Group

June 2022

Edition

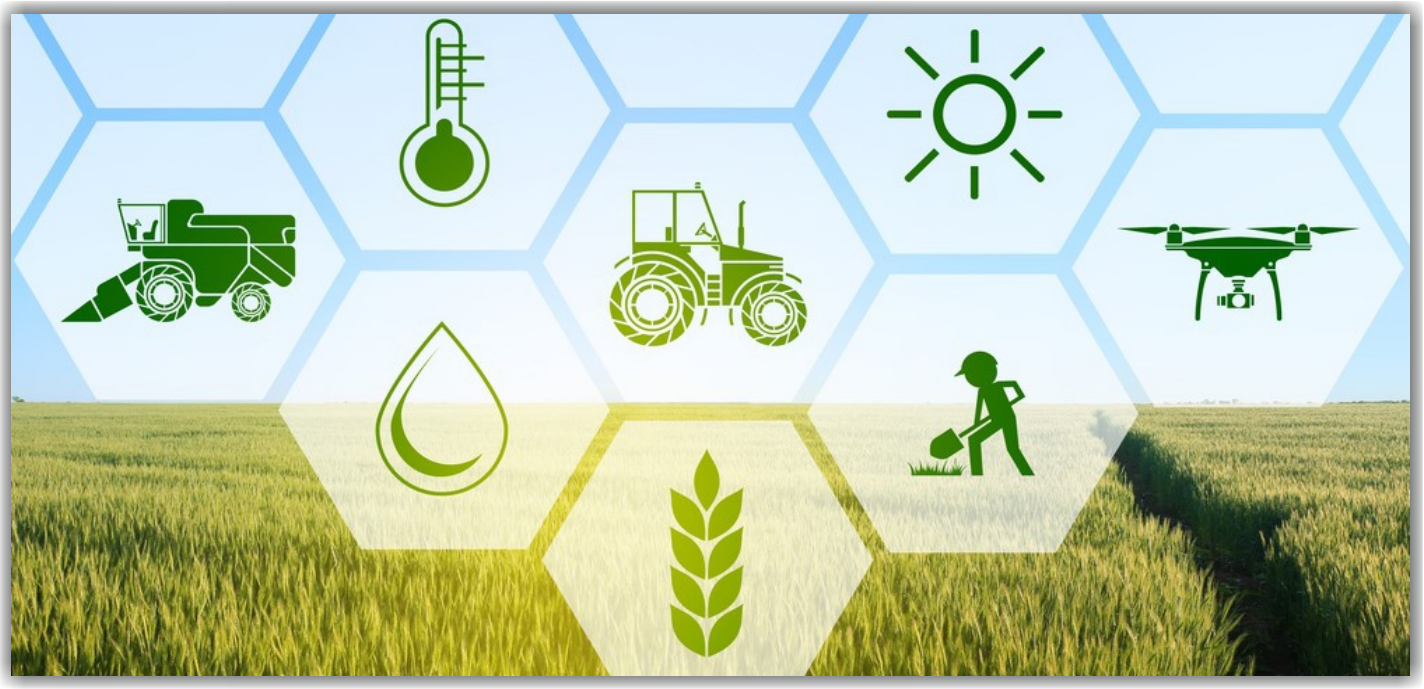
ANALYSIS REPORT ON INDIAN IRRIGATION SECTOR

Water scarcity cannot be overstated for humans, livestock as well as agriculture. Thus, irrigation plays an important role in providing adequate water to agricultural land which in turn provides food security to humans across the globe including India. The irrigation sector in India over time has welcomed both the public and private sectors and increased its coverage to enhance the overall productivity of the Indian agriculture sector.

The depleting water levels and irregular monsoon are the major talks of the time, and the rising global warming situation making it worse ever than before. In such a scenario, the dependency on monsoon rain is going to endanger the high-yield agriculture output and productivity of water-intensive crops. So, it's time to move on to efficient irrigation methods like Drip irrigation, Micro-irrigation methods to make way for a sustainable future.

