Vol 7 Issue 3 Dec 2017

ISSN No : 2249-894X

Monthly Multidisciplinary Research Journal

Review Of Research Journal

Welcome to Review Of Research

RNI MAHMUL/2011/38595 **ISSN No.2249-894X**

Review Of Research Journal is a multidisciplinary research journal, published monthly in English, Hindi & Marathi Language. All research papers submitted to the journal will be double - blind peer reviewed referred by members of the editorial Board readers will include investigator in universities, research institutes government and industry with research interest in the general subjects.

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REVIEW OF RESEARCH
ISSN: 2249-894X
IMPACT FACTOR : 5.2331(UIF)
VOLUME - 7 | ISSUE - 3 | DECEMBER - 2017

WATER CRISIS AND MANAGEMENT OF AGRICULTURAL WATER USE

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ABSTRACT: -

Nowadays, "crisis" is most related to the word "water"; so, many studies and projects focusing on the assessment of global water demand and its availability have been developed. In fact, water demand has reached critical levels in many areas of the world, especially in countries with limited water availability. Present water shortage is one of the primary world issues, and according to climate change projections, it will be more critical in the future.

Human actions bring about water scarcity in three ways: through population growth, misuse and inequitable access.

Without water people do not have a means of watering their crops and, therefore, to provide food for the fast growing population.

The sustainable water management concept refers to all practices that improve crop yield and minimize non-beneficial water losses.

KEYWORDS: *water crisis, agricultural water management*

INTRODUCTION:

Due to intense competition with domestic, industrial and power sectors, agriculture will also have to depend more and more on the use of marginal/poor quality of water as it is projected that the share of water allocated to agriculture is likely to decrease by 10-15% in the next 20-30 years. Sprinkler and drip irrigation methods of water application are techniques in which such water can be used effectively. However, the long-term impact of prolonged use of such waters has to be always kept in mind while recommending such options.

Simple measures like banning transplanting of paddy before second week of June in Haryana and Punjab have made a significant impact on the ground water extraction in the two states. Such policy decisions can convey a message that unnecessary and wasteful use of water is a non-sustainable and non-negotiable issue.

The water savings associated with the various interventions developed are as below:

- Proper scheduling of canals (matching supply with demand)
- Precision leveling through laser levelers
- Scientifically designed check basins/border strips

- Zero tillage
- Adoption of pressurized irrigation systems
- Land configuration changes-ridge/furrow or raised/sunken beds
- Use of tissue cultured eucalyptus, banana, sugarcane, papaya etc.

RAINWATER HARVESTING

Rainwater harvesting is the process of collecting, concentrating and improving the productive use of rainwater, and reducing unproductive depletion such as runoff, evaporation and seepage. Harvested rainwater may be used for providing pre-sowing irrigation, supplemental/life saving irrigation, recharging ground water and/or for domestic purposes. There is generally enough rainfall in most of the moist semi-arid and dry sub humid zones to meet the crop water needs, and if local water balances were managed better then India should not have to suffer from droughts. Of the total precipitation that falls in the country, less than 29% is harvested or utilized and 21% of it is lost to the sea. Several studies have shown that the acceptance for rain fed technologies has been only in those areas where rainwater harvesting and its subsequent utilization in the field was made an important component of technological interventions.

The National Agricultural Research System (NARS) through its vast network of State Agricultural Universities (SAUs), Indian Council of Agricultural Research (ICAR) institutions and All Indian Coordinated Research Projects (AICRPs) have developed a technologies focusing on enhancing water use efficiency at all levels. They are briefly described below-

LAND LEVELING

Proper land leveling is one of the management options which is generally ignored. It increases the water application efficiency which leads to higher yields as well as increase in water use efficiency. It also has a direct impact on the nutrient use efficiency.

METHODS OF IRRIGATION

It is very important to employ the correct method of water application to minimize the adverse effects of irrigation. The selection of the right method of irrigation is influenced by the soil type, land topography, crops to be grown, quality and quantity of water available for irrigation and other site-specific variations. Farmers go in for surface flooding which is an inefficient manner of using this precious natural resource. 10 to 15% efficiency in water use can easily be achieved by adopting the appropriate method.

1. Furrow irrigation: The furrow method of irrigation is generally used to irrigate row crops and vegetables. In areas where water for irrigation purposes is scarce, the practice of alternate or skip furrow irrigation can save considerable quantity of water without significantly affecting the yields. In areas requiring surface drainage or where the cultivated crops are sensitive to water logging, the furrows are effective in removal of excess water.
2. Surge flow irrigation: Excessive water intake and deep percolation losses are major limitations for irrigation through furrows and border strips. Surge flow furrow irrigation results in faster water front advance and reduces the volume of water required to complete the advance phase. The studies also confirmed that it increases water distribution efficiency, reduces infiltration rate and the cumulative infiltration depth, and consequently reduces the percolation losses.
3. Pressurized irrigation systems: To encourage adoption of water efficient technologies, the Government has provided subsidy to popularize pressurized system of irrigation like sprinklers and drip (Trickle). The pressurized method of irrigation gives many advantages over the gravity surface irrigation methods in terms of water savings and yields. The quality of produce through drip irrigation is generally superior to conventionally irrigated crops. These pressurized irrigation systems are very useful particularly in undulating and uneven lands or very coarse textured soils.

