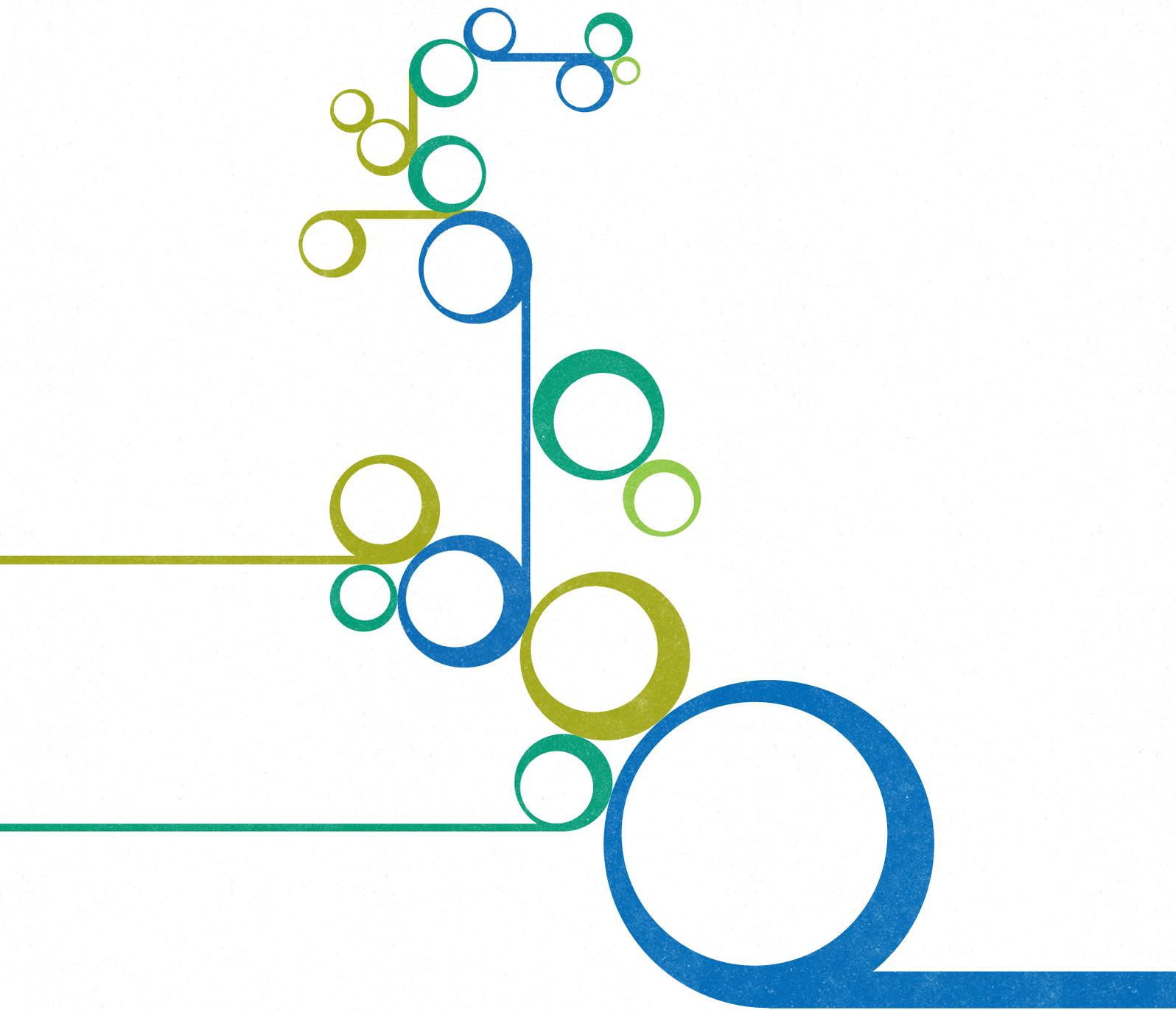


Accelerating growth of Indian agriculture: Micro irrigation an efficient solution

Strategy paper - Future prospects of micro irrigation in India







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Accelerating growth of Indian agriculture: Micro irrigation an efficient solution

Strategy paper - Future prospects of micro irrigation in India

डॉ० संजीव कुमार बालियान
DR. SANJEEV KUMAR BALYAN



सत्यमेव जयते

कृषि एवं किसान कल्याण राज्य मंत्री
भारत सरकार
Minister of State for Agriculture
and Farmers Welfare
Government of India

- 9 FEB 2016

MESSAGE

India, being primarily an agrarian economy, is grappling with Water scarcity issues since the country needs every drop of Water for sustaining its agriculture sector and increasing farm production and productivity. Our government is, therefore, committed to address the issues of conserving and judiciously using the available Water resources with the help of technology, particularly in the field of agriculture with launching a flagship Scheme “Pradhan Mantri Krishi Sinchai Yojna”, among other policy measures.

In this light, the publication of the “Strategy Paper – Future Prospects of Micro Irrigation in India aligned with Government’s Vision” by Irrigation Association of India (IAI) and FICCI is highly relevant, praise worthy and indeed in line with the policy of the government to not only facilitate the accrual of the benefits of the technology to the farmers of the country but also get more out of the available resources. I am sure all those who are concerned with leveraging technology for effective use of Water, policy makers and academics alike, will find this Study highly useful.

My heartiest congratulations to IAI and FICCI on this comprehensive effort and best wishes for coming up with more such initiatives in future.


(Dr. Sanjeev Kumar Balyan)

मोहनभाई कुंडारीया
MOHANBHAI KUNDARIYA



कृषि एवं किसान कल्याण राज्य मंत्री
भारत सरकार
कृषि भवन, नई दिल्ली-110001
MINISTER OF STATE FOR AGRICULTURE
& FARMERS WELFARE
GOVERNMENT OF INDIA
KRISHI BHAWAN, NEW DELHI 110001

February 10, 2016

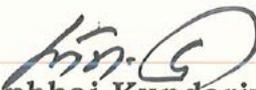
Message

Water is one of the most precious natural resources and its rapid depletion has remained a cause of concern for Governments worldwide. Water scarcity has posed a great challenge before us as our agri-prosperity depends on timely and adequate irrigation. To support millions of Small and marginal farmers, our Government has focused on agricultural irrigation. Considering the significance of irrigation for production and productivity in agriculture, the Government under the able leadership of our Prime Minister has launched the 'Pradhan Mantri Krishi Sinchai Yojna'.

At this juncture of heightened focus on agri-irrigation, industry's role becomes vital for addressing issues at hand. I am happy to note that Irrigation Association of India and FICCI have taken the lead by coming up with a strategy paper-Future Prospects of Micro Irrigation in India aligned with Government's Vision.

The paper is timely which consolidates all relevant facts & figures and also contains a wealth of 'analysed information'. This is likely to be useful for the Government functionaries for understanding issues scientifically and for shaping the policy contours. This would also be a reliable material for academics and scholars and a ready reckoner for the irrigation industry itself.

IAI and FICCI both deserve appreciation. I congratulate them and wish a grand success of this venture.


(Mohanbhai Kundariya)

S.K. PATTANAYAK
SECRETARY



भारत सरकार
कृषि एवं किसान कल्याण मंत्रालय
कृषि, सहकारिता एवं किसान कल्याण विभाग
Government of India
Ministry of Agriculture & Farmers Welfare
Department of Agriculture, Cooperation
& Farmers Welfare

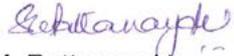
MESSAGE

The adoption of micro-irrigation technology in our country has helped in achieving higher cropping and irrigation intensity in recent years and has made a significant impact on resource saving, cultivation cost, crop yield and farm productivity. This technology has received considerable attention from policymakers and Government for its perceived ability to contribute significantly towards agricultural productivity and economic growth.

Micro-irrigation, an essential technological intervention for saving and conserving water, finds special importance in Hon'ble Prime Minister's flagship scheme '**Pradhan Mantri Krishi Sinchai Yojna**' which has been launched with the aim of extending irrigation cover – "**Har Khet ko Pani**" – and improving water use efficiency – "**Per Drop More Crop**" – in a focused manner and concentrating on source creation, distribution, management, field application and extension activities in the area of water management.

In this context, the initiative of Irrigation Association of India (IAI) and Federation of Indian Chambers of Commerce & Industry (FICCI) to come up with a Strategy Paper on "**Future Prospects of Micro Irrigation in India aligned with Government's Vision**" is highly significant and provides us with important inputs for policy making in agriculture sector.

IAI and FICCI must be congratulated for this substantive effort, particularly at a time when the Government is focusing on leveraging technology to harness all our water resources to help the distraught farming community reeling under severe water scarcity.


(S.K. Pattanayak)

Date: May 19, 2016

Preface



Primal Oswal
President
Irrigation Association of India

I feel privileged to present on these pages an important Strategy Paper, which is a combined initiative of IAI – the Irrigation Industry’s Voice for Spread of micro irrigation, FICCI – the Industry’s Voice for Policy Change and Grant Thornton, an internationally renowned consulting and advisory organisation.

Despite Agriculture being the lifeline of India, it is beset with water scarcity, making it hardly remunerative and uncertain. The present government has therefore emphasised heavily on the correlation of water management with farm productivity, as indicated in Hon’ble Prime Minister’s slogan ‘Per Drop More Crop’ and his launching a flagship Scheme ‘Pradhan Mantri Krishi Sinchai Yojna’ (PMKSY) with the stated intent of ‘Her Khet Ko Pani’.

This study, starts with a reality-check on the current status of micro irrigation in the country including the technologies available. It then, based on detailed deliberations with all stake holders viz. Government of India, State Governments, IAI; distils their decades of experience in implementing such programs, to finally suggest the roadmap for efficient, effective and successful implementation to the Government. The study also deals with critical challenges faced by successive government against their various initiatives and analyses the reasons for the low penetration of merely 8% of the total potential.

I am pleased to advise that the study has come up with game changing ideas, which are in line with this government’s focus to bring about a change in the lives of the millions of farmers and to bring about Acche Din in their lives.

I also take this opportunity to thank FICCI for standing alongside us and making this publication a reality and Grant Thornton for giving shape to vision of IAI.



Foreword



Harshavardhan Neotia

President
Federation of Indian Chambers
of Commerce and Industry



A Didar Singh

Secretary General
Federation of Indian Chambers of
Commerce & Industry

Water is considered as the most critical resource for sustainable agricultural development. However, the increasing population, and more erratic rainfall, is likely to reduce the water supply for agriculture. Therefore, time has come when Indian agriculture should appreciate the fact that water is a precious and limited resource and should be conserved and handled carefully in the most efficient manner, to minimize the dependence of agriculture on monsoon.

The solution lies in examining the innovative models for their contribution to higher efficiency of water usage. Micro irrigation is proved to be a one such efficient method which enables better control and monitoring of existing water which can be translated into higher water usage efficiency. Recognizing the importance of micro irrigation, the current government manifesto has talked about **Har Khet Ko Pani**. However, in spite of the sustained efforts made by central and state governments, the extent of success in adoption of Micro irrigation by farmers needs a review.

Micro irrigation is one of the priority areas for FICCI. With this background, FICCI along with Irrigation Association of India (IAI) subsequently commissioned a research study to Grant Thornton India LLP. I sincerely hope that practical suggestions given by IAI in this report will be helpful in providing actionable insights to all stakeholders for the next exciting phase of micro Irrigation - as a major driver for sustainable agriculture.

India accounts for about 17% of the world's population but only 4 percent of the world fresh water resources. With 1544 m³ per capita water availability, India is already declared as water- stressed country by international norms. Cross country comparison of water use efficiency shows that India uses 2-3 times water to produce one unit of major food crops as compared to other major agricultural countries like China, Brazil, and USA.

However, these challenges also provide opportunities to redefine the ways we have to deal with stress on limited water resources in the country. Recognizing the importance of water as a critical input to agriculture, Government of India has taken many initiatives to promote the concept of water use efficiency and realizing the goal of "Per drop more crop".

FICCI has identified agriculture as the main focus area not only because of its overriding importance to the national economy also because it is amply evident that future agribusiness growth shall largely depend on sustainable, productivity - led growth of this sector. Therefore measures to increase effective use of water at farm levels become critical. With this background FICCI initiated this strategy paper with the Irrigation Association of India (IAI) and Grant Thornton India LLP. We hope this report will be useful to stimulate new ideas and help in opening up another facet to the emergent knowledge base of the Irrigation sector.

Message



Rahul Kapur
Partner
Grant Thornton India LLP

The Indian economy is well poised to grow in the coming years. The outlook for manufacturing and service sector is positive, however, the third sector comprising the Indian economy, agriculture continues to face significant challenges. Considering the natural resources including land and water are limited and cannot be increased, there is an eminent need to address the key challenges surrounding the sector:

- Increase in yield considering the acreage under cultivation is under the severe pressure of growing population and urbanisation;
- Credit facilities to the farmers;
- Innovation in technology and mechanisation with increased penetration;
- Pre-harvest services;
- Post-harvest infrastructure.

