BODHIVRUKSHA JOURNAL OF DIVERSE DISCIPLINE (BJDD)
An Open-Access, Peer-Reviewed, Multidisciplinary Scholarly Journal | Bi-Monthly | Multilingual | Academic Research
Vol 2, Issue 6 (November-December 2026) (Special Issue 2) | ISSN: 3139-1486 (Online) | ISSN: 3139-9819 (Print)

India's adoption and growth of drip irrigation technology

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Abstract

Drip irrigation is an important water-efficient agricultural technology that delivers water directly to the root zone of crops. In India, its adoption has been encouraged to improve irrigation efficiency, support agricultural productivity and promote sustainable water management. The present study, entitled India's Adoption and Growth of Drip Irrigation Technology, examines the historical growth and spatial distribution of drip irrigation and evaluates the physical and financial progress of the Per Drop More Crop (PDMC) scheme during the period 2019-20 to 2023-24. The study adopts a descriptive and analytical research design based on secondary data obtained from the Ministry of Agriculture and Farmers Welfare, the Economic Survey of India and other official publications. The proposed analytical techniques include percentage growth, compound annual growth rate, target-achievement ratios and financial utilisation analysis. Particular attention is given to distinguishing drip-only coverage from combined micro-irrigation coverage, which includes both drip and sprinkler systems. However, the available published figures do not provide a complete, consistently defined annual series of drip-only coverage and scheme expenditure for every year of the selected period. Consequently, the study distinguishes verifiable empirical findings from areas requiring additional official data. The study highlights the importance of transparent reporting, reliable year-wise statistics, region-specific implementation strategies and effective financial monitoring for expanding drip irrigation in India.

Keywords: Micro irrigation, Drip Irrigation, PMKSY, Agriculture Technology, Physical Progress, PDMC.

1. Introduction

India is a predominantly agricultural country with over 50% of the country's population dependent on agriculture for their livelihood. As most of Indian agriculture is dependent on monsoon rainfall and climate change has increased the uncertainty of rainfall, water management has become a major challenge for agriculture. Traditional irrigation methods waste a lot of water, with a water use efficiency of only 30% to 40%. Micro-irrigation, especially drip irrigation, has emerged as a revolutionary technology to overcome this problem. Drip irrigation provides water and fertilisers (fertilisation) directly and as required at the roots of crops, which saves up to 70% of water and significantly increases crop productivity. After that, the expansion of drip irrigation in India mainly took place in three phases. Initial phase (1970 to 1990) Drip

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irrigation technology was introduced in India in the 1970s, mainly on the lines of technology in Israel. Initially, this technology was limited to only a few cash crops (e.g. sugarcane, orchards) and water-scarce states like Maharashtra, Gujarat, Tamil Nadu and Andhra Pradesh. Then, the policy incentives and development (1990 to 2010) The central and state governments, recognising the importance of micro-irrigation, started providing subsidies through various schemes after 1990. In 2010, the 'National Mission on Micro Irrigation - NMMI' was launched, which led to the rapid expansion of drip irrigation in the country. And then the modern phase and PMKSY (2015 to date) On 1 July 2015, the Central Government launched the 'Pradhan Mantri Krishi Sinchana Yojana' (PMKSY). Under this scheme, a special component campaign called "Per Drop More Crop" (PDMC) was implemented. Under this scheme, a financial subsidy of 55% was provided to small and marginal farmers and up to 45% to other farmers. Also, a 'Micro Irrigation Fund' (MIF) of ₹5,000 crore was set up with NABARD to provide funds to the states to spread this technology. Currently, the PMKSY-PDMC scheme has succeeded in bringing more than 110 lakh hectares of agricultural area under micro irrigation in the country. Maharashtra, Andhra Pradesh, Gujarat, Karnataka and Tamil Nadu are leading the country in the use of drip irrigation.

Need and Objectives of this Study Although drip irrigation is rapidly being adopted in the country, its expansion has remained uneven due to geographical conditions, climate and economic factors in different states. Also, it is very important for farmers to conduct an analytical study of the physical (Physical - hectare area) and financial (Financial - subsidy allocation) progress of the government. Considering this background, the present research paper is done.

2. Objective

- To analyse the historical growth and spatial trends of drip irrigation coverage in India.
- To study the trend of physical progress of drip irrigation under PMKSY.

3. Methodology

The study uses a descriptive and analytical research design based on secondary data. It examines published government statistics, scheme monitoring information and official policy documents. The study period is 2019-20 to 2023-24, comprising five financial years.

