest the decline in groundwater levels and to meet the increased water requirements, there is a need to promote use of rainwater harvesting. In urban areas, it can be carried out through Recharge pit, Recharge trench, Tubewell and Recharge well with trench. In the rural areas, the known methods are construction of Recharge shaft, Dugwell recharge, Check dam, Percolation tank, Gully plug, Contour bund, Gabion structure, Groundwater dams/Subsurface dyke etc.

Rainwater harvesting in urban areas

In alluvial urban areas, where permeable rocks are exposed on land surface or at very shallow depth, roof top rainwater harvesting can be done through recharge pits. This technique is suitable for building having a roof area of 100 sq.m. and are constructed for recharging shallow aquifers. Recharge pit may be of any size and shape and are generally 1-2 m. wide and 2-3 m deep which are back filled with boulders (5-20 cm) gravels (5-10 mm) and coarse sand (1.5 – 2mm) in graded form (boulders at the bottom, sand at the top). A mesh may be provided at the roof so that leaves or any other solid waste / debris is prevented from entering the pit.

Another method of carrying out rainwater harvesting in urban areas is through trench. This method is suitable for roof top area of 200-300 sq.m. where permeable strata is available at shallow depths. The trench is 0.5 – 1m wide, 1-1.5m deep and 10-20 m long depending upon the availability of water to be recharged.

Roof top harvesting through existing tubewells can be carried out in urban areas where shallow aquifers have dried up and tubewells are taping deeper aquifers.

In urban areas where surface soil is impervious and large quantities of roof water or surface water is available within a very short period of heavy rainfall, the use of trench/pit is made to store in water in filter media and subsequent recharged to groundwater through specially constructed recharge wells. Recharge well is constructed to a depth of at least 3-5 m below the water level. A lateral trench of 1.5 – 3m width with 10-30m length depending upon availability of water is constructed with the recharge well in the centre. The trench is back filled with boulders, gravels and course sand to act as filter media to recharge wells. The method of rainwater harvesting through trench with recharge well can be used in most of our urban areas in Punjab.

Participation of housing sector

Participation of housing sector is illustrated with example of Chandigarh. It is estimated that a house in Chandigarh / Mohali with plot size of 250 sq.yard (10 marla) which is equivalent to 210 sq.m. will have roof top area of about 115.50 sq.m.(55% of plot size) and if the run-off generated by 30mm/hr (average rainfall intensity) comes to be $3m^3$/hr. If the hourly intake capacity of each recharge well is $30m^3$/hr, then we need to club 10 houses for each recharge well having an average depth of 50m. The cost of such structures comes to be Rs. 100000.00 with each individual sharing a cost of Rs. 10,000/-. The housing sector needs to be involved by making provisions in the building bye-laws.

The rainwater harvested can be stored in storage tanks or specially constructed lakes for taping water for irrigating lawns.

CONCLUSION

Water conservation measures and rainwater harvesting needs to be adopted in urban and rural areas to cut down demand and to increase the

recharge besides carrying out artificial recharge. A holistic approach followed along with education and awareness programmes taken up by NGOs and media should help in conserving our precious water resource.

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