Amongst the above, the most critical aspect being, increasing the yield for feeding the ever growing population of the country (which stands at 1.27 billion today and is estimated to rise to 1.6 billion by 2050) which will become increasingly difficult with the plummeting land holding sizes. For this purpose, irrigation plays an important and most critical role. However, it is to be noted that irrigation and livestock accounts for 91% of water withdrawal in India, which is well above the global average. Also dependence on natural water resource will impact the Indian agriculture in a big way considering India would be one of the water scarce countries by 2025.

Hence, with the looming water scarcity crisis, there is a prudent and paramount need for efficient use of the available water resources. Given its higher efficiency (on an average overall saving of irrigation water is 20-48%, fertiliser by 28.5% and energy by 30.5%) and ease of implementation within months (while the other irrigation infrastructure takes years to implement), micro irrigation systems can go a long way in addressing the issues faced by the country and the agricultural sector. Hence, micro irrigation remains the only efficient solution and a low hanging fruit for the government, industry and farmers to overcome the challenges faced by the agriculture sector.

With this background, Irrigation Association of India, FICCI and Grant Thornton India LLP are pleased to present this strategy paper. We hope this report will encourage more discussions around Government's vision for sustainable agriculture and suggest how the micro irrigation technology will play a crucial role in achieving the same.

Executive summary

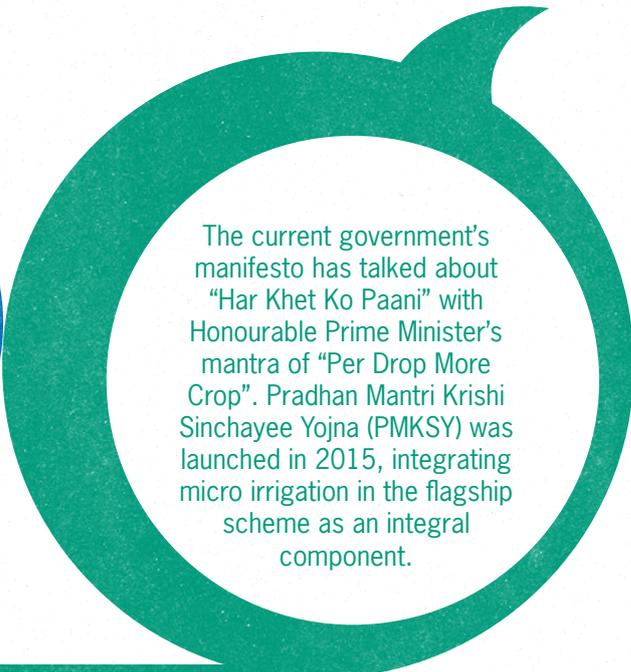
India's population stands at 1.27 bn and is estimated to rise at a steady pace to reach 1.6 bn by the year 2050. (According to the World Bank estimates). Even though food grain production has increased significantly over the years, there is a need for the production to increase even further in order to meet the ever growing demand created with this population increase. Given the fact that land and water are limited resources, this would require an improvement in the productivity of crops. Additionally, of all the economic sectors, agriculture is the one where water scarcity has greatest relevance. Agriculture accounts for approximately 70 percent of the global freshwater withdrawals and approximately 90 percent of its consumptive use. According to the UN FAO, in 2010, irrigation & livestock accounted for 91 percent of water withdrawal in India, which is well above the global average. India has 18 percent of the world's population with only 4 percent of the usable water resources and is expected to face the brunt of looming water scarcity crisis. **With the need to increase productivity while saving water, micro irrigation will play a key role for the future of Indian agriculture.**

Recognising the importance of micro irrigation, the government has taken various initiatives since 1992. The first real thrust however came in 2006, when the government launched a Centrally Sponsored Scheme (CSS) for micro irrigation. This was later upgraded to the National Mission on Micro Irrigation (NMMI) and was implemented through the year 2013-14. For the year 2014-15, NMMI was subsumed under the National Mission for Sustainable Agriculture (NMSA) and was implemented under the On Farm Water Management (OFWM) component of the scheme.

Pradhan Mantri Krishi Sinchayee Yojna (PMKSY) was launched in 2015, integrating micro irrigation in the flagship scheme as an integral component. The scheme focusses on providing an end-to-end solution to the irrigation supply chain. One key differentiator for micro irrigation is that when compared to other components of this scheme, which include creating infrastructure to bring water to farms and watershed development, micro irrigation presents a quick-win opportunity for all the stakeholders where the implementation can be seen on ground within months. **Developing infrastructure takes years while bringing area under micro irrigation is a task that only requires a few months.**



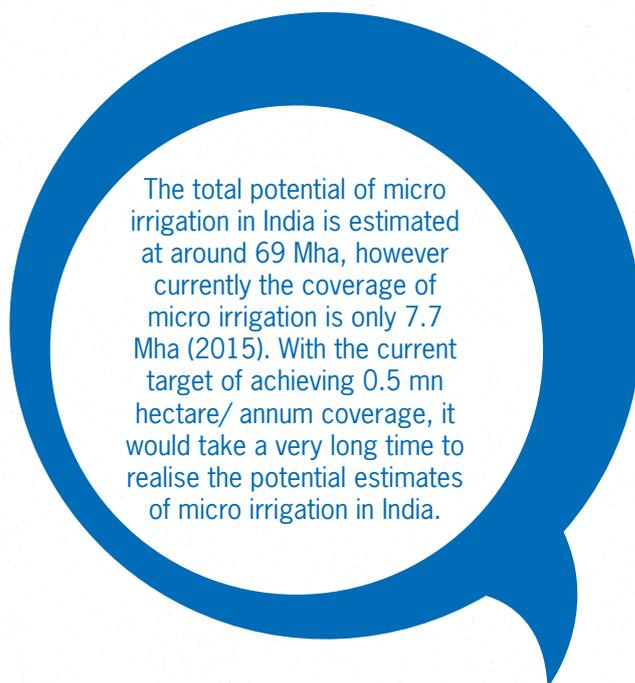
With the need to increase productivity while saving water, **micro irrigation** will play a key role for the future of Indian agriculture.



The current government's manifesto has talked about "Har Khet Ko Paani" with Honourable Prime Minister's mantra of "Per Drop More Crop". Pradhan Mantri Krishi Sinchayee Yojna (PMKSY) was launched in 2015, integrating micro irrigation in the flagship scheme as an integral component.

Apart from various schemes, there have also been large-scale projects taken up at the state level that have seen success for example Gujarat Green Revolution Company (GGRC) and Andhra Pradesh Micro Irrigation Project (APMIP). The common thread running through these are the presence of a team dedicated to promote micro irrigation and strong information technology (IT) backed operations.

Despite the stated focus on micro irrigation, the current situation on the ground shows a different picture which has led to lower adoption rates. The subsidy in last few years has been declining and the proposed subsidy under PMKSY is lower still (INR 1,075 crores in 2015-16 and INR1,111.8 crores in 2014-15). The utilisation of funds released has also reduced year-on-year pointing towards the challenges faced in implementation of these government schemes. While each government initiative in the past decade has had its own merits and shortcomings, there are a few fundamental challenges that have not yet been dealt with, which include the following:



- **Lack of focus on micro irrigation:** The years of operation of National Mission on Micro Irrigation (NMMI) showed the strongest growth of micro irrigation penetration in the recent decade. However, since the scheme was changed to a component under the National Mission for Sustainable Agriculture (NMSA), there has been a lack of focus on spreading micro irrigation in India, which is a continuing issue seen with the Pradhan Mantri Krishi Sinchayee Yojna (PMKSY).
- **Lack of dedicated team and IT-backed operations:** Tracking the installation of a micro irrigation system, step-by-step, from initiation of work order to installation and payment is still not possible in a majority of states, which is a major source of inefficiencies in the system where IT can play an important role. Also the teams that are implementing the micro-irrigation schemes in various states (with an exception of few) are not dedicated for the said implementation, hence a focused approach is missing.
- **Delay in release of guidelines/government orders, uncertainty and sporadic changes in scheme guidelines:** The lack of smoother/ longer-term guidelines pose a major challenge as evidenced by the fact that operational period of the schemes, on an average, is only 5 months where the farmers miss the utilisation of the micro irrigation system during the peak demand season.
- **Subsidy disbursement process:** Continues to be a big impediment in the growth of the industry. Unavailability of subsidy funds for installations already approved, delayed release of funds, identification of beneficiaries among others, leading to significant delays.
- **Absence of easy financing mechanisms for farmers:** Farmers face major challenges in finding financing option for the micro irrigation products and in case they do find a financing source, there are high collateral demands.

Hence, rather than looking at a business-as-usual model, there is an urgent requirement for leapfrog initiatives to achieve the vision and mission of the government. With this background, Irrigation Association of India in collaboration with FICCI and Grant Thornton India LLP has taken up this study, which focuses on bringing out the benefits of micro irrigation to the farmer as well as the government, provides a snapshot of the current situation, looks at the potential for the technology in India, analyses the regulatory environment surrounding the industry, provides insight into the on-the-ground realities of the functioning of government schemes and provides some suggestions on ways to tap the remaining potential for micro irrigation in India. This study endeavours to demonstrate how micro irrigation can be an integral part of PMKSY in achieving the vision of the Honourable Prime Minister through some proposed ‘game changers’ for the industry, including:

Quick snapshots - Benefits of micro irrigation

- a) Increase in water efficiency – 50 to 90%
- b) Energy consumption savings – 30.5%
- c) Fertiliser consumption savings – 28.5%
- d) Productivity increase,
Fruit/Crops – 42.4%
Vegetables – 52.7%
- e) Irrigation cost savings – 31.9%
- f) New crop introduction – 30.4% farmers
- g) Increase in Farmers’ income – 42%

- **JAM Trinity solution** - A new fund flow model, to improve efficiency, transparency and reduce delays in release of funds. This is a Direct Benefits Transfer (DBT) model that allows farmer with a choice of provider to go with. The subsidy is in the name of the farmer (in the form of conditional prepaid card); which is then dovetailed with benefits of financial inclusion with interest subvention, credit guarantee provisions, etc. to the farmer, while making the entire process easier through a simple IT enabled system. The third party assessment also ensures that the product a farmer receives is up to the mark and therefore, a farmer can avail its full utility. A perhaps salient, but powerful benefit of such a system is the ability to monitor progress of projects at the highest level. Since each step of the process will be updated online, the road blocks and bottlenecks can be observed in real-time basis and thus, there is high transparency and accountability. This can be taken up as “**on demand micro irrigation under PMKSY**” with initially targeting atleast 1 million hectare coverage and can be phased to ensure remaining potential been covered as the scheme matures.
- **Promoting better process management**, which entails having a dedicated team whose priority would be promoting micro irrigation at the state level. Also ensuring stronger IT capabilities, thereby a complete online tracking mechanism from installation of MI equipment to fund flow. For example usage of Geographic Information System (GIS) for geo-referencing and tagging
- **Ensuring smoother and long term guidelines** that remain in place for a significant period of time to reduce confusion and ensure steady implementation of the schemes.
- **Moderating subsidy levels in states** where penetration of micro irrigation is already above the national average and re-routing that subsidy to states with very low penetration, where the technology still needs to be promoted. It is proposed that states where micro irrigation penetration is equal or above the national average, subsidy should be capped at 50 percent and where penetration is below the national average, subsidy cap should be between 50 and 70 percent. It also needs a reform driven approach, where states that do not cap the subsidy would not be eligible for central assistance and should take the entire subsidy from state budgets.
- **Financial inclusion**, which entails providing priority sector lending status to MI industry and helping the farmer with financing for the equipment through steps such as interest subvention and credit guarantee fund, to ensure that banks are more comfortable providing funding in this industry and this can be a step in the direction of reducing the dependence on subsidy over time.
- **Providing crop focus solutions**, for example making use of micro-irrigation mandatory for water guzzling crops. This has been initiated by few states to make use of micro-irrigation mandatory for sugarcane. It can be considered to be taken up at the national level as well as for various other crops
- **Providing infrastructure status to the micro- irrigation industry** to reduce some of the operating costs for MI manufacturers and thereby, reducing the cost of the equipment for the farmer
- Others.