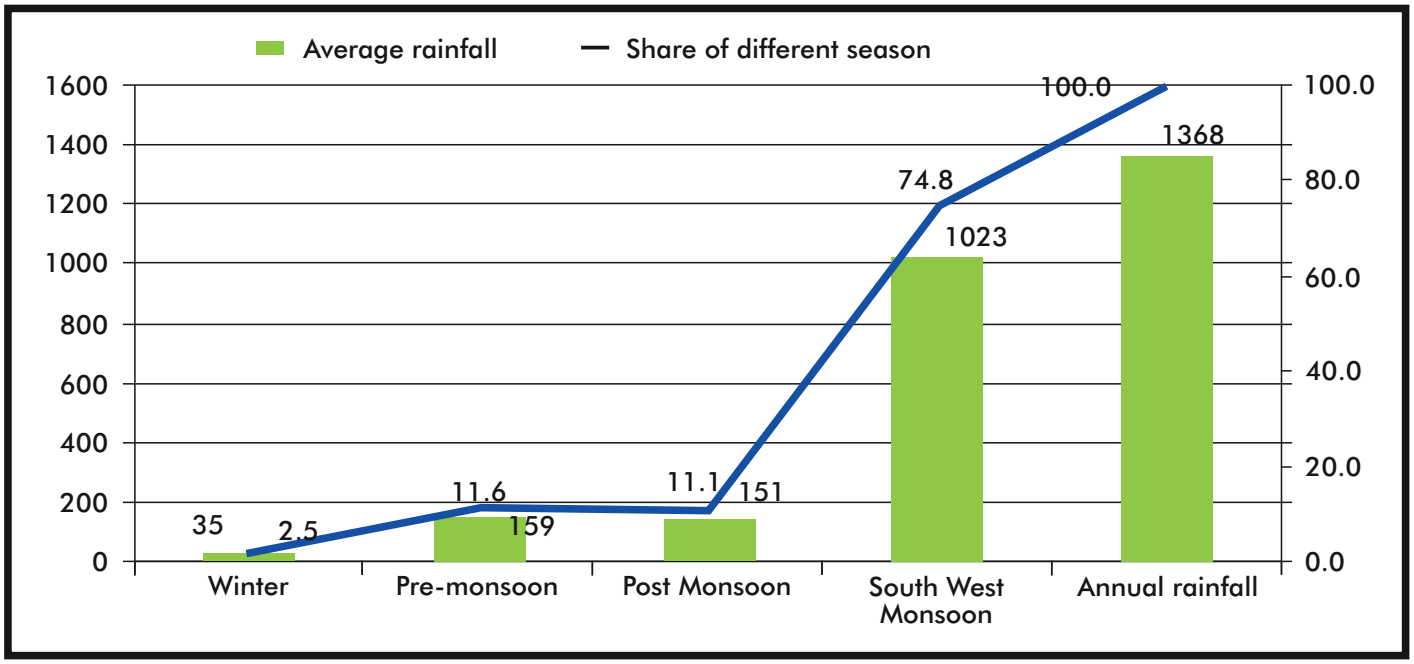
In a vast and diverse country like India, where the climate is tropical, irrigation facilities play a crucial role. But with the increasing use of water by this rising population, the continuous depletion of groundwater levels is adding fuel to the fire. Currently, around 84% of total water available in the country is used for irrigation purposes, but due to climate change and other potential reasons, the groundwater availability is in decline and thus it can create a major water scarcity issue in the country the water for drinking and other purposes.

Right now, the surface water has been used for irrigation purposes from tanks, canals, tube wells, etc across the country for ages. But, the continuous decreasing availability and lack of the restoration of these resources, is shifting a major load on irrigation and impacting the groundwater levels. Thus it is necessary to address the low-level efficiency in water usage in the Indian agriculture system within time to make the changes reversible.



The public infrastructure of the Indian irrigation system is the largest across the globe if compared in terms of water storage, coverage area, and availability of large reservoirs. As the annual per capita average availability of water in India is going to decline drastically to the level of 1341 m^3 by the year 2025, from the level of 5000 m^3 in 1950. The seasonal rainfall variation plays an important role in this.

Seasonal rainfall variation across india



Source: https://krishi.icar.gov.in/jspui/bitstream/123456789/34362/1/irrigation_rajni_preprint.pdf

Thus, it is important to study and find a suitable irrigation method that should fit the natural climatic conditions of the country. These systems must be efficient in terms of the productivity of water along with water-saving techniques and also be economical for farmers, and result in high-yield crops. Here, efficient financial allocation and economic planning through comprehensive irrigation schemes like "Pradhan Mantri Krishi Sinchayee Yojna" (PMKSY) can enhance the performance of irrigation systems. This has the potential to resolve the issue of water scarcity in an agriculture-intensive country like India in an economical way.

Irrigation in India is utilizing the major available surface and groundwater from various sources and thus has an inter-ministerial governance structure to effectively manage these resources. It is important to keep a close check on groundwater depletion and water use efficiency.