It is also possible to supply the nutrients to the crops through the pressurized system of irrigation popularly called as fertigation. Supplying liquid soluble fertilizers through a drip system can lead to savings in fertilizer applied to the extent of at least 40% without affecting the yield and a much higher application efficiency

compared to the conventional methods. This is in addition to the savings in water applied which could be anywhere from 50 to 70%. The quality of produce is also superior.

In regions where good quality (fresh) water is available even in limited quantities, conjunctive use offers a safe way of utilizing a combination of poor and good quality either through mixing (dilution) or cyclic uses (Table 8). In a detailed study aimed at evaluating the use of paper mill effluent for irrigation in the farmers' fields, it was observed that in all the crops namely, maize, wheat, rice and mustard, highest grain yields were obtained with mixed irrigation (Tube well + effluent in 1:1 ratio) as compared to irrigation with tube well and effluent waters only.

In many coastal areas, excessive pumping of ground water through tube wells leads to deterioration of water quality due to sea water intrusion. For skimming fresh water, Dorouv technology/infiltration gallery methods have been found to be beneficial to prevent sea water intrusion. Similarly, in many island areas overdrawal of good quality ground water leads to lowering of water table and acute water shortage. Scientific regulation of the intensity of tube wells according to local aquifer characteristics is highly essential to ensure proper water balance.

WASTEWATER PRODUCTION, TREATMENT AND MANAGEMENT

As stated earlier, more than half of the country would be living in cities and towns by 2050, a very sizeable amount of domestic as well as industrial waste waters will be generated. Since these wastewaters also contain a significant amount of nutrients and their disposal is an environmental issue, they should be considered as resource for irrigation and systematic efforts should be made for their primary treatment as it is cost effective. Periurban agriculture needs to be given high priority to meet the specific demands of the urban population particularly vegetables and flowers. Therefore, it is time to declare these wastewaters as a "resource" so that one can start to scientificantly develop cost-effective and eco-friendly solutions to meet the domestic, industrial, agricultural and environmental demands of the country which would be the most populous nation of the world in a couple of decades.

MULTIPLE USES OF WATER

Since the scarcity of water is going to worsen in the future, the emphasis has to shift from the conventional land productivity approach to enhancing the water productivity on a systems basis. Multiple use of water provides opportunities for increasing water productivity, enabling diversification to high value products, reducing risk, optimizing resource use and a regular flow of income as well as judicious utilization of water of poor/marginal quality. Integrated farming system (IFS)-based agriculture can enhance the water productivity, reduce the amount of external inputs to be purchased by the farmers and increase his income

USE OF MODERN TOOLS IN WATER MANAGEMENT

The stupendous progress in information technology coupled with the rapid advancements made in Geographical Information Systems (GIS), simulation tools, sensors, precession farming and remote sensing have opened up new vistas for water resources development and management. These tools should be an integral system of scientific management of irrigation networks, water distribution, crop planning and related operational activities as they will enable the system managers to take correct and timely decisions. These tools can be equally, if not more effectively utilized in assessment and monitoring of watershed related development studies. Decision Support Systems (DSS) for real-time monitoring and decision-making with inputs from remote sensing and ground based inputs can contribute significantly in improving water use efficiencies in large irrigation projects and integrated watershed management.

Developments in biotechnology have reached a level where gene flow has no boundary. Marker Assisted Selection (MAS), gene pyramiding etc. can enable identification as well as introduction of genes (single/multiple) that can enhance water use efficiency as well as increase tolerance to water logging, soil salinity or heavy metal toxicity. The potential of this technology needs to be utilized fully.

The Government of India has initiated several large programmes focusing on development of water resources. Some of the major ones are:

- Flood Management Programme
- Artificial Recharge to Ground Water through Dug Well
- Command Area Development and Water Management Programme
- National Project for Repair, Renovation and Restoration (RRR) of Water Bodies
- Accelerated Irrigation Benefit Programme (AIBP)
- Farmer's Participatory Action Research Programme (FPARP)
- Integrated Watershed Development Programme
- The National Mission on Water (part of National Action Plan on Climate Change) which has set a target of enhancing water use efficiency by 20% by the end of the current plan
- National Bureau of Water Use Efficiency (NBWUE) is being constituted as an Authority for the purpose of promotion, regulation and control of efficient use of water in irrigation, municipality and/or industrial user.
- Establishment of State Water Resources Regulatory Authorities (SWRRA) being encouraged.

CONCLUSION

Share of water to agriculture is going to decline in the future due to the stiff competition from the industrial and domestic sectors and compounded further by global warming and associated adverse impact of climate change. The pressure to produce more and more from less and less is intensifying with each passing moment. Since, water is a critical input for agriculture, therefore, adoption and up scaling of new technologies as quickly as possible is the only viable solution.

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