

## **Enhancing Water Use Efficiency**

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**Abstract:** Water availability per capita per year in India has decreased from 5177 m<sup>3</sup> in 1951 to 1567 m<sup>3</sup> in 2011 and is projected to further reduce to about 1140 m<sup>3</sup> in 2050 viz. a whopping 78% decline since past 68 years. With these figures, India is already a water stressed country. We have only about 4 per cent of the world's total fresh water resources while our irrigated agriculture consumes about 81% of the total developed fresh water resources. Traditional Canal Distribution Network with efficiency between 35-40% is not adequate for catering to the water, food and energy requirements of the ever burgeoning population and its lifestyle changes. Enhancing water use efficiency in every sector of water use including irrigation is, thus, very crucial and imperative for sustaining life faced with the challenges posed by climate change on water sector being witnessed in the present times.

The paper attempts to discuss deep concerns and commitment of Government of India towards enhancing water use efficiency and its optimum utilization as reflected in the National Water Policy 2012, National water Mission under National Action Plan on Climate Change, Pradhan Mantri Krishi Sinchai Yojna (PMKSY) aimed at "Har Khet Ko Pani" and "Per Drop More Crop", adoption and incentivisation of micro irrigation system so as to cover more area under assured/protective irrigation for the same quantum of available water, Jal Shakti Abhiyan, challenges in ground-implementation, role of farmer's awareness and their active participation in Participatory Irrigation Management through Water Users Associations for the common and collective good.

### **1. INTRODUCTION**

India has around 4% of world's fresh water resource, out of which about 81% is used in agriculture. The utilizable water resource in India is 1123 BCM which amounts to mere 28% of the average annual precipitation. Water availability per capita per year in India has decreased from 5177 m<sup>3</sup> in 1951 to 1567 m<sup>3</sup> in 2011 and is projected to further reduce to about 1140 m<sup>3</sup> in 2050 viz. a whopping 78% decline since past 68 years. With these figures, India is already a water stressed country.

A 2018 report of Food and Agriculture Organisation (FAO) of the UN addresses the importance of increasing water-use efficiency, which is used as a measure of the value of water to the economy and society in units of value added per cubic metre of water used. Water-use efficiency is a little over USD 15/m<sup>3</sup> worldwide, though significant differences exist among countries and regions. The lowest water-use efficiency is in Central and Southern Asia at USD 2/m<sup>3</sup>. The highest water-use efficiency is in Oceania at USD 50/m<sup>3</sup>. 75 countries have efficiencies less than USD 10/m<sup>3</sup> (of those, 10 countries are below USD 1/m<sup>3</sup>), 56 countries between USD 10/m<sup>3</sup> and USD 40/m<sup>3</sup>, and 17 countries between USD 40/m<sup>3</sup> and USD 80/m<sup>3</sup>. The figure is only USD 1.9/m<sup>3</sup> in case of India which is, obviously, a cause of deep concern.

Enhancing water use efficiency in every sector of water use including irrigation is, thus, very crucial and imperative for sustaining life faced with the challenges posed by climate change on

water sector being witnessed in the present times. Increasing water-use efficiency over time has significant bearing on sustainable food production, economic growth, infrastructure and industrialization, cities and human settlements as well as consumption and production.

With growing scarcity of water resources, it is essential to adopt the irrigation practices and methods bringing about enhanced water use efficiency so as to utilize the water so saved for additional irrigation/other beneficial use.

## **2. Water Use Efficiency (WUE) in Traditional Canal Distribution Network *Vis A Vis* Micro Irrigation System**

Overall efficiency of Canal Distribution Network in India is about 35-50%. Final Report regarding WUE studies completed in consultation with concerned State Governments in case of 35 irrigation projects on the basis of a Concept Note of CAD&WM Wing of erstwhile MoWR in May 2005 on “Need to bring greater efficiency in Irrigation System” had shown weighted average overall project WUE as 36% only.