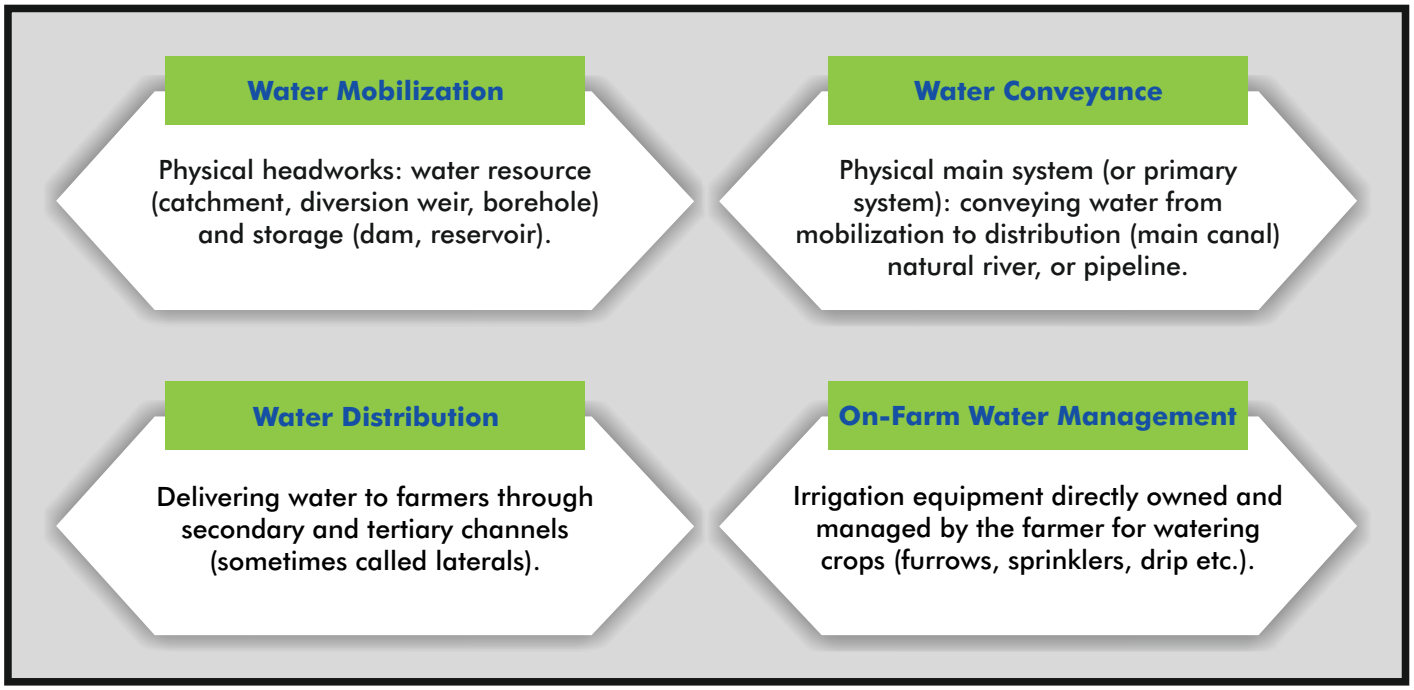
Currently, due to climate change, more than 50% of agricultural land with food grain cultivation is dependent on various types of irrigation methods whereas the remaining is covered under rain fed areas. This proportion is continuously widening due to decreasing precipitation during monsoon and so putting pressure on available water resources.

Irrigation in India is administered by 3 line ministries under the government of India to create an overall strategy for the development of irrigation techniques along with addressing the crisis of water level depletion. The effective coordination among these ministries is paramount for successfully reducing the water wastage in the irrigation process along with the encouragement of water-saving campaigns such as "More Crop Per Drop".

- Ministry of Agriculture & Farmer's Welfare
- Ministry of Jal Shakti
- Ministry of Rural Development

In a wide spectrum, irrigation is an artificial process that includes the technique to carry water from the various sources to cultivated agricultural land and benefits the crop yields.

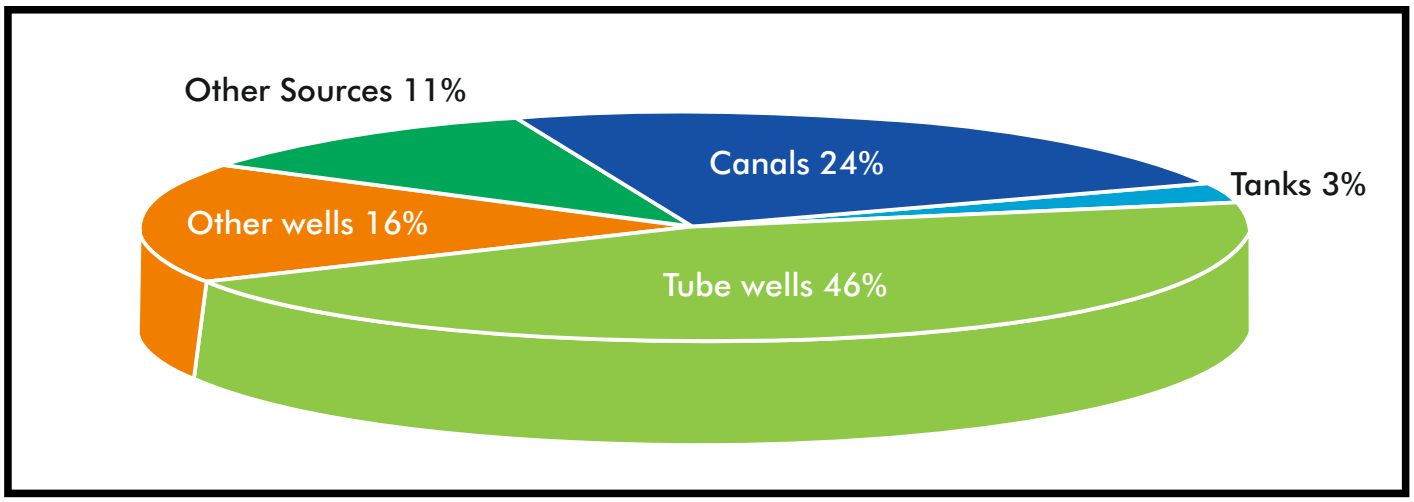
Components of irrigation system



Source: https://www.adb.org/sites/default/files/publication/30329/ppp-irrigation-drainage-sector-india.pdf

Based on different sources of water, the types of irrigation can be described as canal irrigation, well irrigation, tank irrigation, etc.