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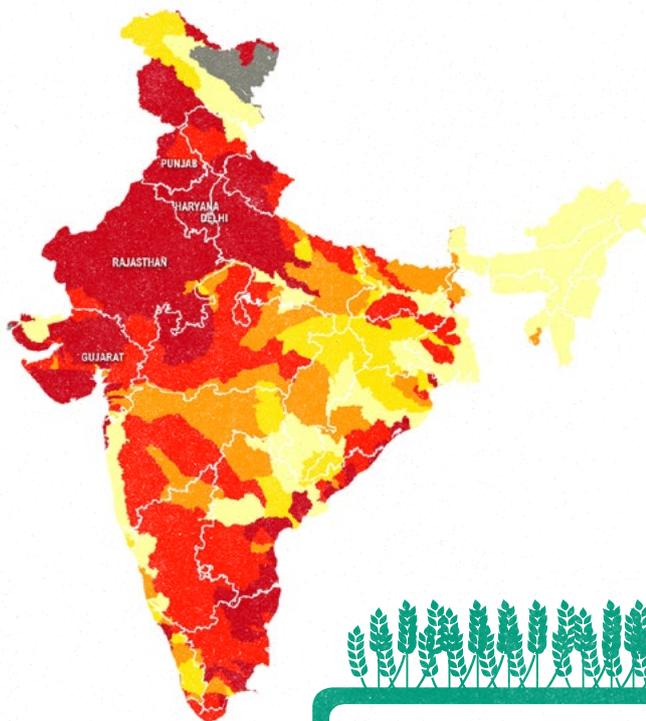


Challenges for Indian agriculture

- Agriculture sector, the largest contributor to fresh water withdrawals
- Growing population and dependence on agriculture

Challenges for Indian agriculture

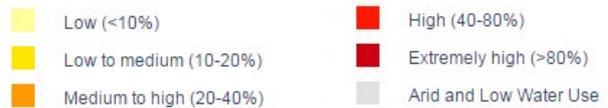
The twin challenges



54%

of India faces **high** to **Extremely high** water stress

Baseline water stress (withdrawals/available supply)



www.indiawaterpool.in
WORLD RESOURCES INSTITUTE



Agriculture is the largest consumer of water in India. It accounts for approximately **90 percent of 7,61,000 bn litres** of annual freshwater withdrawals in the country.



India's population stands at 1.27 bn and is estimated to rise at a steady pace to **1.6 bn by the year 2050**, (According to the World Bank). The population continues to grow and ensuring food security for the population is a major challenge ahead for the government

United Nations projected that nearly **3.4 bn people** would be living in 'water-scarce' countries by the year 2025 and India would be at the centre of it.

Per capita consumption of water in agriculture sector ranges from 4,913 kl to 5,800 kl per capita per year (considering 11.86 crore – 14 crore farm owners in India¹)

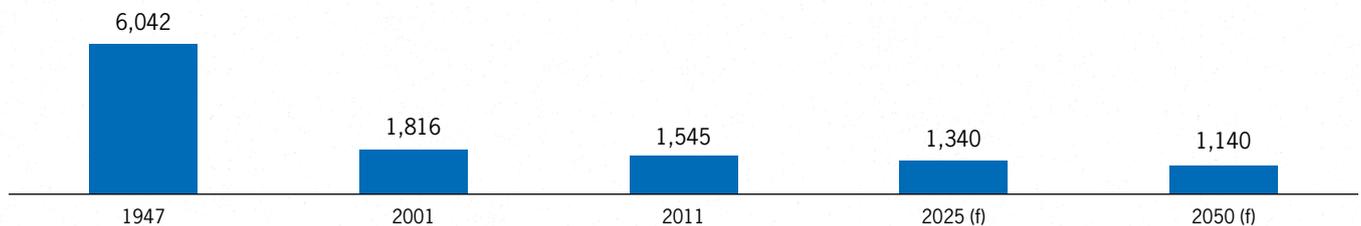
1. <http://www.hindustantimes.com/india/how-many-farmers-does-india-really-have/story-431phtct509xZSjEr6HODJ.html>, http://articles.economicstimes.indiatimes.com/2013-08-24/news/41444004_1_indian-agriculture-one-crore-farmers-farmers-capacity

Agriculture sector is the highest contributor to fresh water withdrawal

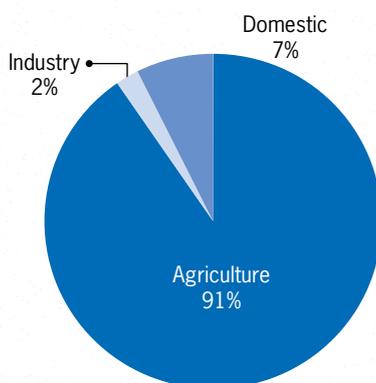
Of all the economic sectors, agriculture is the one where water scarcity has greater relevance. Agriculture accounts for approximately 70 percent of the global freshwater withdrawals and approximately 90 percent of its consumptive use. As per United Nations Food and Agriculture Organisation (UNFAO, in 2010), irrigation and livestock segments accounted for 91 percent of water withdrawal in India, which is well above the global average. Observations made on the source of water withdrawal are also alarming. About a third of the water withdrawal came from groundwater. Ground water is depleting very fast and there is no faster recharge mechanism considering it is a very long drawn process. Groundwater, if exploited from greater depth cannot be recharged by rainfall and therefore can no longer be a renewable resource. World bank estimates in 2010 showed that groundwater supported 60 percent of irrigated agriculture and 80 percent of rural and urban water supplies.

According to projections by the United Nations (UN) nearly 3.4 bn people would be living in ‘water-scarce’ countries by the year 2025. The Indian sub-continent, with its unique position in South-Asia may face the brunt of the crisis and as a result, India would be at the centre of it. India has 18 percent of the world’s population with only 4 percent of the usable water resources. 90 percent of the waste water discharged into the rivers does not meet environmental standards, while 65 percent rainwater runoff flows into the seas, which is a major wastage. These two factors also add to the impending scarcity.

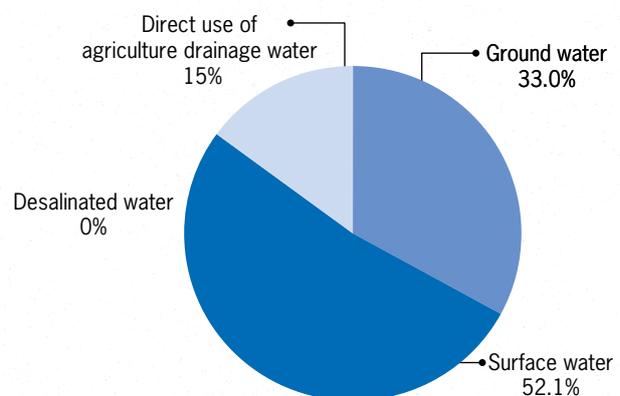
Per-capita water availability forecast (cubic meters)



Annual fresh water withdrawal by sector, 2013 (total 761 km³)



Water withdrawal by source, 2010 (total 761 km³)



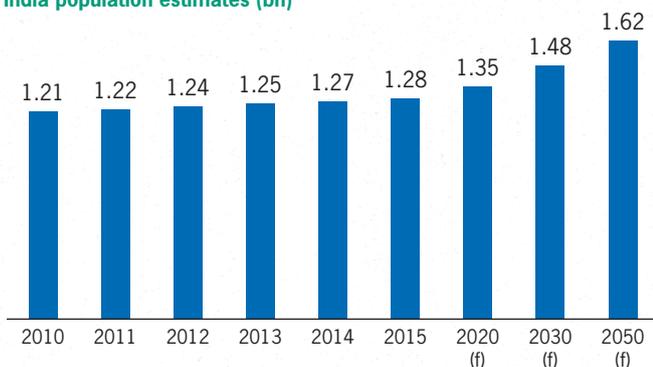
Source-UN FAO estimates, World Bank estimates

The growing population in the country depends largely on agriculture and agriculture produce

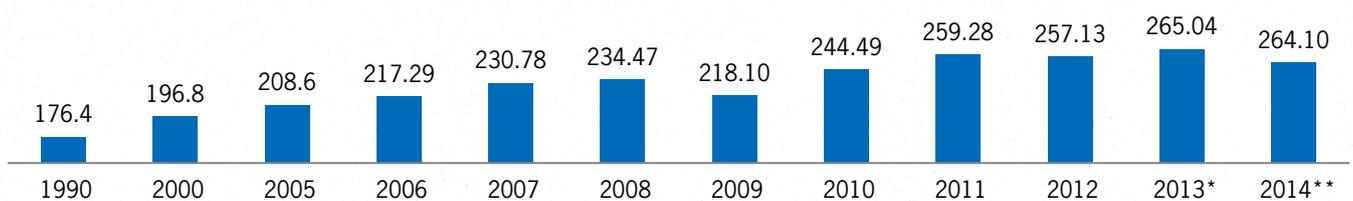
Feeding a growing population, which is expected to reach 1.6 bn by the year 2050, is going to be a major challenge ahead for Indian agriculture. Even though food grain production has increased significantly over the years, there is a need for the production to increase even further in order to meet the future demand created due to this population growth of the country. Given the fact that land is a limited resource, this would require an improvement in the productivity of crops.

Another factor, which is also subtly indicated by the varying food production numbers, is the continued reliance on rain-water for cultivation. In 2014-15, food production declined to 251.1 mt from 265.04 mt the previous year. The reason behind the decline was the 12 percent monsoon rainfall deficit. Therefore, ensuring adequate water supply to the farms is essential. These conditions, in addition to the looming water scarcity, make the need for a prudent and efficient use of the land and water resources paramount. Agriculture therefore needs more efficient irrigation methods. Given its higher efficiency, micro irrigation systems can go a long way in addressing the issues faced by the country and the agricultural sector in the country.

India population estimates (bn)



India food grain production (mn tons (mt))



Note 1. Final estimate

Note 2. First Advance Estimates of Production of Food-grains for 2015-16

Source-World bank projections; Agricultural Statistics Division, Directorate of Economics & Statistics Department of Agriculture, Cooperation & Farmers Welfare



Micro irrigation – The solution to the challenges faced by Indian agriculture

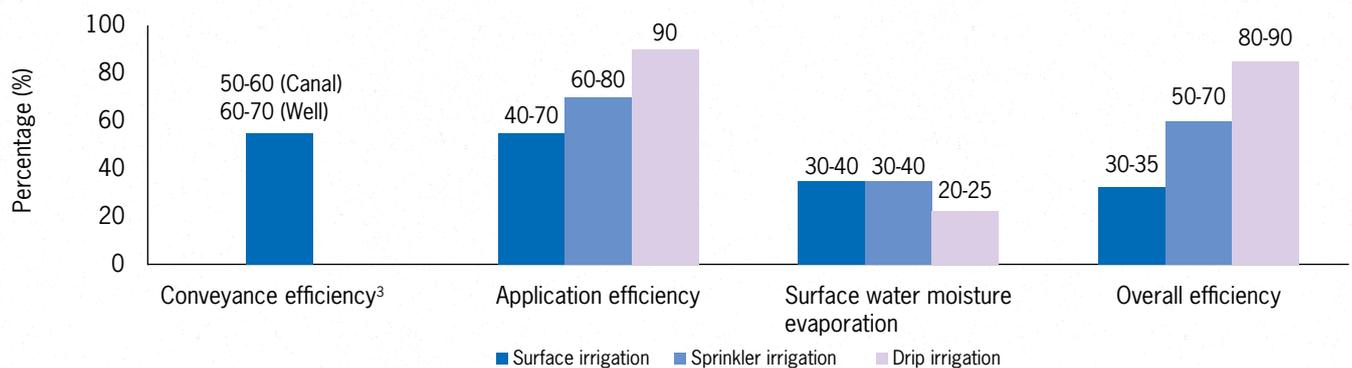
- Efficient water use
- Impact of micro irrigation: Government savings of input subsidies
- Impact of micro irrigation: Input savings and productivity increase
- Impact of micro irrigation: Overall benefit to the farmer

“Micro irrigation” - The solution

Micro irrigation: Efficient water use

With usage of micro irrigation systems, conveyance loss is minimal. Evaporation, runoff and deep percolation are also reduced by using micro irrigation methods. Another water saving advantage is that water source with limited flow rates such as small water wells can be used. Micro irrigation provides significantly higher water usage efficiency due to proximity and focused application

Water usage efficiency under various irrigation systems



Note 3. For open channels only

Efficient water use leads to additional benefits such as increase in the area under irrigation as well as more usage of marginal/degraded land

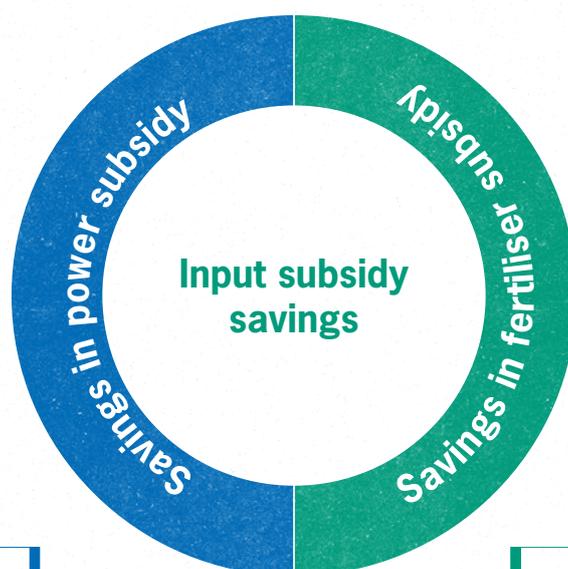
- In a survey done for the Government of India (consisting of 5,892 beneficiaries of the National Mission on Micro Irrigation (NMMI) across 13 states) an increase in the area under irrigation of 8.41 percent after the adoption of the micro irrigation system was seen.
- In the same survey, the sampled farmers indicated that 845.50 hectares of waste/degraded land was not being used for cultivation. However, after the adoption of the micro irrigation system, the farmers were able to bring 519.43 hectares of such land under cultivation.