On the contrary, Micro irrigation (MI) techniques like drip and sprinkler help in water saving upto 40% over conventional flood irrigation methods through enhanced water use efficiency thereby enabling irrigation with extended coverage for a longer duration from the same source of water. Water use efficiency of Micro Irrigation including drip irrigation is as high as 80 to 95%. The MI techniques also help in reducing water-logging, fertiliser usage, labour expenses and other input costs and in enhancing the agricultural productivity and farmers’ income besides sustaining soil health. An Impact evaluation study of Micro Irrigation scheme was carried out by Department of Agriculture Cooperation & Farmers Welfare in 2014 through M/s Global Agri System Ltd. The major findings of the study are as under:

- Irrigation cost is reduced by 20% to 50% with average of 32.3%.
- Electricity consumption is reduced by about 31%.
- Saving of fertilizers in the range of 7% to 42%.
- Average productivity of fruits and vegetables increased by about 42.3% and 52.8%.
- Overall income enhancement of farmers in the range of 20% to 68% with an average of 48.5%.

Thus, improving water use efficiency is very much helpful to cover more area under irrigation, thereby bridging the exiting gap of about 13.17 M Ha (August 2018 figure) between IPC (Irrigation Potential Created) and IPU (Irrigation Potential Utilised) for optimum utilisation of the available water resources.

### **Measures to Enhance Water Use Efficiency**

Following are the important measures which may be adopted holistically in order to enhance the water use efficiency,

- i. Intensive use of mass awareness/IEC activities, Krishi Vigyan Melas etc
- ii. Promoting and incentivizing efficient use of water
- iii. Irrigation scheduling
- iv. Adopting Piped/micro irrigation system
- v. Conjunctive use of surface and ground water
- vi. Command Area Development in *pari passu* mode
- vii. SCADA (Supervisory Control and Data Acquisition System) for efficient measurement/allocation/regulation of irrigation water
- viii. Sensor-based Smart Irrigation Controllers to optimize the delivery of irrigation water to the crops
- ix. Wind and Solar Powered Irrigation for drawing/supplying water
- x. Less water consuming varieties of seeds
- xi. Laser leveler for field-leveling to save upto 30% of water
- xii. No tillage farming
- xiii. Mulching and Hydro-Gels
- xiv. Cropping Pattern Planning as per natural resource endowment of the region
- xv. Screen houses for plants
- xvi. Shelter Belt of trees on the farm boundary to reduce evaporation due to wind
- xvii. Weed Management
- xviii. Participatory Irrigation Management, Water Users Associations and Co-operative Farming
- xix. Institutional mechanism for access of farmers to timely credit/finance and subsidies to easily adopt modern irrigation practices
- xx. Recycling and re-use of water
- xxi. Water Pricing, Water Budgeting & Auditing, Water Footprint and Water Market
- xxii. Public Private Partnership (PPP)
- xxiii. Performance Evaluation and Benchmarking

## 1. IMPORTANT STEPS TAKEN IN INDIA TOWARDS ENHANCING WUE

### 1.1 National Water Policy

The concern about efficient use of water has been amply reflected in detail in the National Water Policy (NWP) 2012 particularly under its Clause 1.2, sub-Clause 4.3 of Clause 4 and Clause 6. Recently, in view of many emerging challenges in water sector, a drafting committee has been constituted by the DoWR, RD&GR on 5th November, 2019

to revise the National Water Policy 2012 through wider consultation with various stakeholders including State Governments.

## **1.2 National Water Mission**

One of the 8 National Missions formulated by the National Action Plan on Climate Change, the National Water Mission unveiled on 30<sup>th</sup> June 2008 aimed at increasing water use efficiency by 20% in all sectors by the end of the 12<sup>th</sup> Five Year Plan i.e. by 2017 as one of its 5 goals to achieve.

## **1.3 Launch of Pradhan Mantri Krishi Sinchai Yojna (PMKSY)**

Efficient use of water is one of the mission objectives of the PMKSY (i.e. Pradhan Mantri Krishi Sinchai Yojna) launched in July 2015 which mainly aims at “Har Khet Ko Pani” (ensuring water to every farm through assured irrigation) and “Per Drop More Crop” (ensuring more productivity through micro irrigation). PMKSY provides convergence of 4 components under 3 Central Govt. Ministries. The “Per Drop More Crop” component is under Ministry of Agriculture, Cooperation & Farmers Welfare.