4. Data Analysis

Table 1.1 India five state Drip irrigation achievement report area covered (Ha)

State	2019-20	2020-21	2021-22	2022-23	2023-24	Total Area (5 Years)
Tamil Nadu	1,99,06.19	1,18,710.46	62,615.76	44,713.37	85,550.43	**5,14,651.21**
Maharashtra	1,14,815.97	35,200.00	64,205.66	1,09,281.80	49,339.42	**3,72,842.85**

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Aandra Pradesh	92,121.00	No record	No record	70,467.00	63,605.00	**2,26,193.00**
Gujarat	77,498	65,239.00	55,051.00	71,222.00	66,485.00	**3,35,495.00**
Karnataka	65,006.96	65,802.35	35,934.73	42,484.55	48,598.89	**2,57,827.48**

Sources:- pmksy.gov.in

The table shows the area (in hectares) under Drip Irrigation in five major Indian states over a 5-year period, from 2019-20 to 2023-24. Total Achievement: Tamil Nadu: 514651.21 Ha (Ranked 1st; the highest total adoption among the five states, with peak coverage in 2019-20). Maharashtra: 372842.85 Ha (Ranked 2nd; notably high coverage in 2019-20 and 2022-23). Gujarat: 335495.00 Ha (Ranked 3rd; annual coverage remained relatively steady). Karnataka: 257827.48 Ha. Andhra Pradesh: 226193.00 Ha (Note: Records were not available for 2020-21 and 2021-22). Over the 5-year span, Tamil Nadu recorded the highest overall drip irrigation coverage. For the financial years 2020-21 and 2021-22, Andhra Pradesh has missing or no records. The data indicates the implementation progress under the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) framework for improving water-use efficiency in agriculture.

Table 1.2 India five state Drip irrigation year-on year (YoY) growth rate

State	2020-21 vs 2019-20	2021-22 vs 2020-21	2022-23 vs 2021-22	2023-24 vs 2022-23
Tamil Nadu	-40.36%	-47.25%	-28.59%	91.33%
Maharashtra	-69.34%	82.40%	70.21%	-54.85%
Aandra Pradesh	N/A	N/A	N/A	-9.74%
Gujarat	-15.82%	-15.61%	29.37%	-6.65%
Karnataka	1.22%	-45.39%	18.23%	14.39%

Sources:- pmksy.gov.in

The table shows the year-on-year growth rate for Tamil Nadu: it recorded sustained declines in drip irrigation area from 2020-21 to 2022-23 (-40.36%, -47.25%, and -28.59%), which was then followed by a substantial rebound of +91.33% growth in 2023-24. Maharashtra: it recorded sharp declines in 2020-21 (-69.34%), then strong positive growth in 2021-22 (+82.40%) and 2022-23 (+70.21%), before falling again by -54.85% in 2023-24. Andhra Pradesh: data was mostly unavailable (N/A) for the first two comparison

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periods, with a modest decline of -9.74% shown in 2023-24. Gujarat: it showed consistent declines at first (-15.82% and -15.61%), a marked recovery of +29.37% in 2022-23, and a small drop of -6.65% in 2023-24. Karnataka: it saw a modest increase in 2020-21 (+1.22%), a steep fall in 2021-22 (-45.39%), and then recovered with positive growth in both 2022-23 (+18.23%) and 2023-24 (+14.39%).

Table 1.3 India five state 5-years CAGR, Annual Average, & 5-years share

State	Total Area (Ha)	Five years Average (Ha)	Five Years CAGR (%)	Share in Total (%)
Tamil Nadu	5,14,651.21	1,02,930.24	-18.90%	**30.15%**
Maharashtra	3,72,842.85	74,568.57	-19.04%	**21.84%**
Gujarat	3,35,495.00	67,099.00	-3.75%	**19.65%**
Karnataka	2,57,827.48	51,565.50	-7.02%	**15.10%**
Aandra Pradesh	2,26,193.00	75,397.67 (3yrs)	-8.84% (3yrs)	**13.25%**
Total	17,07,009.54	3,41,401.91	-8.56%	**100%**

Sources:- pmksy.gov.in

The table shows the Tamil Nadu leads the 5-year total drip irrigation area with 5,14,651.21 Ha (an average of 1,02,930.24 Ha per year), holding the highest share at 30.15%, though it experienced a negative CAGR of -18.90%. Maharashtra ranks second with a total area of 3,72,842.85 Ha (averaging 74,568.57 Ha annually), accounting for 21.84% of the total share, with a CAGR of -19.04%. Gujarat stands third with 3,35,495.00 Ha in total coverage (67,099.00 Ha annual average), representing 19.65% of the total share and showing a relatively stable CAGR of -3.75%. Karnataka covers a total area of 2,57,827.48 Ha (51,565.50 Ha annual average), capturing a 15.10% share with a CAGR of -7.02%. Andhra Pradesh recorded a 3-year total area of 2,26,193.00 Ha (an average of 75,397.67 Ha over those 3 years), making up 13.25% of the share with a 3-year trend CAGR of -8.84%. Overall Combined Total: Across all five states, the cumulative 5-year drip irrigation area reached 17,07,009.54 Ha, with an annual average of 3,41,401.91 Ha and an overall negative CAGR of -8.56%.

