A REVIEW: CONSERVATION AND MANAGEMENT OF GROUND AND SURFACE WATER RESOURCE IN MAHARASHTRA, INDIA

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Abstract

Water is the most efficient source on earth. Water is the basic input of plants and also important to animals who survive the life. Plants requires 50- 75% of water while animals requires 65%. Rainfall is the main source of natural water resource. India has been irregular and as an average rainfall country. As per increasing level of population, urbanization, industrialization and decreasing level of tree land and global warming; water resource levels are decreasing suddenly. The total rechargeable fresh ground water resources are 33.93 BCM and only 17.18 BCM current withdrawals. Out of the 1531 watersheds, 76 are overexploited, 4 critical, 100 semi- critical and 4 poor quality. We have to urgent need to recharge or manage the water sources artificially by Gully plug, Contour bunds, Gabion Structure, Percolation tanks, Dams/ Cement plug, Nala bunds, Sub surface Dyke methods and conserve easily. It is necessary to recharge the ground water as well surface water resource and this is a new era to conservation and management of water resource.

Key words: Conservation, contour bunds, era, gully plug, water recharge.

INTRODUCTION

Water is required for domestic, agricultural, hydro-power, thermal power, navigation, recreation, etc. Ecological needs of the river should be determined, through scientific study, recognizing that the natural river flows are characterized by low or no flows, small floods (freshets), large floods, etc., and should accommodate developmental needs. Global water scenario is total 14000 million BCM, out of this (97.3%) ocean and remaining 2.7% fresh water. India is a semi- rainfall country. The water is not only to be treated as public good but also economic good (Seckler et al, 1999; ADB, 2004; IWMI, 2000). The rainfall starts from June and ends to September. It means annual rainfall is an average or low. India's Water Resources are critical in condition to its economic growth. National Water Academy resources of India to manage the National water sector have been badly hit by the economic downturn and the lack of investment has nullified many of the reform gains. The total precipitation of water is 4000 BCM out of these only 1869 BCM is available. Out of total availability of water, 1123 BCM water resource has been utilized for agriculture, industries,

urban area, household and other purposes. In the total water utilization, surface water is only 690 BCM and remaining 433 BCM is ground water. Current utilization of surface water is 450 BCM that is 65.21% and from ground water 243 BCM that is 56% water is utilized. The ground water source is utilized for various forms and also will be use.

The pumping of groundwater at a rate in excess of recharge, therefore, can result in the loss of water from nearby stream channels due to the lowering of the water table. In Denmark, small stream flowing over coarse and sand gravels deposited observed that average, regional stream flow volume were reduced about 40%. The low rain flood plains are low relief depositional that bordered stream channels to inundation during high flood flow. The vegetation alterations will affects the rate of water infiltrates into the soil, altering the rates of surface and surface flows (Molden and Sakthivadivel, 1999; Rosegrant and Perez, 1995).

In Maharashtra, rainfall is also low and irregular. The average rainfall of Maharashtra is less than 750 (and locally 500) mm/A. The topography of Maharashtra shows that 20% hilly with slopes greater than 15% called as run off zone, 30% includes valleys with slope less than 5 to 15% called as Recharge zone. Maharashtra has made extensive investment in large, small and medium Dams, through current utilization is only about mean annual run-off. Mostly, the rural areas outside the command of major irrigation to agriculture area are by canals. Most of Maharashtra, state is underlain by Deccan Traps Basalt rock. This formation of rock gives rise to a complex low storage weathered hard rock aquifer system. In Maharashtra, 40785 villages and 82% population depends on agricultural area for its livelihood. 71% agriculture land is under irrigation by ground water while 29% by surface water. From the ground water, 85% irrigation 10% industries use and 5% domestic purpose. Also, 80% drinking water needs of the total rural population (ESR, 2014).

On the basis of rainfall, Rivers are now unregulated, inadequate attention has been given to the maintenance of key water resource infrastructure with a high risk to public safely from the breach of dams, lakes, catchment plans are not implemented. Widespread and progressive depletion of ground water tables; drying up of most dug wells, depending of dug wells as dug cum bore wells, but also with subsequently, yield reduction, drilling of progressively deeper bore wells (WBD, 1998). Several Dams formed for water conservation in Maharashtra especially in Pune. There are major Rivers like Godavari, Narmada, Tapi, Krishna, Bhima- Bhama, Indrayani etc and various Dams are form like Koyana 103 TMC, Ujani TMC, Jayakwadi TMC, Khadakwasala 2.43 TMC, Pansheth 10.7 TMC, Temghar 2.27 TMC, Varasgaon 12.82 TMC, Chaskaman 1.67 TMC, Dimbhe 12.50 TMC etc. water storage capacity (RBAI, 1989).