## **1.4 Concept of Piped Irrigation Network to ward off Land Acquisition problems**

Land acquisition is the inherent problem in case of conveyance and application of water by traditional open canal network system. It is also the main reason behind the gap between IPC and IPU. In July 2017, Central water Commission has brought out its innovative “*Guidelines for Planning and Design of Piped Irrigation Network*” for conveyance and application of water with the aim of improving the irrigation efficiency and addressing the land acquisition issues through a widely consultative process at a time when no readymade guidelines/BIS standards are available on this concept.

## **4.5 Micro Irrigation Fund**

The Cabinet Committee on Economic Affairs chaired by the Prime Minister on 16.05.2018 has approved an initial Corpus of Rs.5,000 crore for setting up of a dedicated “Micro Irrigation Fund” (MIF) with NABARD under PMKSY.

States may access MIF for innovative integrated projects, including projects in the Public Private Partnership (PPP) mode and also for incentivizing micro irrigation through an additional (top up) subsidy over and above the one available under PMKSY-PDMC

Guidelines and for covering additional areas. However, it should not be a substitute for State's share in PMKSY-PDMC.

Farmers Producers Organization (FPO)/Cooperatives/State Level Agencies can also access the funds with State Government Guarantee or equivalent collateral. Farmers Cooperatives may access this fund for innovative cluster based Community Irrigation Projects.

The Group of Secretaries, 2017, emphasized on target of 10 million ha under micro irrigation over the next 5 years, which would require acceleration of the present pace of implementation. This can be accomplished by effective utilization of the resources of both PMKSY-PDMC and MIF in any or both of the following manner,

- To facilitate the States in mobilising the resources for expanding coverage of Micro Irrigation by taking up special and innovative projects
- To incentivise micro irrigation beyond the provisions available under PMKSY-PDMC to encourage farmers to install micro irrigation systems

#### **4.6 Adoption of micro irrigation by more and more States**

The Task Force on Micro Irrigation had estimated a potential of 69.5 m Ha under micro irrigation whereas the area covered so far is only about 14% or so. More and more States in India are adopting the modern techniques of micro irrigation in order to effectively cope up with the water scarcity issues. States like Rajasthan, Andhra Pradesh, Maharashtra, Gujarat, Karnataka and Haryana are having the largest area under micro irrigation. In Rajasthan, the State Government has come up with the policy of executing new water resources projects only on the basis of pressurised/micro irrigation system. One such example is Parwan Major Multi-Purpose Irrigation Project, the original project proposal of which was accepted during 120<sup>th</sup> meeting of the Advisory Committee of DoWR,RD&GR held on 13.09.2013 with CCA of 1.31 lakh Ha and conventional gravity water distribution system. Subsequently, Govt. of Rajasthan revised the project proposal incorporating irrigation through pressurised/micro irrigation system leading to saving of water allowing enhanced CCA from 1.31 lakh Ha to 2.01 lakh Ha which was accepted during 135<sup>th</sup> meeting of the Advisory Committee held on 12.03.2018.

The major challenge in ground-implementation of micro irrigation techniques to enhance WUE is the high initial and maintenance costs of the sophisticated system components. Water being a State subject, States have devised their own ways to promote, incentivize, subsidise and improve water use efficiency through State specific programmes/schemes depending upon their demographic, socio-economic and political characteristics.

#### **4.7 Mass Awareness through Krishi Vigyan Kendras and Melas**

Department of Agriculture, Cooperation & Farmers Welfare (DAC&FW) creates awareness about Micro Irrigation by wide publicity through press & print media, publication of leaflets/booklets, organization of workshops, exhibitions, farmer fairs, information on State/Government of India web portals etc. In addition, Indian Council of Agricultural Research (ICAR) imparts training and organizes field demonstrations through Krishi Vigyan Kendras (KVK) to educate farmers for promotion of Micro Irrigation. After initiation of the Jal Shakti Abhiyan, over 10.8 crore farmers have been trained through the Krishi Vigyan Kendras and 371 Melas were conducted across the country between July 2019 to September 2019.

#### **4.8 People's involvement in water management**

It has now been realised that without active participation of beneficiaries, the irrigation systems cannot be managed efficiently with due equity of water distribution. The experience shows that wherever farmers including women have been actively engaged, the overall management of irrigation system and the water use efficiency have significantly improved. The legal framework, which has been established in various States, will ensure systematic involvement of beneficiaries in the management of irrigation system at various levels. There has to be however, a provision for adequate financial support to these organizations to carry out their responsibilities. The PIM Acts of various States do have provisions for the financial management of these associations.