Traditionally types of irrigation



Source:https://www.insightsonindia.com/agriculture/different-types-of-irrigation-and-irrigation-systems-storage/irrigation-methods/

But the continuous harnessing of groundwater for irrigation purposes puts pressure on the environment and in turn increases the salinity of water, water pollution, and degradation of nutrients in groundwater including the loss of flood plains and wetlands across the country. This is causing harm to the natural habitat of many living organisms in the ecosystem.

To address this, an effective water management methodology is the only solution, as the future economic, social, and physical growth of human life is dependent on water. For this, the role of administration at each level from policy making to spreading awareness among farmers through live monitoring tools is the best way out.

Three modes of irrigation that receive policy support

Surface Irrigation

- Also known as Flood Irrigation.
- Conventional method of irrigation in India.

Drip Irrigation

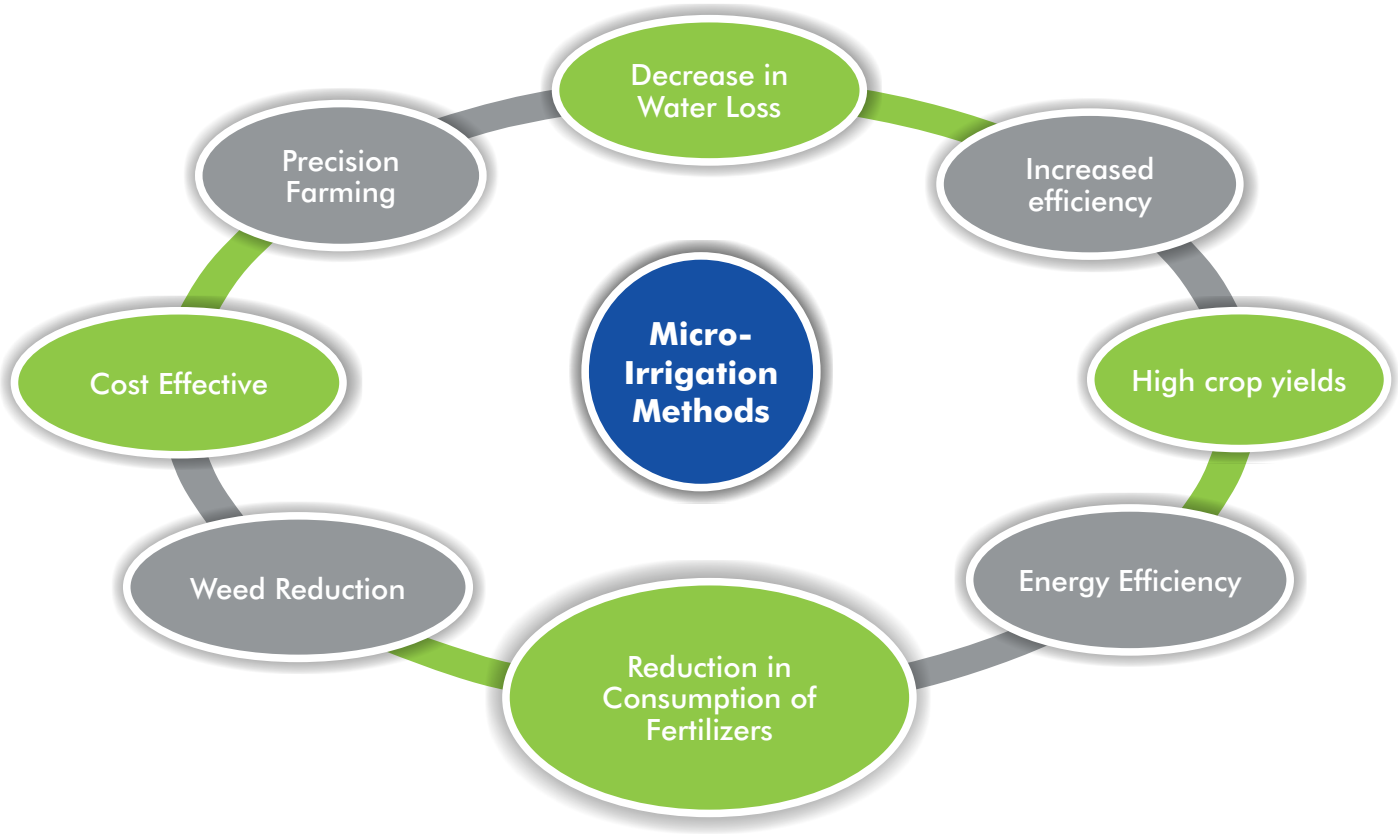
- Water falls drop by drop directly to the roots of plants and crops.
- One of the most effective and efficient method of irrigation.

Sprinkler Irrigation

- Water is piped to one or multiple central locations across the field and distributed through high pressure sprinkler.
- Reduce conveyance loss of water, due to central allocation of sprinklers.