Source-Sivanappan (1997), Researchgate.net report; retrieved September 03, 2015; National Mission on Micro Irrigation Impact study prepared for the Government of India, June 2014, retrieved August 31, 2015

Impact of micro irrigation: Government savings of input subsidies (1/3)

Drip Irrigation coverage	3.37 mha	Theoretical potential for micro irrigation in India	69.5 mha
Sprinkler Irrigation coverage	4.36 mha	Untapped potential	61.8 mha

Agriculture accounts for 20-25 percent electricity sold in India. In 2013-14, this consumption stood at 166,712 mn kWh and government provided INR 66,988 crore (US\$ 10.98 bn) in subsidies. On an average, use of micro-irrigation techniques can improve power efficiency by 30.5 percent, although this varies across states.



Subsidy on fertilisers to the agriculture sector in India has been increasing and for the year 2013-14, it stood at INR 71,251 crore (US\$ 11.68 bn). Owing to more judicious use of fertiliser as a result of more careful application of water, micro irrigation can improve fertiliser consumption efficiency by 28.5 percent on an average.

Potential savings by tapping the remaining theoretical potential = INR 10,400 crore (US\$ 1.7 bn)

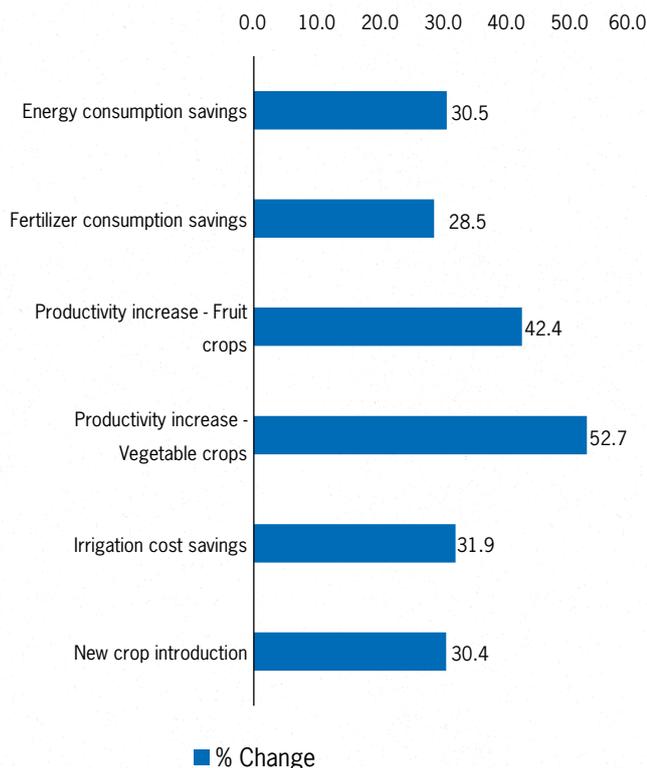
Potential savings by tapping the remaining theoretical potential = INR 4,427 crore (US\$ 725.6 mn)

Note: Methodology used for above calculations is detailed in the appendix; INR to US\$ conversion done at 1 US\$ = 61.01 INR, the rate in March, 2014 as published by the Ministry of Finance

Source – India Agri Stat; Mission for Integrated Development of Horticulture (MIDH); Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India; National Mission on Micro Irrigation Impact study prepared for the Government of India, June 2014, retrieved August 31, 2015; Grant Thornton Analysis

Impact of micro irrigation: Input savings and productivity increase (2/3)

Micro irrigation can help improve all facets of the production process, from reduction in input consumption to increased productivity of the crop. It has even given farmers the flexibility to introduce new crops on their lands.



- Due to the smaller power units required as a result of lower water requirement and thus lower number of hours of irrigation, very significant electricity savings, on average 30.5 percent, have been estimated.
- Direct fertiliser application to the root increases the efficiency of usage, resulting in an average reduction in consumption by 28.5 percent
- As a result of the controlled and targeted application of water, soil moisture can be maintained at optimum levels. This leads to an increase in the productivity of the crops. Across various studies, it has been found that the adoption of micro irrigation systems helped boost the yield of fruit as well as vegetable crops. An average increase of 42.3 percent in the productivity of fruit crops and 52.8 percent increase in the productivity of vegetable crops was seen. This in turn helps increase incomes of the farmers
- As a result of the improved water use efficiency through judicious use in micro irrigation systems, the overall irrigation cost has been shown to be brought down. An average reduction of 31.9 percent was seen.
- Farmers also showed an increase in the new crops introduced on the farms as a direct result of adoption of micro irrigation. On average, 30.4 percent farmers introduced new crops

Note: The percent change figures are according to a survey of 5,892 beneficiaries of NMMI across 13 states; Survey conducted as part of the NMMI impact study. State-wise break down of these figures is available in the appendix

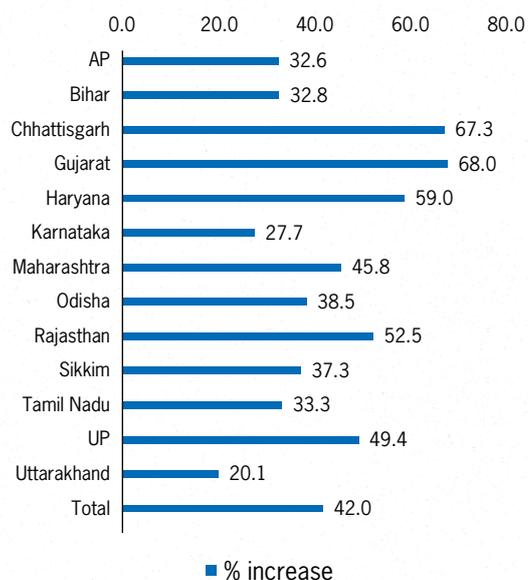
Source-National Mission on Micro Irrigation Impact study prepared for the Government of India, June 2014, retrieved August 31, 2015



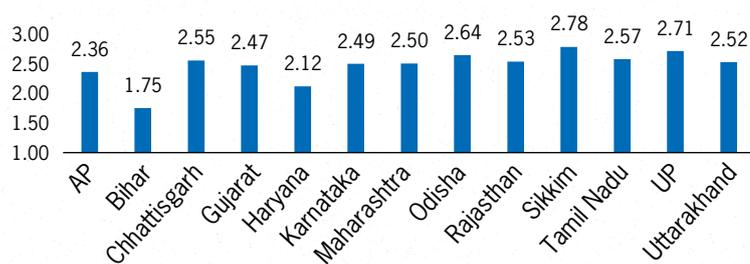
Impact of micro irrigation: Overall benefit to the farmer (3/3)

A look at the average benefit-to-cost ratio for the crops grown in each state shows that the benefits to the farmer outweigh the costs of installation in every case. The income of the farmer also shows an average of 42percent increase⁵

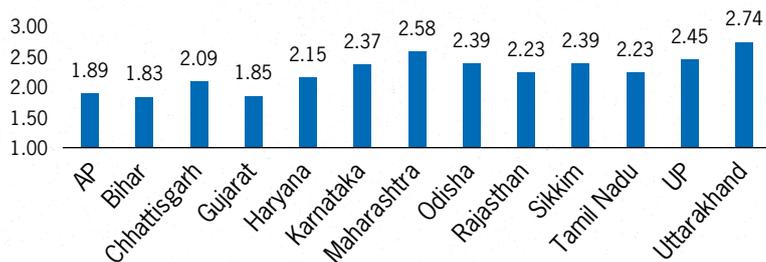
Increase in farmer's income



Benefit: Cost ratio, fruit crops



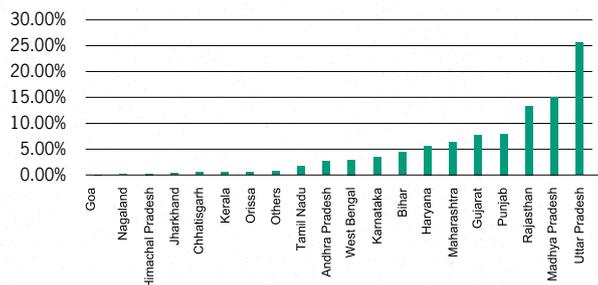
Benefit: Cost ratio, vegetable crops



Micro irrigation - A relief for drought prone areas

Indian agriculture which is heavily dependent on monsoon as source of water for agricultural activities, crumbles under the situation where there is shortage or failure of monsoon in that particular year. This results in farmers distress and below average crop yields. Particularly in the drought prone areas/ parts of Maharashtra, Karnataka, Andhra Pradesh, Odisha, Gujarat, Madhya Pradesh, Karnataka, and Rajasthan among others there is a visible impact. It may be noted that states like Maharashtra, Rajasthan, Gujarat, Haryana, Bihar, Karnataka and Andhra Pradesh are among the leading states having high potential of Micro Irrigation in India. Hence, Micro irrigation can not only save water, however this technology can come as a major relief for drought prone areas of the country with proper planning and implementation.

State wise potential of micro irrigation in India (% share)



The farmer in all the surveyed cases is far better off with micro irrigation systems and the **Return on Investment (ROI)** of installation is between just 1.5 to 2.5 years.



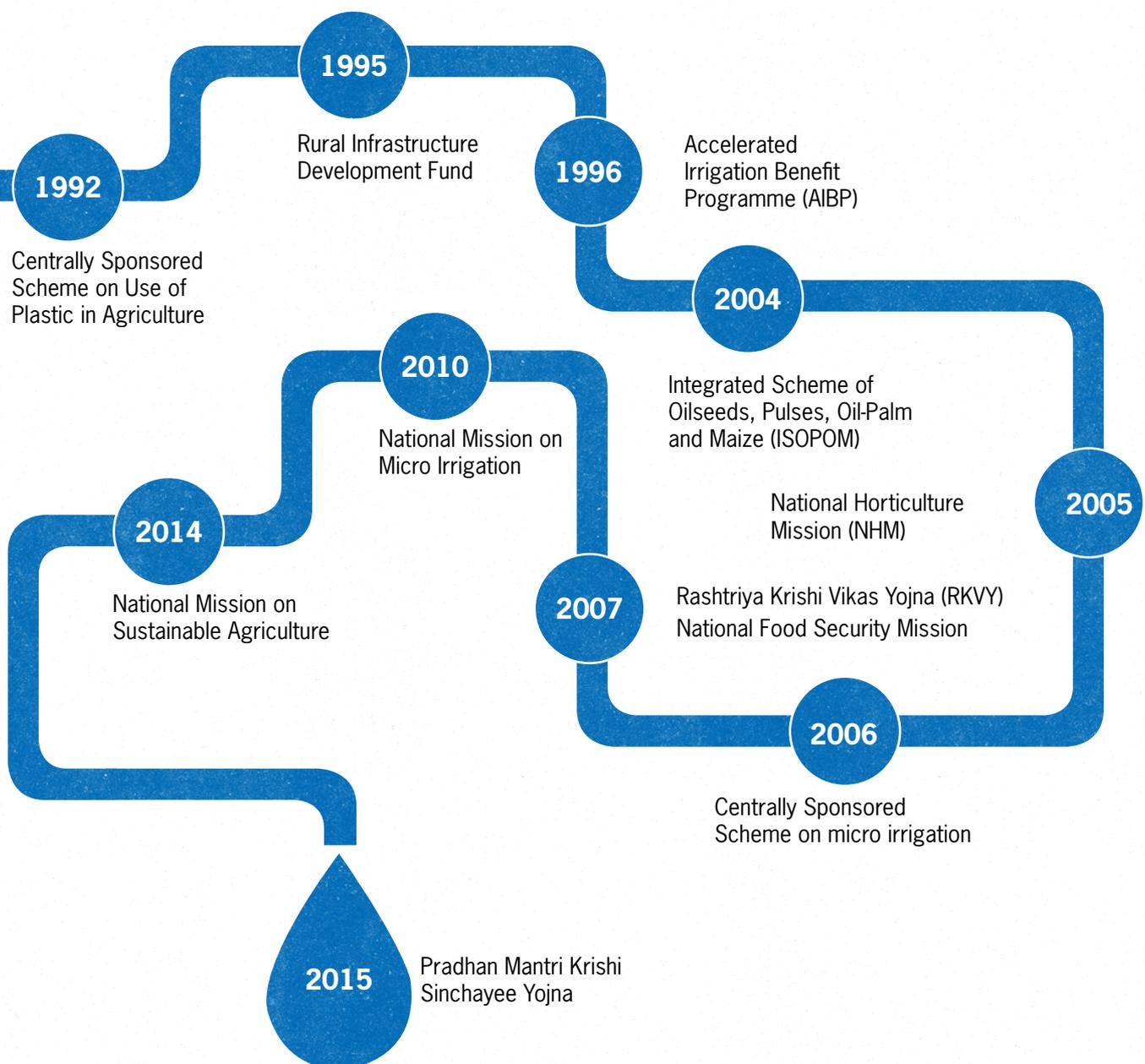
Note 5: According to a survey of 5,892 beneficiaries of NMMI across 13 states; Survey conducted as part of the NMMI impact study Source-National Mission on Micro Irrigation Impact study prepared for the Government of India, June 2014, retrieved August 31, 2015