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Table 1.4 All India Physical Progress Report (2019-2- to 2023-24)

Years	Drip Irrigation Area (Ha)	Sprinkler Irrigation Area (Ha)	Total Micro Irrigation Area (Ha)
2019-20	6,24,388.09	5,50,666.73	11,75,054.82
2020-21	3,58,001.88	5,79,759.51	9,37,761.39
2021-22	3,58,488.79	6,56,584.80	10,15,073.59
2022-23	5,32,270.62	5,69,874.97	11,02,145,.59
2023-23	4,77,194.33	6,64,244.47	11,41,438.80
Total	**23,50,343.71**	**30,21,130.48**	**53,71,474.19**

Sources:- pmksy.gov.in

The table shows the total physical progress and area covered (in hectares) under micro-irrigation across India over a 5-year period. Drip Irrigation: A total of 23,50,343.71 Ha was covered over 5 years, with the highest coverage achieved in 2019-20 (6,24,388.09 Ha). Sprinkler Irrigation: A total of 30,21,130.48 Ha was covered, peaking in 2021-22 (6,56,584.80 Ha). Total Micro Irrigation Area: Combined, both methods covered a grand total of 53,71,474.19 Ha across India during this timeframe.

5. Findings & Conclusion

- Overall Performance: The study of drip irrigation coverage across five major Indian states from 2019-20 to 2023-24 reveals a cumulative area of 17,07,009.54 hectares, with an overall negative compound annual growth rate (CAGR of -8.56%) across the period.
- Leading States: Tamil Nadu emerged as the top-performing state, recording the highest cumulative coverage of 5,14,651.21 Ha (holding a 30.15% share), followed closely by Maharashtra at 3,72,842.85 Ha (21.84% share). Together, these two states account for over half of the total drip irrigation area among the studied states.
- Fluctuations & Trends: The year-on-year analysis demonstrates high volatility in adoption rates. While 2019-20 witnessed peak overall figures, subsequent years faced significant declines partly due to pandemic disruptions and missing data records (such as in Andhra Pradesh for 2020-22) followed by intermittent recoveries (like Tamil Nadu's sharp rebound in 2023-24).
- Final Takeaway: While micro-irrigation schemes under initiatives like PMKSY have successfully driven substantial water-use efficiency adoption, the fluctuating year-on-year growth highlights the need for more consistent policy implementation, better data tracking, and sustained financial incentives to encourage farmers to adopt and maintain drip irrigation systems continuously.

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6. References

1. Ministry of Agriculture & Farmers Welfare. (2024). State-wise Drip and Sprinkler Irrigation Achievement Report (2019–20 to 2023–24). Pradhan Mantri Krishi Sinchayee Yojana (PMKSY), Government of India. Retrieved from https://pmksy.gov.in
2. Narayanamoorthy, A. (2004):
3. Narayanamoorthy, A. (2004). Drip irrigation in India: Can it solve water scarcity? Water Policy.
4. Narayanamoorthy, A. (1997):
5. Narayanamoorthy, A. (1997). Economic viability of drip irrigation: An empirical analysis from Maharashtra. Indian Journal of Agricultural Economics.
6. Narayanamoorthy, A., Bhattarai, M., & Jothi, P. (2018):
7. Narayanamoorthy, A., Bhattarai, M., & Jothi, P. (2018). An assessment of the economic impact of drip irrigation in vegetable production in India. Agricultural Economics Research Review.
8. NITI Aayog. (2021). Evaluation Study on Per Drop More Crop Component of Pradhan Mantri Krishi Sinchayee Yojana (PMKSY-PDMC). Government of India, New Delhi.
9. Kumar, M. D., Sharma, B. R., & Singh, O. P. (2009). Water saving and yield enhancing micro-irrigation technologies: How far can they contribute to water productivity in Indian agriculture? International Water Management Institute (IWMI) Research Report.
10. Ministry of Jal Shakti. (2022). Operational Guidelines for Operationalization of Micro-Irrigation under Per Drop More Crop (PDMC). Department of Water Resources, River Development & Ganga Rejuvenation, New Delhi.
11. Rajaguru, S., Kalidasan, T., & Tamilselvi, G. (2023). Constraints faced by the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) beneficiaries in adoption of drip irrigation system in Tamil Nadu. Journal of Extension Education.
12. Choudhary, R., & Mathur, A. (2021). Impact of Pradhan Mantri Krishi Sinchayee Yojana on irrigation development and crop productivity. Indian Journal of Agricultural Sciences.
13. Department of Agriculture & Farmers Welfare. (2023). Annual Report 2022-23: Micro Irrigation and Natural Resource Management. Ministry of Agriculture & Farmers Welfare, Government of India, New Delhi.
14. India Economy Survey government of India 2019 to 2024.