The micro-irrigation methods such as dripper, sprinkler, etc are largely benefiting the Indian agricultural growth as they ensure 50%-90% water use efficiency at the farm

Advantages of micro irrigation



But still, its scalability in India depends on the financial assistance from the government, under the specialized schemes for water-intensive crops and water-scarce areas. The effective utilization of various sources of water can change the course over time and provide sustainable growth to Indian agriculture with effective water management.

The rising population in India and its continuous increasing demand for food grains due to upgrades in economic and living standards are bringing opportunities to enhance crop productivity. But India's climate needs artificial sourcing of water for crops and plants through various irrigation methods as due to rising temperature across the globe the distribution of rainfall is impacted significantly. India with an 18% share of the world's population and nearly about 4% share of gross freshwater reserves of the globe is heavily dependent on irrigation facilities. But still, the demand is rising and increasing the use of fresh water for irrigation purposes. This is creating the problem of water scarcity in the various parts of the country for other necessities.

To address the issue, the government is promoting the micro-irrigation methods under PMKSY and trying to promote a cost-effective water-saving irrigation technology through subsidies and other financial assistance. The allocation is impacting the farm productivity at large along with enhancing the coverage of the scheme at the corners of the country with an effective implementation plan. The Ministry of Agriculture and Farmers Welfare through the implementation of the Per Drop More Crop campaign under PMKSY parallelly works on the adaption of water conservation techniques at the farm level.

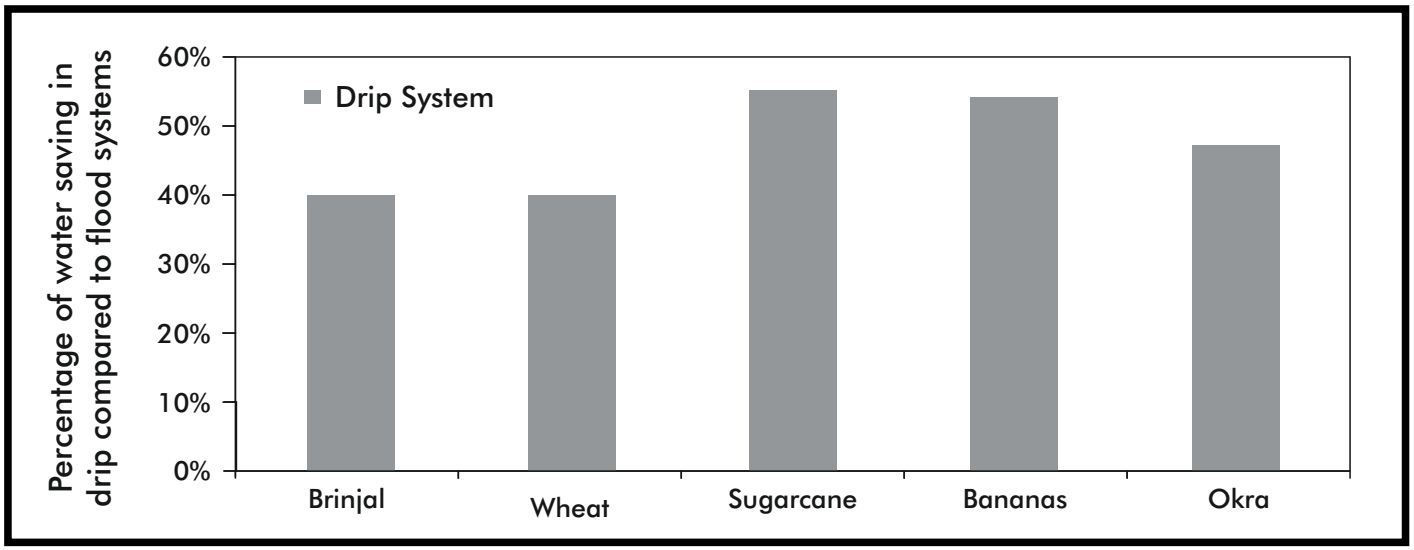
Government financial assistance and coverage under Per Drop, More Crop

Year	Released (Rs. In Crore)	Achievement (Coverage of Micro Irrigation) (Lakh Hectares)
2017-18	2819.49	10.48
2018-19	2818.38	11.58
2019-20	2700.01	11.72

Source: https://pib.gov.in/PressReleasePage.aspx?PRID=1658110

In this regard, to date, more than 138 lakh hectares of the area have been covered under micro-irrigation techniques and enhanced the farm level efficiency while addressing the water scarcity at large.