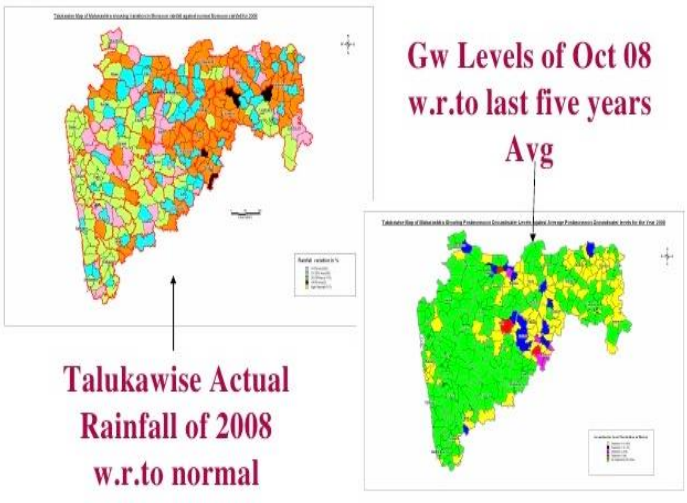

Figure 1 Rainfall of Maharashtra

Figure 2 Rock arrangement

1 NEED FOR ARTIFICIAL RECHARGE-

There is a need to switch over from perennial irrigation to protective irrigation. Over the years unfortunately it has been focused on nurturing perennial irrigation by growing perennial crops by ignoring the climatic compatibility. There are some artificial recharges will be needed as follows-

- To arrest decline in ground water levels
- To overcome the inadequacy of waters
- To enhance availability of ground water at specific place and time
- To increase infiltration of rainwater in the subsoil this has decreased drastically in urban areas due to paving of open area
- To improve ground water quality by dilution
- To improve ecology of the area by increase in vegetation cover, etc.
- To increase agriculture production

1.1 Artificial Recharge Concepts-

1.1.1 Basic Requirements for Artificial Recharge-

- Availability of non-committed surplus monsoon
- Run off in space and time.
- Availability of suitable hydro-geological
- Environment
- Availability of suitable site for creating AR structure

1.1.2 Areas Suitable for Artificial Recharge-

- Areas with sufficiently deep water levels, that is, areas which are not water logged.
- Areas where substantial amount of aquifer has already been de-saturated.
- Areas where ground water levels are declining on regular basis.
- Areas where availability of ground water is inadequate in lean months.
- Areas where salinity ingress is taking place Water use is about 85% - biggest
- Water use efficiency is one of lowest in the world.
- A small increase in efficiency can make huge quantity water available for other sectors

- It's a challenging task to spread water education among farmers
- Agriculture extension offices
- Agricultural colleges & Institutions
- Panchayat Institutions, Local bodies
- Water user associations

1.1.3 Advantages of Artificial Recharge-

- Increases the productivity of aquifer.
- It reduces flood hazards.
- Effects rise in ground water levels.
- Mitigates the effects of drought.
- Reduces soil erosion.

1.2 Challenges of Ground Water-

- Limited source of surface water and frequent droughts
- Low cost drilling devices and institution of finance availability
- Temporary rainfall variability
- Climate change
- Urbanisation and Industrialisation
- Over extraction of ground water
- Increasing level of sea water

1.3 Ground Water Management-

Considering the existing water stress conditions in India and the likelihood of further worsening situation due to climate change and other factors, water resources projects should be planned as per the efficiency benchmarks to be prescribed for various situations. Integrated farming systems and non-agricultural developments may also be considered for livelihood support and poverty alleviation.

- Ground water management is to address the emerging problems of water scarcity.
- Groundwater Management implies implementation of those means or methods that should ensure sustained supply of non-contaminated (potable) groundwater from underlying aquifer zones of a basin.
- The term sustainability used in reference to groundwater resources mean the use of these resources in such quantities and under such conditions that would allow their renewal at a rate greater than or equal to their use.
- It requires both Supply side and demand side management and integration of both as well.

1.4 Management Measures-

While every effort should be made to avert water related disasters like floods and droughts, through structural and non-structural measures, emphasis should be on preparedness for flood / drought with coping mechanisms as an option. Greater emphasis should be placed on rehabilitation of natural drainage system. Encroachments and diversion of water bodies (like rivers, lakes, tanks, ponds, etc.) and drainage channels (irrigated area as

well as urban area drainage) must not be allowed, and wherever it has taken place, it should be restored to the extent feasible and maintained properly.