Micro irrigation in India – Current status and reality check

- Journey so far
- Promising “ACCHE DIN” to the Indian farmer
- Reality check
- Current status and growth in India
- State wise micro irrigation penetration
- Potential estimates for micro irrigation in India

Micro irrigation in India – Current status and reality check

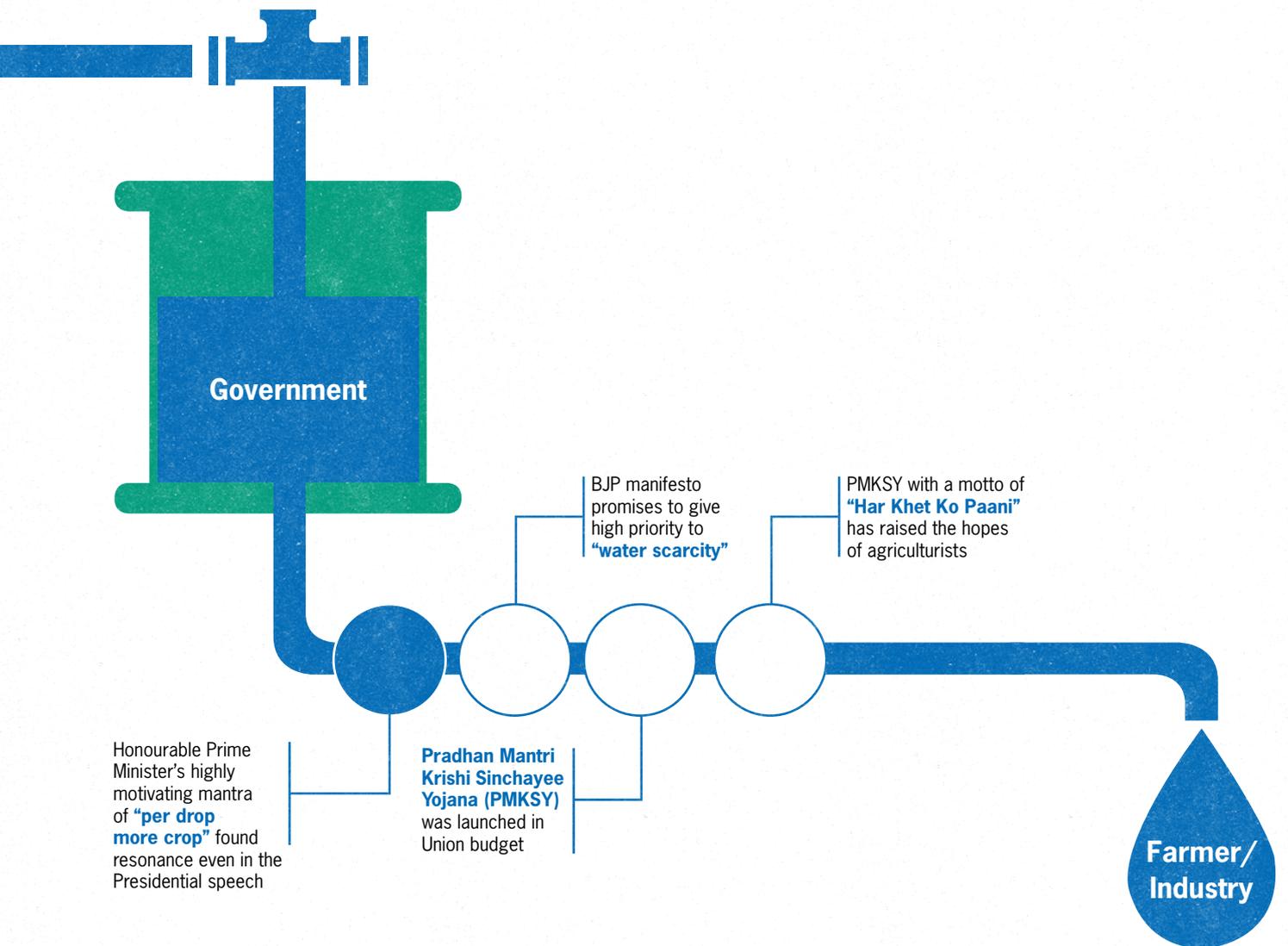
Micro irrigation – Journey so far



Government schemes with micro irrigation as a component or focused micro irrigation schemes

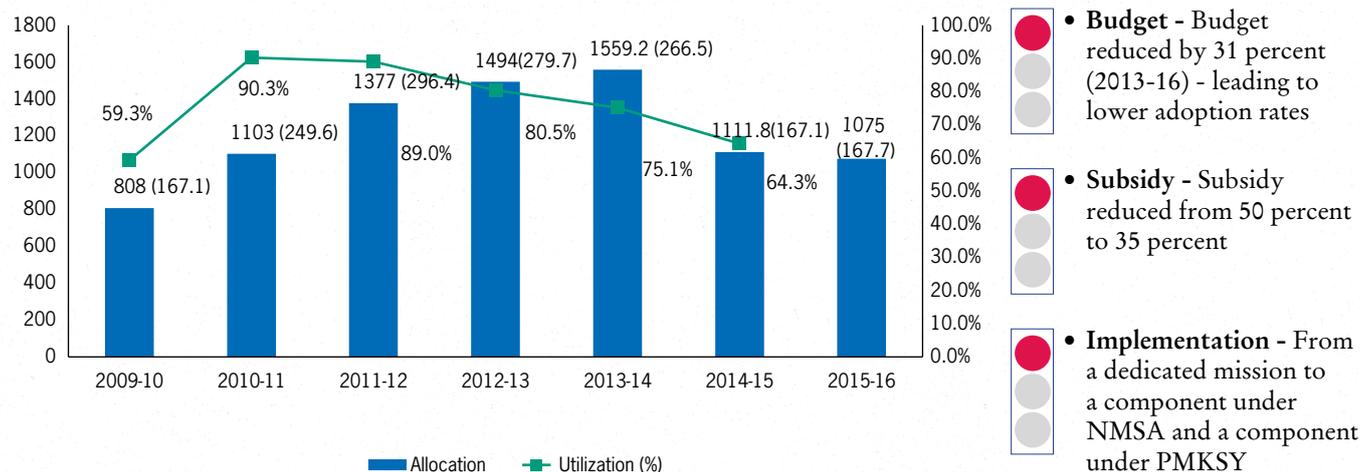
Micro irrigation – Promising “ACCHE DIN” to the Indian farmer

2015, with the new government taking seat at the centre, encouraging announcement were made that included:



Micro irrigation: Reality check

Allocation and funds released under micro irrigation schemes in India in INR crore (US\$ mn)



Key learnings:

- Allocation for micro irrigation under various schemes is declining, keeping in mind that for 2015-16 under PMKSY, allocation is INR 1,075 crore (US\$ 167.7 mn)
- Dilution of attention from a scheme to a component under a scheme
- Despite great demand, utilisation (funds released) under various schemes have seen a downward trend since 2012-13 primarily due to implementation challenges.
- States like Maharashtra, Haryana, Bihar which have potential for micro irrigation have not been able to utilise the amount released under OFWM for the FY2014-15 which again indicates that steps are needed to use the funds and technology available to utilise our water resources judiciously

Note: INR to US\$ conversion done prevalent average exchange rate for that year as published by USForex.com: 1 US\$ = INR 48.36 (2009), 1 US\$ = INR 48.36 (2009), 1 US\$ = INR 45.65 (2010), 1 US\$ = INR 46.45 (2011), 1 US\$ = INR 53.42 (2012), 1 US\$ = INR 58.51 (2013), 1 US\$ = INR 61.00 (2014), 1 US\$ = INR 64.12 (2015)

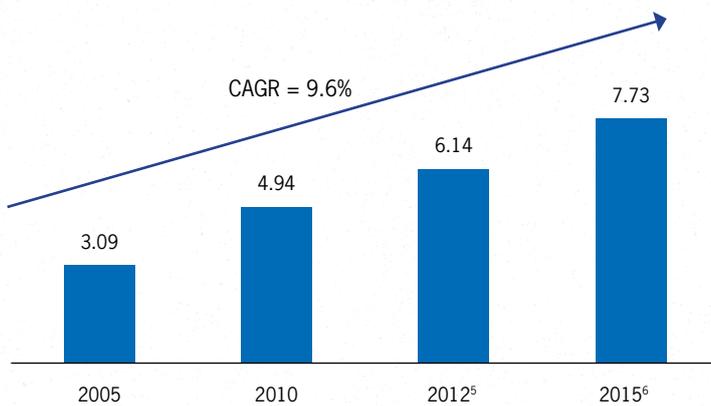
Financial progress under OFWM for FY 2014-15

States	Financial Progress (INR lakhs)		
	Release	Utilisation	% utilisation
Andhra Pradesh	12148	35110.04	289%
Bihar	3500	297.86	9%
Chhattisgarh	1000	661.61	66%
Goa	20	10.21	51%
Gujarat	14068	13706.4	97%
Haryana	2300	1631.21	71%
Himachal Pradesh	150	150	100%
Jharkhand	1500	27.59	2%
Karnataka	12425	11740.18	94%
Kerala	375	375	100%
Madhya Pradesh	6650	6714.05	101%
Maharashtra	17750	13537.79	76%
Odisha	1014	1057.11	104%
Rajasthan	7500	9516.25	127%
Tamil Nadu	5662	8756.54	155%
Telangana	7757	6601.9	85%
Uttar Pradesh	300	321.72	107%
Uttarakhand	697	385.46	55%
Assam	100	95.85	96%
Manipur	272	0	0%
Mizoram	450	0	0%
Tripura	200	200	100%
Sikkim	426	425.93	100%
NCPAH	90	0	0%

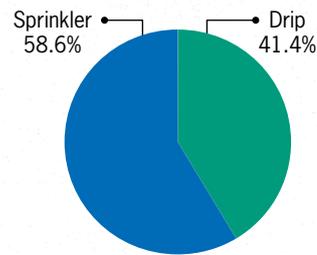
Note on centrally sponsored scheme on micro irrigation under PMKSY

Micro irrigation: Current status and growth in India

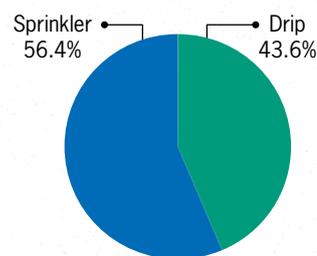
Area under micro irrigation (mn hectares), 2005-2015



Micro irrigation by type, 2012⁵



Micro irrigation by type, 2015⁶



- Micro irrigation has seen a steady growth over the years. Since 2005, area covered under micro irrigation systems has grown at a CAGR of 9.6 percent. Geographically, states with the largest area under micro-irrigation include: Rajasthan (1.68 mh), Maharashtra (1.27 mh), Andhra Pradesh (1.16 mh), Karnataka (0.85 mh), Gujarat (0.83 mh) and Haryana (0.57 mh).
- Majority of the area covered under micro irrigation systems comes under sprinkler irrigation with 56.4 percent, while 43.6 percent comes under drip irrigation. Area under drip irrigation has shown stronger growth in recent years, growing at a CAGR of 9.85 percent in the 2012-2015 period while sprinkler irrigation has grown at a pace of 6.60 percent in the same time period. Overall, the area under micro-irrigation has grown at a CAGR of 7.97 percent in this time frame