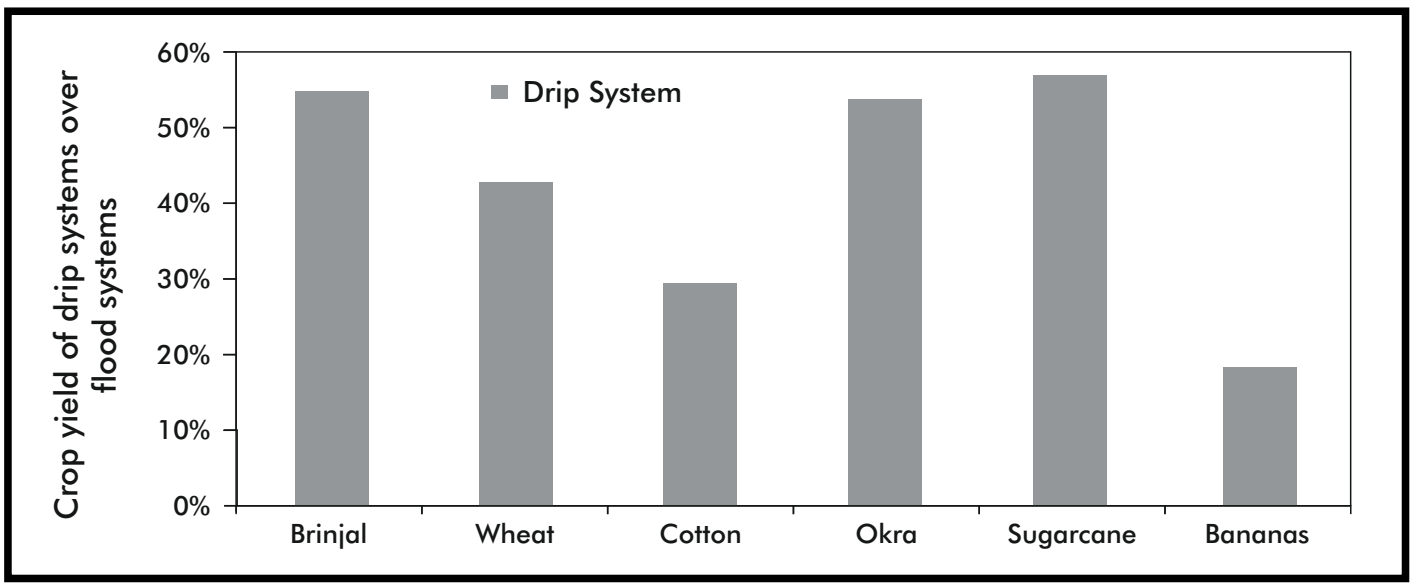
Water-saving under drip irrigation over flood systems



Source: https://www.currentscience.ac.in/Volumes/122/06/0664.pdf

The technique not only saves the water but also enhances and increases the crop yields significantly. This also helps in increasing the farmer's income and addressing the challenges of food security for such a huge population.

Excess crop yield under drip irrigation over flood systems



Source: https://www.currentscience.ac.in/Volumes/122/06/0664.pdf

Here, one of the major concerns is the rising gap between the irrigation potential and its actual use by farmers across the country. The uneven distribution of surface water and uneven groundwater level especially in urban parts of the country is significant. It impacts the irrigation system at large and creates evil impacts on the environment such as frequent droughts and floods in the various parts of the country.

4. Opportunities, Strategic Issues and Challenges

Water is a scarce resource and irrigation depends completely on it. Thus this utilization raises many concerns regarding the availability of water for other purposes. Along with this, the problem of inefficient use of water for irrigation purposes by the farmer community through surface or flood irrigation in place of micro irrigation methods is posing a major threat to climate change.

Categorization of threats

Social	Inequitable Allocation of Water Resources, Rehabilitation, Resettlement of People living on the banks of river, etc
Environmental	Floods, Droughts, River Bank Erosion, Degradation in Surface Water and Ground Water Quality, etc
Economic	Low Water Rates, Operational and Maintenance Expenditure, etc
Others	Food Scarcity, Inadequate availability of Safe Drinking Water, Virtual Monopoly of Central/ State Governments, etc

All these potential concerns, present lots of opportunities in the irrigation sector for its stakeholders right from improving the water use efficiency and increasing the crop productivity at large. In this regard, some basic techniques such as identifying the critical period of crop growth, identification of water use efficiency concerning crop life cycle and duration, continuous availability of irrigation water, etc can improve the farming system as a whole.

But in a diverse country like India, adopting a sustainable and efficient micro-irrigation system is a big challenge even after providing financial assistance and government support. Some of

Obstacles inconverting to new irrigation techniques

- Concentration of the techniques only in some states
- Ineffective implementation of schemes at various states
- Delay in Financial Reimbursement and Subsidies
- Absence of Real Time Monitoring
- Unavailability of Power
- High Expenses

Besides jeoparding the productivity of food crops and solving the problem of food security, unscientific methods of irrigation can create major ill impacts on the environment, soil, etc. Thus the government, farmers, and other stakeholders need to mitigate these challenges for the well-being of one and all including organisms, availability/quality of water, farmers, etc.

Steps for quick adaptation

- Type and Location of Irrigation Projects must be chosen prudently, so that impacts can be minimized
- Development of small scale Irrigation System
- Using the Micro-Irrigation and Watershed Management methods to addresses the risks of Water logging, erosion, etc
- Adequate Treatment and utilization of Waste Water
- Channelize the flood flows and conservation of water at Farm level to maintain the adequate water supply.