- Augment supply of ground water through surface and sub-surface water conservation scheme
- Estimate groundwater and surface water together and that took on a watershed/ sub basin basis and plan cropping pattern accordingly.
- Promoting efficient & economic use of water and use of recycled waste water
- Strict adherence to water usage norms and waste treatment
- Fixing reasonable rates for water use
- Updating Policies and the Law based on experience gained

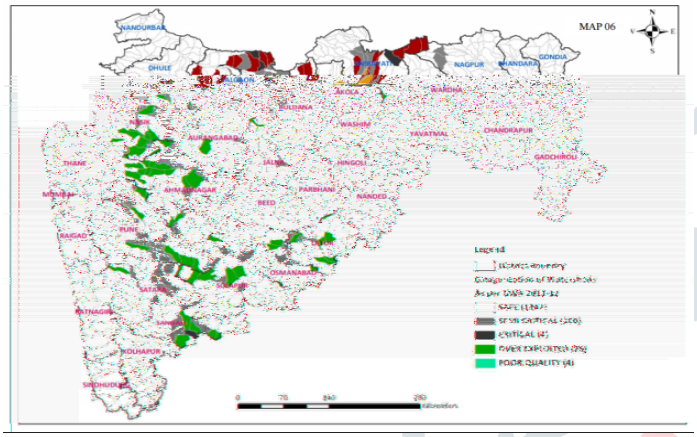

Figure 3 Watershed Categories

Figure 4 Watershed Categories

1.5 Methods of Rainfall Water Harvesting and Artificial ground Water Recharge-

Continuing research and advancement in technology shall be promoted to address issues in the water sector in a scientific manner. Innovations in water resources sector should be encouraged, recognized and awarded. It is necessary to give adequate grants to the States to update technology, design practices, planning and management practices, preparation of annual water balances and accounts for the site and basin, preparation of hydrologic balances for water systems, benchmarking and performance evaluation. There are various methods to harvest the water and recharge artificially to increase the ground water level. These are easy to harvest the water and suitable for water management such as-

1] Gully plug,

2] Contour bunds,

3] Gabion Structure,

4] Percolation tanks,

5] Dams/ Cement plug,

6] Nala bunds,

7] Sub surface Dyke,

8] Drip irrigation system in agriculture

Figure 5 Terracing

Figure 6 Contour Bunds

Figure 7 Cement Nala Bund

Figure 8 Stone Masonry Bund

Figure 9 Earthern Bund

Figure 10 Vanarai/ bag Bund

Figure 11 Drip irrigation in agriculture farm

1.6 Water management Practices-

- Higher level of efficiency in irrigation can be achieved through
- Command area development

- Conjunctive use of surface and groundwater
- Adequate maintenance of the irrigation infrastructure like head works, canal system, etc.
- Canal lining and innovative solutions to reduce evaporation
- Providing drainage and preventing water logging
- Proper cropping calendar and cropping pattern

CONCLUSION

Therefore, the challenges are to manage land, water and other natural resources to achieve the food and environment security, poverty of alleviate and raise living standards in a proper manner. In this paper, emphasis has been placed on improving the productivity of agri. Water use and water resource management. Therefore, the model indicating that the field, system and understanding of water availability, its productivity, allocation, management, and recharge or conservation have been discussed. Identifying and promoting affordable but effective technologies to capture, collect and distribute water that are commensurate with local conditions, organisational skills and expertise, have significant scope for improving household food security and the livelihoods of the poor. The importance policy and mechanisms reflect the aspirations of all stakeholders to derive the full benefits of technological innovations and approaches have also been underlined.

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REFERENCES

[1] Seckler D, Barker R and Amarasinghe UA, 1999. Water scarcity in the twenty-first century. International Journal of Water Resources Development, 15(1/2): 29-42.

[2] Bringing Water to the Poor: Selected ADB Case Studies, 2004, Publication no 8.

[3] www.google.com

[4] IWMI (International Water Management Institute), 2000. World water and climate atlas, http://www.atlas.htm

[5] Molden DJ and Sakthivadivel R, 1999. Water accounting to assess use and productivity of water. International Journal of Water Resources Development, (1/2): 55-71.

[6] Rosegrant MW and Perez ND, 1995. Water resources development in Africa: A review and synthesis of issues, potentials, and strategies for the future. IFPRI (International Food Policy Research Institute), Washington, DC, USA.

[7] Environmental Status Report, PMC, Pune, 2014.

[8] Watershed Based Development- A Source Book, Bharat Gyan Vigyan Samiti, 1998.

[9] River Basin Atlas India, CWC, April 1989.