Note 5: March, 2012

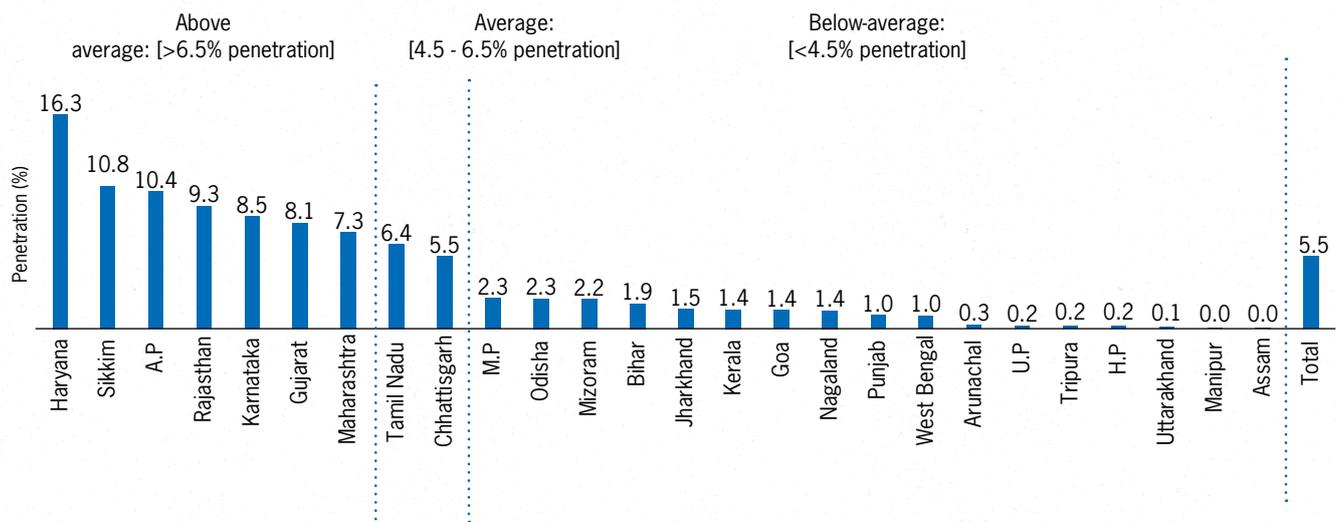
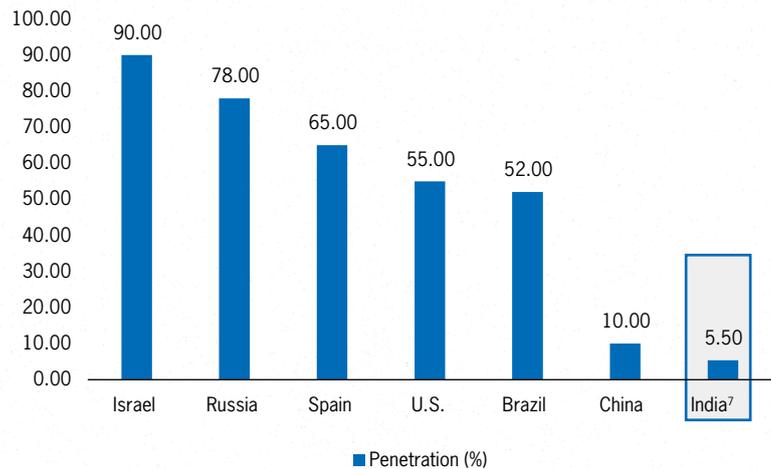
Note 6: As of March 31, 2015

Source - IndiaStat; Grant Thornton analysis

Micro irrigation penetration - Country wise analysis and state wise situation in India

- Penetration of micro irrigation in states of India is variant. The average penetration at the all India level is 5.5 percent which is much lesser compared to countries like Israel, US and even China as shown in the fig.
- India now has close to 8 mh under micro-irrigation. This is attributed to the large cultivable area and area under irrigation
- Penetration of micro irrigation systems is still very low in India. With half the cultivable land in the country still being rain-fed, there is mammoth potential for promoting micro irrigation in India
- In terms of total area, the United States has huge area under micro irrigation, which can be attributed to farmers being more aware and willing to adopt such systems
- Israel has just 0.23 mh under micro irrigation, but this represents a penetration of over 90 percent, which came as a result of an acute water shortage and a strong political will to use innovation in order to protect their water resources

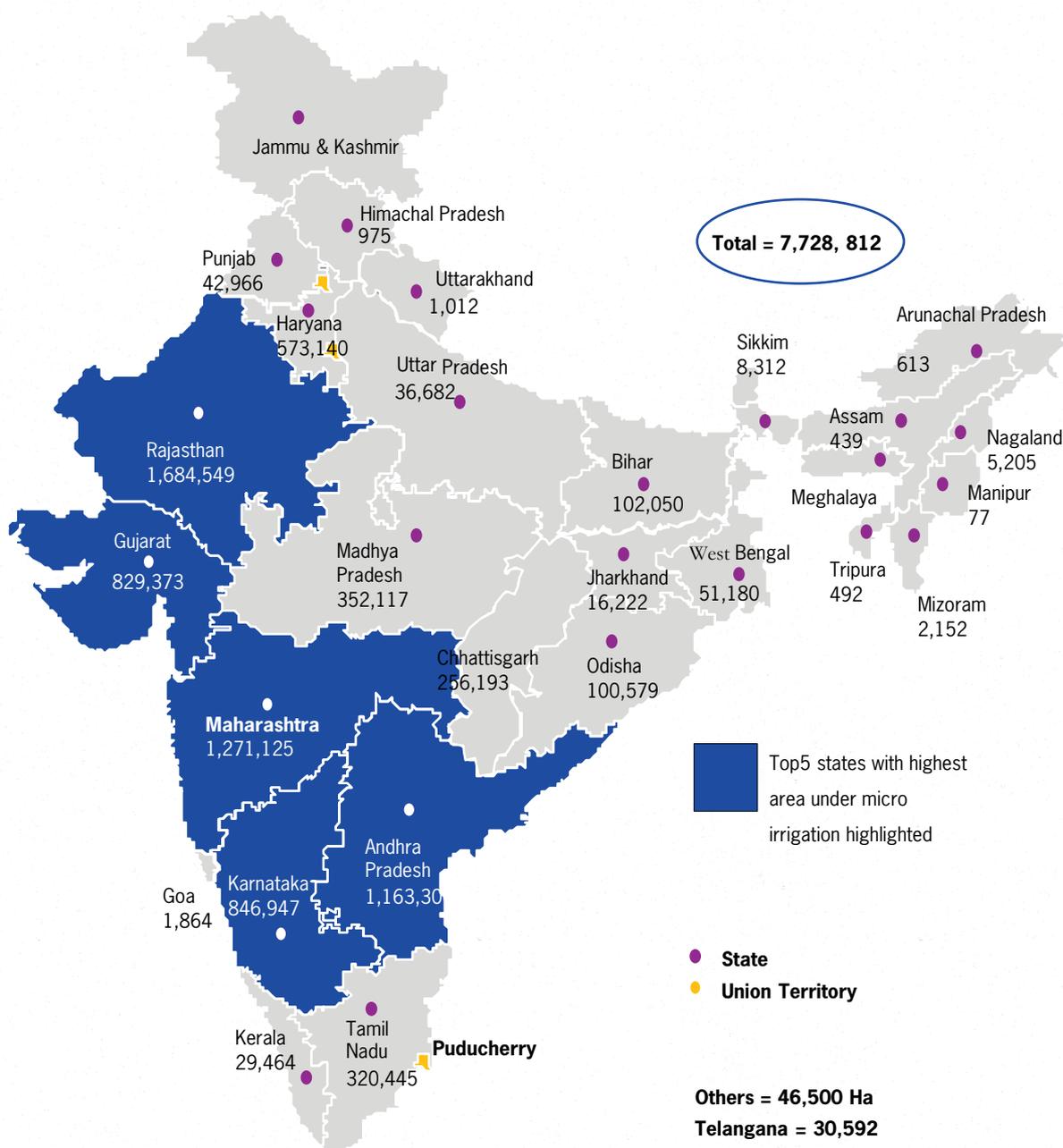
Current micro irrigation penetration estimate



Note 7: Calculated as area under micro irrigation / net sown area

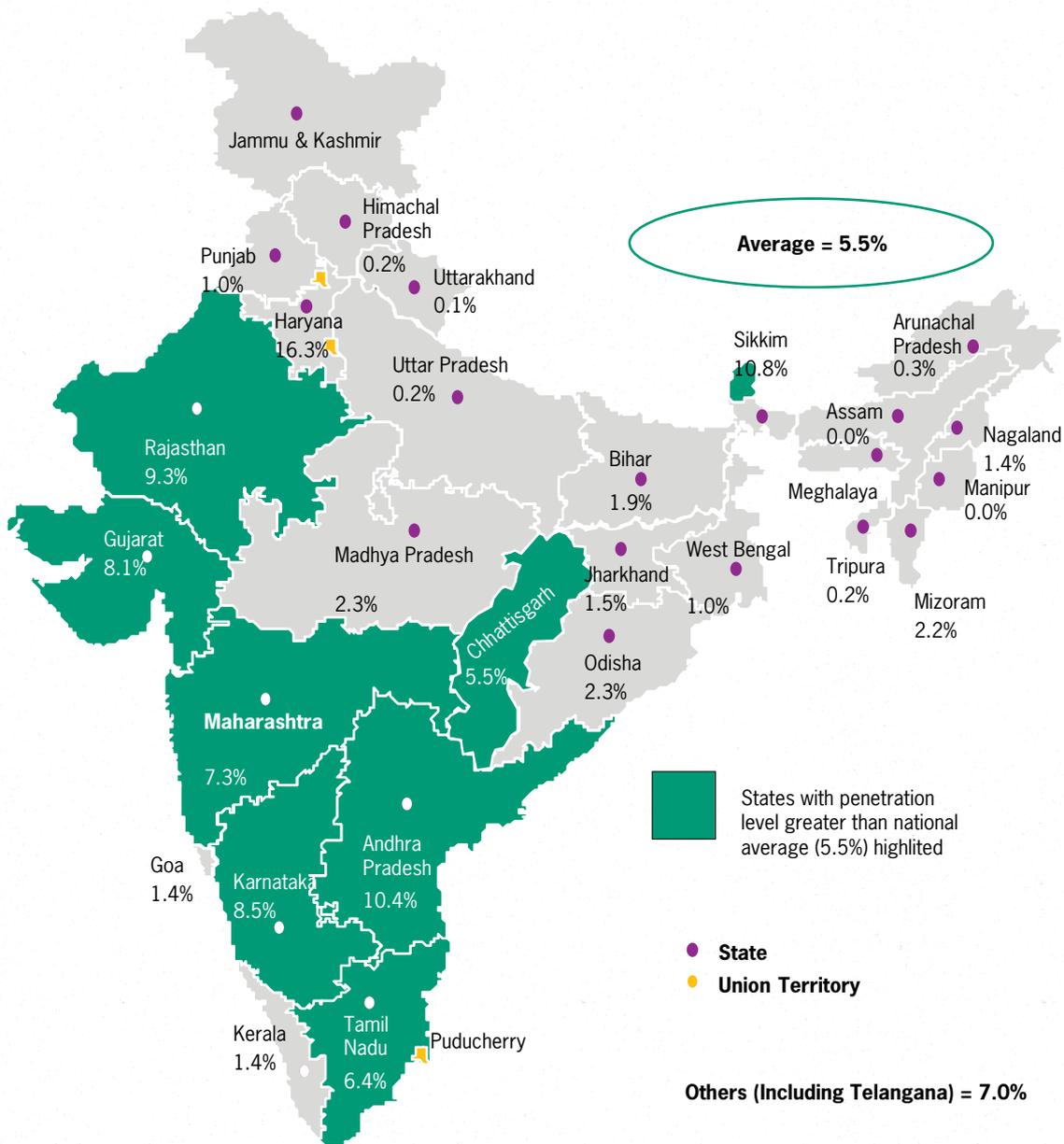
Area coverage by state

Area coverage by state – 2015⁸ (hectares)



Note 8: As of March 31, 2015
Source-NCPAH, MIDH

Penetration by state⁹ - 2015 (%)



Note 9: As of March 31, 2015; Penetration shown here is defined as the area under micro irrigation divided by the total net sown area in the state
Source-NCPAH, MIDH

Potential estimates for micro irrigation in India

Potential for micro irrigation systems (mn hectares (mh))