Thus, the continuous hand holding of specialized organizations like the Indian Council of Agricultural Research (ICAR), and the Central Water Commission (CWC) is essential for the adoption of scientifically beneficial methods of irrigation and keeping a check on these impacts. This can also help in addressing the potential of the Indian irrigation sector in terms of using water sensors, measurement of soil moisture, etc, and generating high-yield crops to make Indian agriculture competitive enough in the global agriculture market.

The government of India aggressively working on mobilizing the financial resources to increase the coverage under the micro-irrigation methods. For this purpose, a Micro irrigation Fund (MIF) has also been created under the National Bank for Agriculture and Rural Development (NABARD) to develop special innovative programs and motivate Indian farmers to adopt micro-irrigation systems on their farms.

Besides this, under PMKSY the central government is bearing the major funding share. The state governments will receive a share of funds based on district and state-level irrigation plans created by them.

Share of funding under the irrigation scheme

S. No.	Funding Agency	In the North-Eastern States (Funding Share in %)	Other States (Funding Share in %)
1	Central Government	90	75
2	State Government	10	25

Based on the expanding coverage and effective implementation, the extension of the PMKSY scheme for 2021-26 with the allocation of a budgetary outlay of Rs 93,068 crore has been approved. The allocation will mobilize the resources for the development of micro-irrigation facilities across the Indian states. The Accelerated Irrigation Benefit Program (AIBP) along with the Har Khet ko Paani campaign and Watershed Development Components are also extended for the same duration so that it can create a cumulative impact.

But to cater to the rising need for irrigation for Indian farmlands and address the related issues, it is important to take along the private players and utilize their expertise and financial resources also. In this scenario, the PPP model with a detailed comprehensive framework can make the best way forward, where financing, innovation, technology up-gradation, operation, and maintenance will play the key role and counter major concerns. This will upgrade the Indian Irrigation sector to the new standards and bring it to par with global best practices.

Characteristics of Creating PPP Model for the Indian Irrigation Sector

Long term contractual agreement	• Generally long-term contracts with a private sector entity; • Only one agreement with a private partner, who in turn signs contracts with designers, builders, and service providers; • Generally implemented through an SPV.
Optimal risk allocation	• Significant level of risk transfer to the private entity over the life of contract; • Risks are allocated to the party that is best able to manage them.
Focus on output specifications	• The public sector defines only the basic standards of the service it requires, not the means by which those services are delivered; • This provides the private party with an opportunity to innovate on how to meet the specified standards; • It also allows scope for the private partner's skills and knowledge to enhance the services provided to the public.
Performance linked payments	• Payments to the service provider are generally linked to performance over the contract life; • A penalty is applicable in the case of non-performance of contracted services.
Whole life costing	• Inclusion of an O&M component ensures that the private partner focuses on the whole life cycle cost of the projects and not just on the upfront capital costs; • The adoption of a whole life cycle costing approach encourages efficient design, which may reduce operating costs.
Performance linked payments	• Greater scope for innovative financing. • Greater financial accountability and support from the government in the form of subsidies, etc.

Source: https://www.adb.org/sites/default/files/publication/30329/ppp-irrigation-drainage-sector-india.pdf

Thus, over time to keep a check on water demand for irrigation purposes and effectively address the issues related to water scarcity, the public and private players both should work in harmony. It will enhance the status of irrigation and bring positive changes in all the aspects of agriculture and water resource management in the country.

The government of India keeps the long-term benefits in the view to expand the cultivable land under the assured irrigation coverage areas. For this, the restoration of water bodies, increase in the storage capacity of water tanks, improvement in catchment areas, etc are taking place under PMKSY.

Along with this, the Ministry of Jal Shakti has started the census of water bodies under the centrally sponsored "Irrigation Census" to keep a continuous check on their status. The process will maintain a national register for the water bodies with important specifications such as size, use, encroachment condition, storage capacity, etc with the reference year of 2017-18.

The major programs and campaigns which in reality shaping up the success of the irrigation sector in India with increasing coverage and enhancing farm productivity are as under:

- **Pradhan Mantri Krishi SinchayeeYojna (PMKSY)**

  The flagship irrigation scheme of the Ministry of Agriculture & Farmer's Welfare, Government of India was launched in 2015. The scheme has multiple components such as Har Khet ko Paani, Per Drop More Crop, Accelerated Irrigation Benefit Program, and Watershed Development. This was designed to increase the irrigation potential of the country through the creation and restoration of water resources at each level and strengthen the distribution network to enhance the potential and efficiency of water use. It is also designed to benefit groundwater management across the Indian states sustainably.

- **Micro Irrigation Fund scheme**

  The fund was created by the Government of India in 2019 under NABARD with Rs 5000 crore corpus to provide financial assistance to Indian states in form of interest subvention loans and expand the coverage of micro-irrigation facilities.

- **Ken Betwa Interlinking Project**

  The project is estimated to provide irrigation benefits to the area of around 6,35,661 hectares on annual basis in the states of Madhya Pradesh and Uttar Pradesh. Under this river-linking project, the surplus water of Ken Basin has been diverted to the water deficit Betwa Basin with the central government's 90% financial support. The project is expected to benefit the drought-prone areas of the two states and developed to create the supporting infrastructure during 2019-2025. The project is also expected to generate 78MW power for the states.