#### **4.9 Rationalisation of Water Rates**

Rationalisation of Water Rates is important to prompt the beneficiaries to use water efficiently and to meet the O&M requirements of the irrigation system. The Vaidyanathan Committee (1991) of the Planning Commission on pricing of irrigation water mentioned that on an average the revenue collection was Rs. 50 per ha as against the O&M requirement of Rs. 250 per ha. Many of the States have already revised the water rates.

#### **4.10 Creation of the Ministry of Jal Shakti**

Knowing that each drop of water is precious, Government of India has accorded high priority to water security. Scientific management of water is increasingly recognized as being vital to India's economic growth and ecosystem sustainability. Government is proactive about water conservation and its efficient management and has created the

Ministry of Jal Shakti in May 2019 to consolidate inter-related functions pertaining to water management. The issue of water conservation and water security, mass awareness about its efficient use and proper management has acquired centre-stage in the policy matters of the Government.

#### **4.11 Jal Shakti Abhiyan**

In his Mann Ki Baat address in June 2019, The Hon'ble Prime Minister of India made a clarion call to the people of India to come together and launch a Jan Andolan for water conservation on the lines of the Swachh Bharat Mission. Jal Shakti Abhiyan - a campaign for water conservation and water security was also launched in July 2019 by the newly formed Jal Shakti Ministry under the guidance of the Prime Minister of India which has witnessed teams of engineers, ground water experts and scientists from the Central Government working with State and District officials in India's 1592 water stressed blocks in 256 districts to ensure five important water conservation interventions which also *inter alia* aim at improving irrigation efficiency.

#### **4.12 Draft National Resource Efficiency Policy (NREP), 2019**

In order to minimize the potential trade-off between growth and environmental well-being, Ministry of Environment, Forest and Climate Change, Govt. of India has come up with a draft National Resource Efficiency Policy (NREP), 2019 which seeks to create a facilitative and regulatory environment to mainstream resource efficiency across all sectors by fostering cross-sectoral collaborations, development of policy instruments, action plans and efficient implementation and monitoring frameworks.

#### **4.13 Economic Survey of India (2018-19) and WUE**

The Economic Survey of India 2018-19 suggests that "focus should shift from 'land productivity' to 'irrigation water productivity. With decline in size of landholdings in agriculture, India has to focus on resource efficiency especially in smallholder farming to attain sustainability. The Economic Survey proposes that a combination of resource efficient method, dynamic cropping patterns, climate change responsive farming and intensive use of ICT and IEC should form the backbone of farming in India. For a safe and food secured future, the agriculture sector has to undergo tremendous transformation from the philosophy of 'green revolution' led productivity to 'green method' led sustainability.

### **5. Tackling Water Scarcity: The Israeli Way**

Over 60 percent desert, Israel is located in a semi-arid climate zone. For thousands of years, the history of the Land of Israel has been influenced by the scarcity of water. To address water scarcity in order to survive, its leaders launched an initiative to close the gap between demand and the available renewable fresh natural water (RFNW) in the country. RFNW came from the mountain and coastal aquifers and the only body of freshwater, the Sea of Galile. The national authorities together with the private sector developed a number of water-related initiatives all over the country including storage solutions, water transfer by gravity and pumping stations, water drills, water quality inspection and control, wastewater collection, and water and wastewater treatment. Over time, other Israeli breakthroughs were made in desalination, public education, irrigation, water pricing policy, and water recycling. Israel also set up and implemented the legal and regulatory framework necessary for establishing an efficient water sector.

In the past decades, Israel achieved a water miracle. By adopting a holistic approach to water consumption that encompasses good management, high tech development and public education, Israel transformed from a water-parched nation to a global leader in the water sector.

## **6. Conclusion**

Enhanced water use efficiency through persistent and concerted efforts of individuals, groups/associations of people and the Government implementation agencies/institutional mechanisms will go a long way in effectively coping up with the challenges posed by climate change and ever increasing population on available water resources and will result in optimum and efficient utilisation of precious water thereby adding to enhanced productivity, prosperity and sustainability.

*Disclaimer: The views/opinion expressed in the Paper are personal views of the author and do not necessarily reflect those of the organization to which he belongs.*

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