Volume 4, Issue 1
January I 2026

Agri Roots
e- Magazine

www.agrirootsmagazine.in

ISSN: 2583-9071

Water Management in Agriculture in India

ARTICLE ID: 0327

Rohit Raj[1], Naveen Kumar[2], Professor (Dr.) Srinivasa Rao Meesala[3]

[1]Postgraduate Student, M.Sc. (Agronomy), School of Agriculture, K.K. University, Biharsharif, Nalanda, Bihar – 803115, India

[2]Research Scholar, Ph.D. (Agronomy), School of Agriculture Sciences, K.K. University, Biharsharif, Nalanda, Bihar – 803115, India

Water is a critical resource for agriculture that has not been efficiently managed in India. This paper discusses issues related to irrigation in India, their effects, and institutional arrangements addressing water scarcity for irrigation. The study finds that the problems are largely institutional, structural, and administrative in nature, and overcoming them is crucial for agricultural development. Irrigation is both an art and a science. While science has provided concepts and methods for measuring the various processes involved in irrigation, farmers' knowledge of their fields and crops, along with practical experience in applying scientific principles, remains central to achieving effective and efficient irrigation.

"Irrigation is everything in India; water is even more valuable than land," remarked Sir Charles Trevelyan decades ago. Wolff similarly observed that if the monsoon fails, agricultural activity comes to a standstill. Today, there is a general consensus that the problem is not an absolute shortage of water but poor management—particularly in utilisation, augmentation, and conservation.

India is endowed with about 183 million hectares of cultivable land, 115.6 million farming families, and nearly 400 million hectare-metres of annual precipitation, along with a conducive agro-climatic environment for cultivating a wide variety of crops. About two-thirds of the country's population is engaged in agriculture, feeding more than one billion people. Yet, a large proportion of farmers remain trapped in poverty, debt, and hunger (Hans, 2010).

Micro-level studies on rural poverty consistently identify irrigation as a key explanatory factor. Gurunathan (2008), using linear regression analysis for Tamil Nadu over 37 years (1964–2000), found that rural poverty could be reduced by 1.54 per

cent through an increase of one hectare of groundwater irrigation per thousand rural population. Hans (2007), in a study of Belthangadi and Mangalore taluks of Dakshina Kannada district, Karnataka, showed that households with better access to irrigation infrastructure were more likely to move above the poverty line, with average household income almost doubling when irrigation was utilised.

Indian agriculture remains heavily dependent on monsoons, with nearly 70 per cent of the net sown area being rainfed. Problems of Indian agriculture are intricately linked to per capita availability of water in a cost-effective manner. Demand for food is increasing, yet a vast proportion of arable land remains fallow during the dry season (Zaman, 2009). The water problem is thus a triple challenge—related to supply, demand, and quality.

By 2030, India will need to produce about 60 per cent more rice with fewer resources. To sustain growth, careful economic valuation of inputs, including irrigation, is essential (Kiran et al., 2009). Despite advances in high-tech agriculture, sustainable farming and livelihood security will continue to depend on efficient management and conservation of natural resources, particularly water.

Objectives of the Study

- To present the problems and challenges related to water use in Indian agriculture.
- To highlight key areas requiring intervention for improved water management.
- To examine selected initiatives undertaken in India to conserve water.

Effects of Water Management on Agriculture

Productivity improvements in agriculture arise both from area expansion and from the combined use of inputs such as irrigation, fertilisers, and plant protection measures. Although irrigated land constitutes only about 46 per cent of the cropped area in India, it contributes nearly 56 per cent of total agricultural output, and around 60 per cent of food grain production comes from irrigated areas.

Farm efficiency is closely linked to water availability, whether through rainfall or irrigation. Under modern farming systems, irrigation is a critical component of integrated farm management. Total Factor Productivity analyses assign significant importance to irrigation in explaining yield variations and technical efficiency across crops and farms.

Challenges and Opportunities in Water Management

One of the most significant challenges facing Indian agriculture is climate change. Global climate change, driven by rising concentrations of carbon dioxide and other greenhouse gases, has increased uncertainty in water availability, making it difficult to optimise irrigation decisions and timing. Natural resources have become increasingly vulnerable, placing agriculture in a situation of growth accompanied by heightened risk.

A substantial portion of annual variation in India's GDP growth is attributable to fluctuations in rainfall. Rising sea levels, depletion of potable water, and declining irrigation potential pose serious concerns. Estimates suggest that by 2080–2100, increases in temperature could lead to crop production losses ranging from 10 to 40 per cent.

In several coastal regions, sand mining has led to declining groundwater tables, forcing farmers to increase pump horsepower, thereby raising cultivation costs and reducing irrigation efficiency. Although programmes such as the Command Area Development Programme have expanded irrigation infrastructure, challenges remain due to inadequate awareness of the scarcity value of water, political interference, and unreliable electricity supply affecting institutions like Water Panchayats.

Water Supply Management

On-farm water management systems can be analysed through three components: primary water supply, farm-level irrigation systems, and drainage. Successful farming requires a reliable, flexible, affordable, and good-quality water supply. Efficient irrigation systems and sound farm management practices are essential for effective water application, while adequate drainage is necessary to maintain soil structure and salinity balance.

Seasonal water requirement analysis forms the foundation of crop planning. Comparing crop water needs with available supplies helps determine whether existing water resources are sufficient or whether crop rotations and management practices need adjustment. Farm water budgeting—covering the crop year and water year—assists in planning monthly and field-level water requirements.

Conclusion

This study analysed the impact of water management on agricultural output, labour, and capital growth in a developing, agriculture-based economy, using government agricultural and economic data spanning 30 years (1977–2006). The findings highlight that improved use and optimal combinations of inputs—particularly water, improved seeds, and fertilisers—are essential for sustaining output growth.

To enhance overall efficiency, irrigation technologies that prioritise water-use efficiency must be developed, disseminated, and adopted widely. Effective water management remains central to achieving sustainable agricultural growth and ensuring food security in India.

References

1. Agoramoorthy, G., & Hsu, M.J. (2015). Irrigation-based social work relieves poverty in India's drylands. *International Social Work*, 58(1), 23–31.
2. Dev, S.M. (2016). Water management and resilience in agriculture. *Economic & Political Weekly*, 51(8), 21–24.
3. Gurunathan, S. (2008). Rural poverty–irrigation nexus in Tamil Nadu. *Journal of Global Economy*, 4(1), 76–82.
4. Hans, V.B. (2007). *Infrastructure for Rural Development – A Comparative Study in Dakshina Kannada District*. Unpublished PhD thesis, Mangalore University, Mangalagangothri.
5. Hans, V.B. (2010). Sustainable Agriculture and India – Dimensions and Directions. In K.A. Rasure (Ed.), *Sustainable Agricultural Development* (pp. 28–38). Jaipur: Oxford Book.