Therefore, it is evident that irrigation in India has been addressed under a comprehensive and long-term policy framework in the last few years. Through this, the government is developing an ecosystem to create, restore and nurture the water resources in the country. It will encourage the intelligent use of water for the purpose while effectively addressing the leakages over time.

7. Conclusion

The future of agriculture across the globe is dependent on the adoption of precision farming and the efficient use of irrigation techniques. These have the power to reduce the wastage of valuable natural resources like water, soil, etc. In this regard, the micro irrigation methods can work as a foundation and make the Indian irrigation sector more productive, attractive, and sustainable for the stakeholders. This will enhance the profitability and yield of agricultural output. The mass-level campaigns such as "Per Drop More Crop" can create an everlasting impact on the Indian irrigation sector if used with the right technology and effective awareness strategy.

Besides this, the long processing time, administrative delays, and red tape are some of the real hurdles to the success of such programs on the ground. But the continuous efforts by the government of India are encouraging the adaption of sustainable best practices in the irrigation sector and help to achieve cost-effectivity and water use efficiency.

Thus the continuous push and increasing awareness will enhance the water productivity for irrigation purpose and plays an important role in the economic growth of the country. The process becomes more effective as the water conservation mechanism is included in the policy itself and is getting implemented at the farm level. This is going to change the scenario of water scarcity and agriculture productivity in India in near future and make the way for sustainable use of fresh water for irrigation purposes.

8. References

1. http://www.cwc.gov.in/imo/home
2. https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1795499
3. https://agricoop.nic.in/en/ministry-major-schemes
4. http://jalshakti-dowr.gov.in/
5. https://www.currentscience.ac.in/Volumes/122/06/0664.pdf
6. https://www.downtoearth.org.in/news/agriculture/growing-gap-in-irrigation-potential-and-usage-major-challenge-66580
7. https://pib.gov.in/PressReleasePage.aspx?PRID=1658110
8. https://pib.gov.in/Pressreleaseshare.aspx?PRID=1778889
9. https://www.investindia.gov.in/sector/agriculture-forestry
10. https://www.india.gov.in/topics/agriculture
11. https://icar.org.in/
12. https://www.adb.org/sites/default/files/publication/30329/ppp-irrigation-drainage-sector-india.pdf
13. https://indiainvestmentgrid.gov.in/sectors/water-and-sanitation/irrigation
14. https://www.insightsonindia.com/agriculture/different-types-of-irrigation-and-irrigation-systems-storage/sources-of-irrigation/
15. https://pmksy.gov.in/microirrigation/index.aspx
16. https://pib.gov.in/PressReleasePage.aspx?PRID=1805815
17. https://pmksymowr.nic.in/aibpmis/Manual/Paper%20on%20IRRIGATION%20GROWTH%20IN%20INDIA.pdf
18. https://pib.gov.in/PressReleasePage.aspx?PRID=1695228
19. https://pib.gov.in/PressReleasePage.aspx?PRID=1707519
20. https://www.nabard.org/content1.aspx?id=1720&catid=8&mid=8
21. https://krishi.icar.gov.in/jspui/bitstream/123456789/34362/1/irrigation_rajni_preprint.pdf
22. https://niti.gov.in/planningcommission.gov.in/docs/plans/stateplan/sdr_maha/ch-4-14-02-05.pdf
23. https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1781721
24. https://publications.iwmi.org/pdf/H042683.pdf
25. https://pib.gov.in/PressReleasePage.aspx?PRID=1793814
26. https://pib.gov.in/PressReleasePage.aspx?PRID=1800717

AG Group

AG was established in the year 1998. In the due course of time AG has become multi-functional, multi-disciplinary organization offering a wide range of consultancy services to multiple sectors for implementation of projects under one roof from "Concept to Commissioning" AG shareholders has track record in the development of mega projects in country & overseas in field of sports, hospitality, tourism, flood management, turf farms, F&B, real estate, fashion & clothing, import & exports, chemical & fertilizers.

The integration and coordination of our in-house experts delivers the pragmatic, valued solutions expected in the markets of today. Quality and Service delivery are key elements of AG Group corporate philosophy and are upheld by a professional management team. The highly motivated, experienced and multi-disciplined team, plans, develop and implement that meet, and often exceed client expectations. We can synergies our experience with your projects to make it a success.

Disclaimer

The documentation created is by using information available on public domain as general in nature. It does not address to any particular situation or source. However, the information received from these sources is believed to be reliable. This information might be partially amended and it's also subject to revision.

A G Horizon Pvt. Ltd. does not make any warranties, expressed or implied, as to the accuracy of such information. We do not accept any liability whatsoever, for any direct of consequential loss arising from this document or its contents.

Contact Details

+91-11- 45356553, 54
+91-9810046249
info@aggrp.in
www.aggrp.in
★ New Delhi ★ Mumbai ★ Hyderabad ★ Imphal