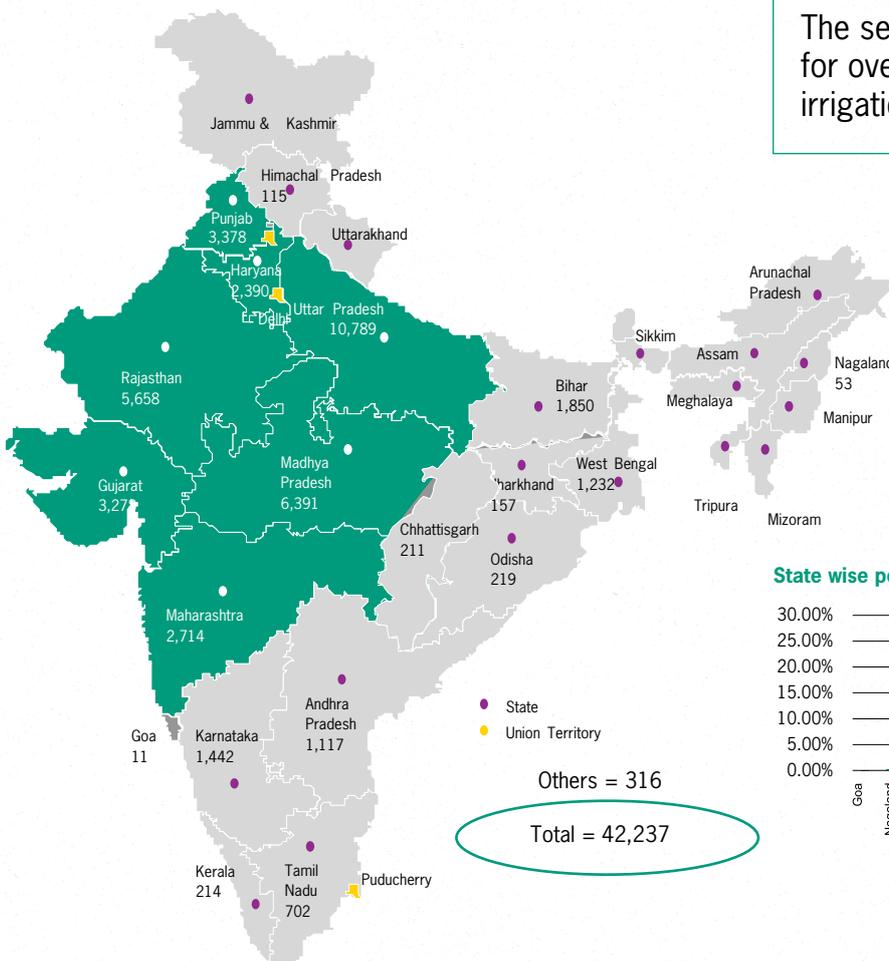
Crop	Total
Cereals	27.6
Pulses	7.6
Oil Seeds	4.9
Cotton	8.8
Vegetables	6.0
Spices and Condiments	2.4
Flowers, medicinal and aromatic plants	1.0
Sugarcane	4.3
Fruits	3.9
Coconuts, plantation crops and oil palm	3.0
TOTAL	69.5

India, with arable land of 140 mn hectares, has huge potential for micro irrigation.

Task-force on micro irrigation (2004) estimated a potential of 27 mh for drip irrigation and 42.5 mh for sprinkler irrigation with total potential of 69.5 mn hectares (as shown in adjacent table)

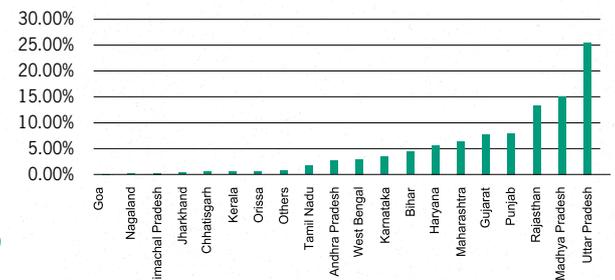
- This estimate is based on the area under crops that are suitable for micro irrigation

State wise potential of micro irrigation in India (Area in 000's ha)



The seven highlighted states account for over 80% of the estimated micro irrigation potential in India

State wise potential of micro irrigation in India (% share)



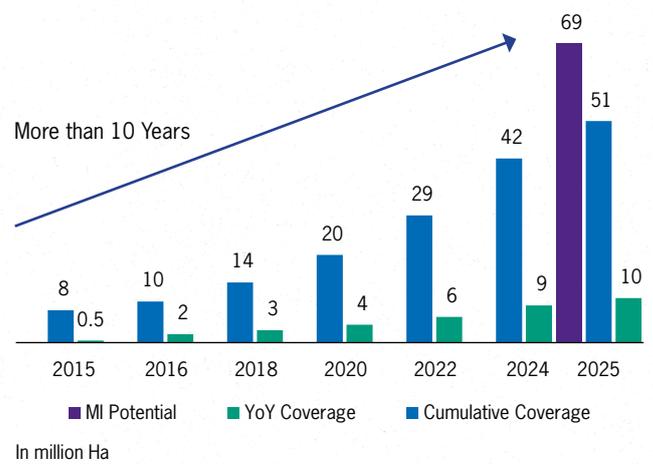
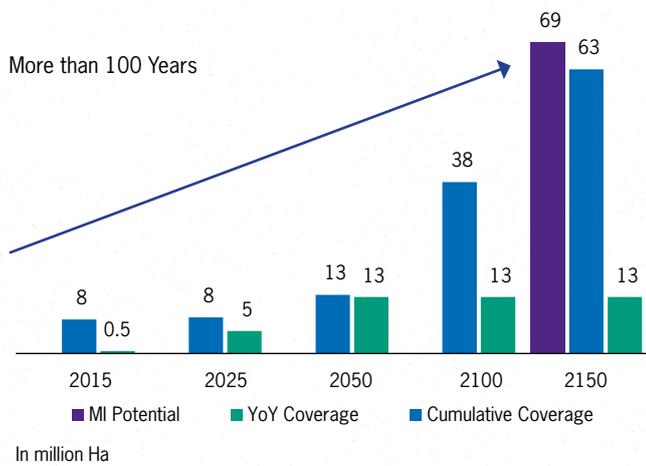
Source - An Analysis of Resource Conservation Technology: A case of Micro-Irrigation (Drip Irrigation), Centre for Management in Agriculture, Indian Institute of Management, Ahmedabad, August 2014

S.Raman 2010 estimated area by state for the potential of drip and sprinkler irrigation, Note on centrally sponsored scheme on micro irrigation under PMKSY

At current pace, it would take 100 years to achieve micro irrigation potential

With the current target of achieving 0.5 mn ha/ per year coverage under micro irrigation, with a budget of just INR 1000 crores (US\$ 156 mn), it will take another 100 years to achieve the potential.

The Government should at least target more than 2 mn ha/year with a budgetary allocation of INR 4000 crores (US\$ 624 mn) /year and increase it by 20 percent year-on-year in order to increase the pace of adoption.



Note: INR to US\$ conversion done at the average exchange rate for 2015, 1 US\$ = INR 64.12 as retrieved from USForex.com
Source: Grant Thornton analysis

Government support via various micro irrigation focus schemes/ project – A critical analysis

- National Mission on Micro Irrigation (NMMI)
- National Mission for Sustainable Agriculture (NMSA)
- Pradhan Mantri Krishi Sinchayee Yojna (PMKSY)

Government support via various micro irrigation focused schemes/ project – A critical analysis

National Mission on Micro Irrigation: NMMI (2010-2014)

The NMMI has broadly been seen as a strong program. Since the first iteration of a centrally sponsored scheme on MI came into being in 2005, the area under micro irrigation almost doubled, growing from 3.09Mha in 2005 to 6.14 Mha in 2012. The NMMI impact study showed that states like Bihar, Karnataka, Orissa, Rajasthan and Sikkim achieved more than 90 percent of set physical and financial targets. Other states such as AP, Chhattisgarh, Gujarat, Haryana, Maharashtra and Tamil Nadu succeeded in achieving more than 70 percent of their targets.

Overall, the physical and financial achievements came in at over 90 percent of the targets in the surveyed states.

Key strengths

Focus on micro irrigation

The scheme had a clear focus and special importance given to micro irrigation, which led to strong growth

Longevity

The scheme was implemented for a sustained period of time, which allowed time for adaptation and increased understanding for effective implementation

Greater efficiency

Having a single implementing agency to which the subsidy funds were sent, allowed for higher efficiency and transparency

Provisions for after-sale service

Quality standards requirement and a focus on after-sale service kept the interest of the farmer at the forefront

Govt. support for demonstrations

The government had made provisions for providing subsidy support for the demonstration of the micro irrigation systems. This lessened the burden of the suppliers and allowed for increasing awareness among farmers

Shortcomings

Inadequacy of subsidy support

The funds allocated by the central government was seen to be a substantial level however, at times, it turned out to be inadequate due to improper budgeting

Fund disbursement

Even though the subsidy funds were transferred to the implementing agency, disbursement was seen as being inefficient. The funds went through various steps and not directly to the farmer or the micro irrigation supplier

Area ceiling limit

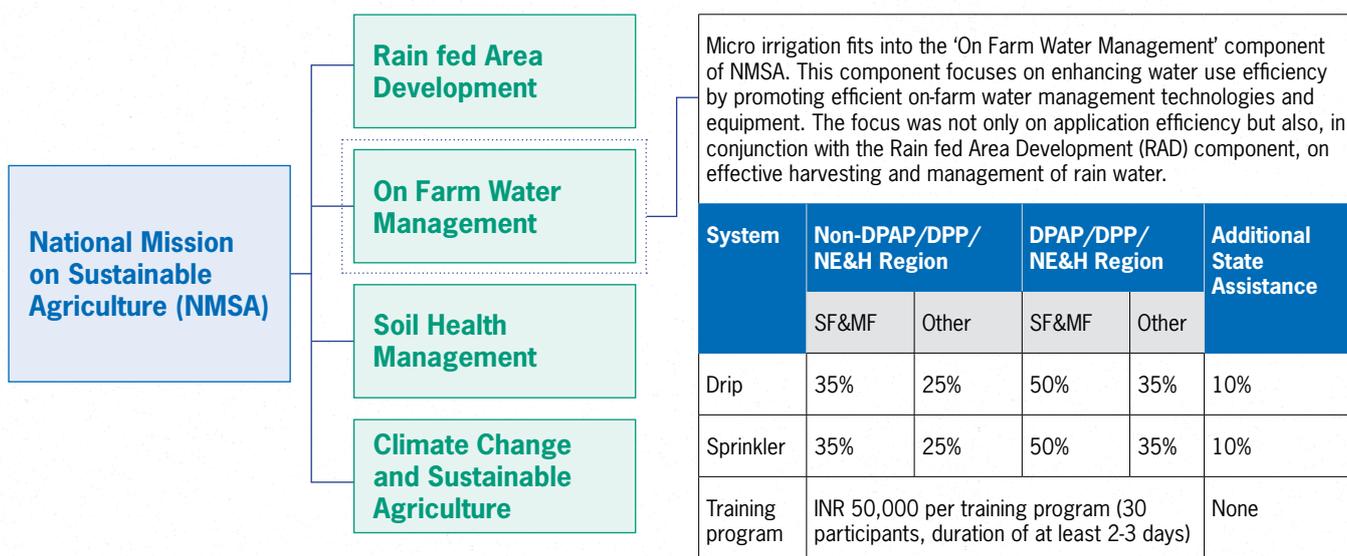
The 5Ha land ceiling has been seen as one of the impediments in faster growth of micro irrigation. Only 15 percent of the farmers in India are large and medium farmers but account for over 55 percent of the land. Experts feel that increasing the cap to 10 Ha would be very beneficial

Non-uniform implementation

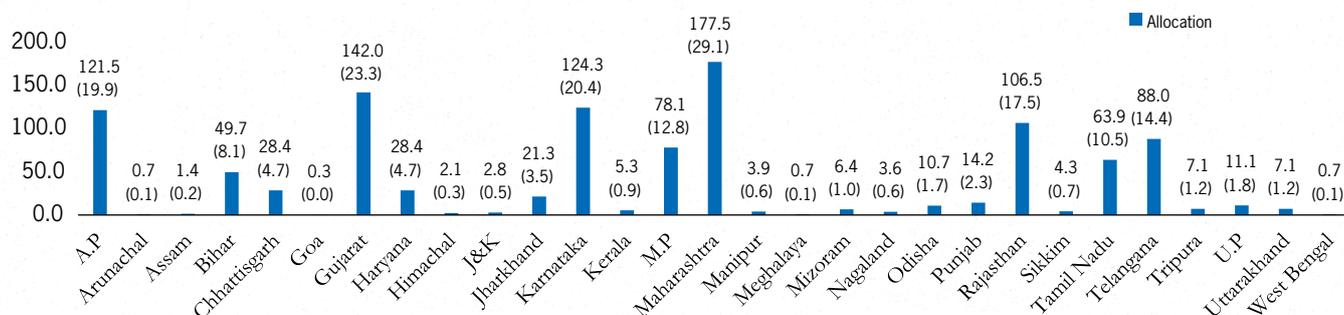
The implementation varied by state and in some states more than one department get involved in parallel with the implementing agency, leading to inefficiencies and confusion.

Source-National Mission on Micro Irrigation Impact study by Global AgriSystem, June 2014, retrieved August 31, 2015; Stakeholder interviews; Grant Thornton analysis

National Mission for Sustainable Agriculture: NMSA (2014-15)



State wise allocation of Funds to OFWM under NMSA (2014-15) in INR crore (US\$ mn)



A total of INR 1,111.82 crore (US\$ 182.3 mn) was allocated for on-farm water management under NMSA for the year 2014-15.

Note: INR to US\$ conversion done at the average exchange rate for 2014, 1 US\$ = INR 61 as retrieved from USForex.com
Source – Department of Agriculture & Cooperation, Ministry of Agriculture, India Stat

An analysis of NMSA (2014-15)

Key strengths

Promoting a sustainable agricultural ecosystem

This scheme has brought to light a key concept of 'focus on the whole ecosystem keeping the challenges of climate change in mind.' This is an important perspective for farmers to have in their everyday farm practices since India is expected to be hard hit by climate change

Promoting location-specific agronomic activities

Due to the wide variety of soil types and climatic conditions prevalent in India, promoting agronomic practices that cater to needs of specific locations is important, which is something strongly emphasised in this scheme

Key shortcomings

Lack of focus

NMSA, which saw a strong growth of micro irrigation, had a focus on promoting a single idea that would have a strong positive influence on the agricultural ecosystem. This kind of focus is also seen in PMKSY, which focuses on the idea of 'water scarcity'. This kind of focus was lacking in NMSA, with the plans requiring focus on all four components of the scheme.

Incomplete guideline

Incomplete guideline with regard to cost structure of micro irrigation components for subsidy release (BOQ's for drip and sprinkler system) leading to incorrect interpretation of cost and subsidy amounts.

Deterrents of prior schemes continued

NMSA also continued some provisions of prior scheme, which were seen in the industry as impediments to growth such as area ceiling of 5 Ha on subsidy support, subsidy flow mechanism still left plenty of room for delays and inefficiencies, long and complicated guidelines etc.



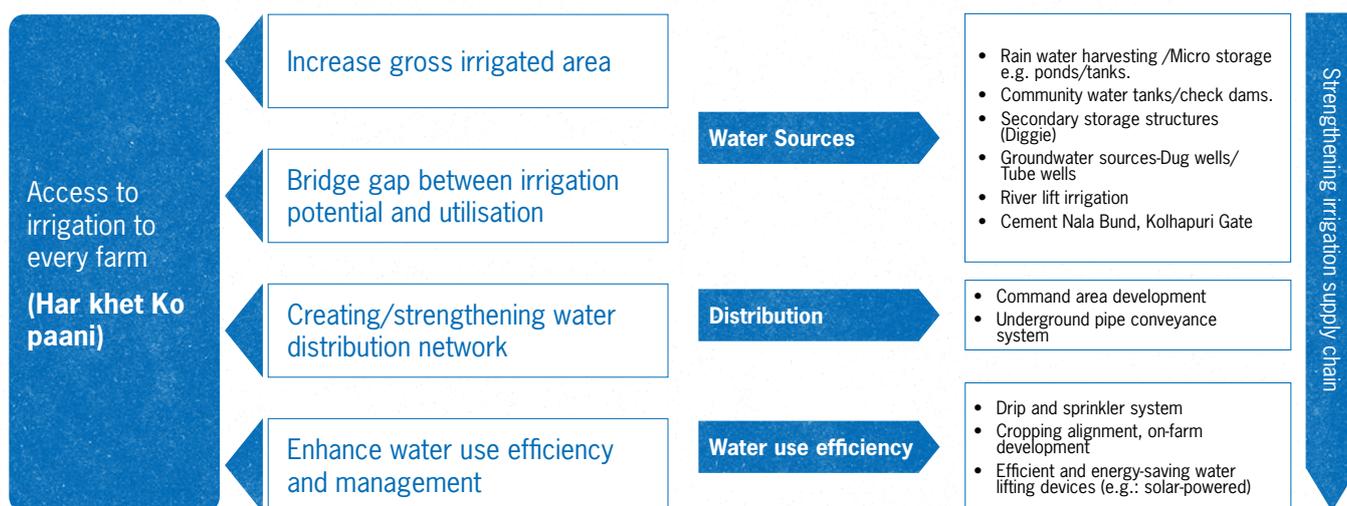
Pradhan Mantri Krishi Sinchayee Yojna (PMKSY)

Background and nature of the scheme

The Pradhan Mantri Krishi Sinchayee Yojna (PMKSY) was launched in July, 2015. The Cabinet Committee on Economic Affairs (CCEA), chaired by the Prime Minister gave its approval for the scheme for the period 2015-16 to 2019-20. The objective of the scheme is “to achieve convergence of investment in irrigation at the field level, expand cultivable area under assured irrigation.”

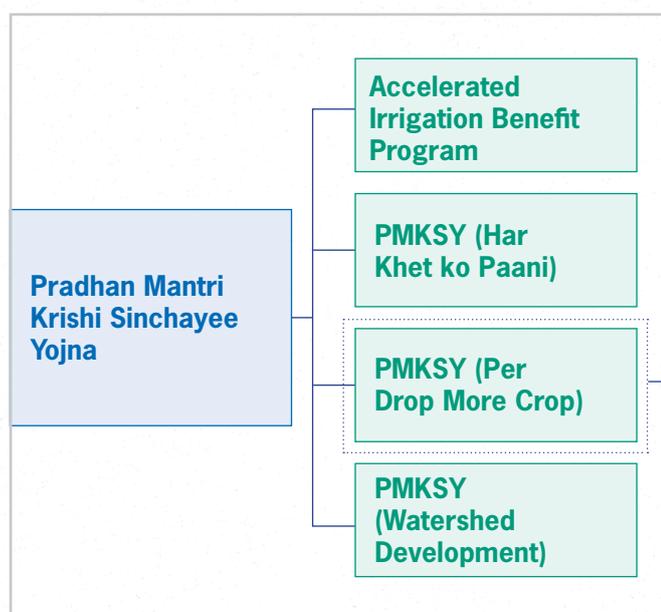
The outlay for the five-year period has been slated as INR 50,000 crores (US\$ 7.8 bn), with an outlay of INR 5,300 crores (US\$ 826.6 mn) set for 2015-16. There are a few opportunities that the government is hoping to exploit, which led to the launch of the scheme. These include the fact that only about 20 percent of rainfall is actually utilised, 10 percent increase in irrigation can bring an additional 14 mn hectares under assured irrigation and also 202 bn cubic meters of ground water potential is still to be tapped. In order to achieve the goal of bringing irrigation water to every farm, the government feels there is a need to converge all ongoing efforts and to bridge gaps through location specific interventions, which is what PMKSY aims to do.

Vision and strategy



Note: INR to US\$ conversion done at the average exchange rate for 2015, 1 US\$ = INR 64.12 as retrieved from USForex.com
Source – Department of Agriculture & Cooperation, Ministry of Agriculture

Micro irrigation in the PMKSY



Micro irrigation fits into the 'Per Drop More Crop' component of the PMKSY. This component calls for the promotion of efficient water conveyance and precision water application devices like drips, sprinklers, pivots, rain-guns etc. on the farms. The component also calls for the construction of micro irrigation structures to supplement source creation activities (including tube wells and dug wells, where ground water is available and not under semi critical/critical/over-exploited categories) which are not supported under AIBP, Har Khet Ko Paani component of the PMKSY, the watershed component of PMKSY and MNERGA. Additionally, the component asks for water lifting devices like diesel/electric/solar powered pump sets including water carriage pipes, underground piping system. These activities will come under the purview of the Ministry of Agriculture.

States with the largest area coverage have been allocated the most under the scheme. Tentatively, approximately INR 1,075 crore (US\$ 167.7 mn) has been allocated to micro irrigation for 2015-16

There is a key difference between micro irrigation and the other components that are included in this scheme. Infrastructure creation and development, as mandated to be part of 'Har Khet Ko Paani' and the 'Watershed Development' components of this scheme, take years to complete, whereas bringing area under micro irrigation only requires a timeline in months. Therefore, pushing micro irrigation through the scheme would allow for a quick win for the government's vision relative to other components of this scheme.

An analysis of the Pradhan Mantri Krishi Sinchayee Yojna (PMKSY)

Key strengths

Focus on an overarching concept

This scheme focuses on a concept of sustainable growth to meet our future demand. As seen before, India in the future is bound to face the crisis unless steps can be taken to use water more efficiently. Focus on a single concept was one of the key reasons for the success of micro irrigation in Israel.

Convergence and removal of redundancies

The government wants a convergence of various schemes and to ensure that the further outlay of funds be used for filling gaps in the schemes currently in place with the goals “Har Khet Ko paani” and “Per drop more crop” firmly kept in mind. The PMKSY is a convergence of twelve schemes and an amalgamation of three.

Greater responsibility and accountability at the district level

With the District Irrigation Plans (DIPs) being the cornerstone of the scheme, the heads of the districts/District Magistrates (DMs) are now directly responsible and accountable for the successful implementation of this scheme. This would ensure greater involvement and more consideration given to each DIP.

Key shortcomings

Focus on an overarching concept

The current funds allocated for micro irrigation this fiscal year, are lower than the previous year's. Therefore, the funds are not keeping up with increasing demand.

Fund disbursement

This scheme still does not address the underlying delays in subsidy disbursement seen in other schemes. There is still no model template not a DBT system for subsidy disbursement and hence, delays seen in previous years are likely to continue here.

Area ceiling limit

Only 15 percent of the farmers in India are large and medium farmers but account for over 55 percent of the land. Experts feel that increasing the cap to 10 Ha, from the current ceiling of 5Ha would be very beneficial. This scheme, however, does not lift that cap. Only 10% of total potential area (which is estimated as 69mHa in India) has been brought under MI as on date. Hence, area ceiling cap of 5Ha may be increased to 10Ha.

District level implementation

India has 640 districts, according to the 2011 agricultural census. Therefore, this scheme would require 640 district irrigation plans, which puts a big load of implementation on the approval committees at the state and central levels. This also increases the dependence of progress on skill-set and capabilities of 640 different district heads, which would have wide variation, and hence would be highly subjective. Also if the INR1,075 crores is to be distributed in these 640 districts the amount reaching these districts become very minuscule



Support by government through large-scale projects

- Andhra Pradesh Micro Irrigation Project (APMIP)
- Gujarat Green Revolution Company (GGRC)
- GGRC and APMIP: Pattern of assistance
- GGRC and APMIP: A critical review

Support by government through large-scale projects

Andhra Pradesh Micro Irrigation Project (APMIP): Overview

The Andhra Pradesh Micro Irrigation Project is a unique and comprehensive project, implemented in Andhra Pradesh. APMIP was established as a dedicated team housed in the Directorate of Horticulture, prior to the Centrally Sponsored Scheme (CSS), in November, 2003 itself. It was launched with the aim of improving the economic conditions of the farmers by:

- conserving water
- bringing additional area under cultivation using the existing water resources
- enhancing the crop production, productivity and quality
- facilitating the judicious use of ground water, saving in power consumption and the cost of cultivation

The project is implemented with the assistance of the Government of India, Government of Andhra Pradesh (state government) and contributions of the farmers.

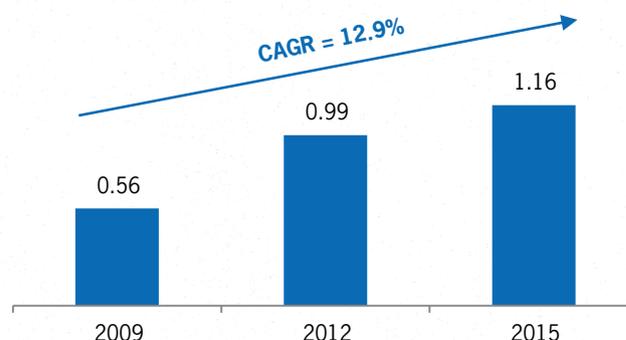
Realisation of the need for adopting micro irrigation technologies in the state arose from the deficit in rainfall/unpredictability of rain, rain shadow regions and the considerable depletion of ground water. The state government, following the concept of more crop per drop, adopted the project with the aim of covering the entire potential area available in all thirteen district under micro irrigation systems. In 2014-15, the government of India formulated the National Mission for Sustainable Agriculture (NMSA), which subsumed the National Mission on Micro Irrigation (NMMI). One of the four components of NMSA is On Farm Water Management (OFWM), which focusses primarily on enhancing the water use efficiency by promoting efficient on farm water management technologies and equipment. OFWM implemented in the state by the APMIP.

Performance

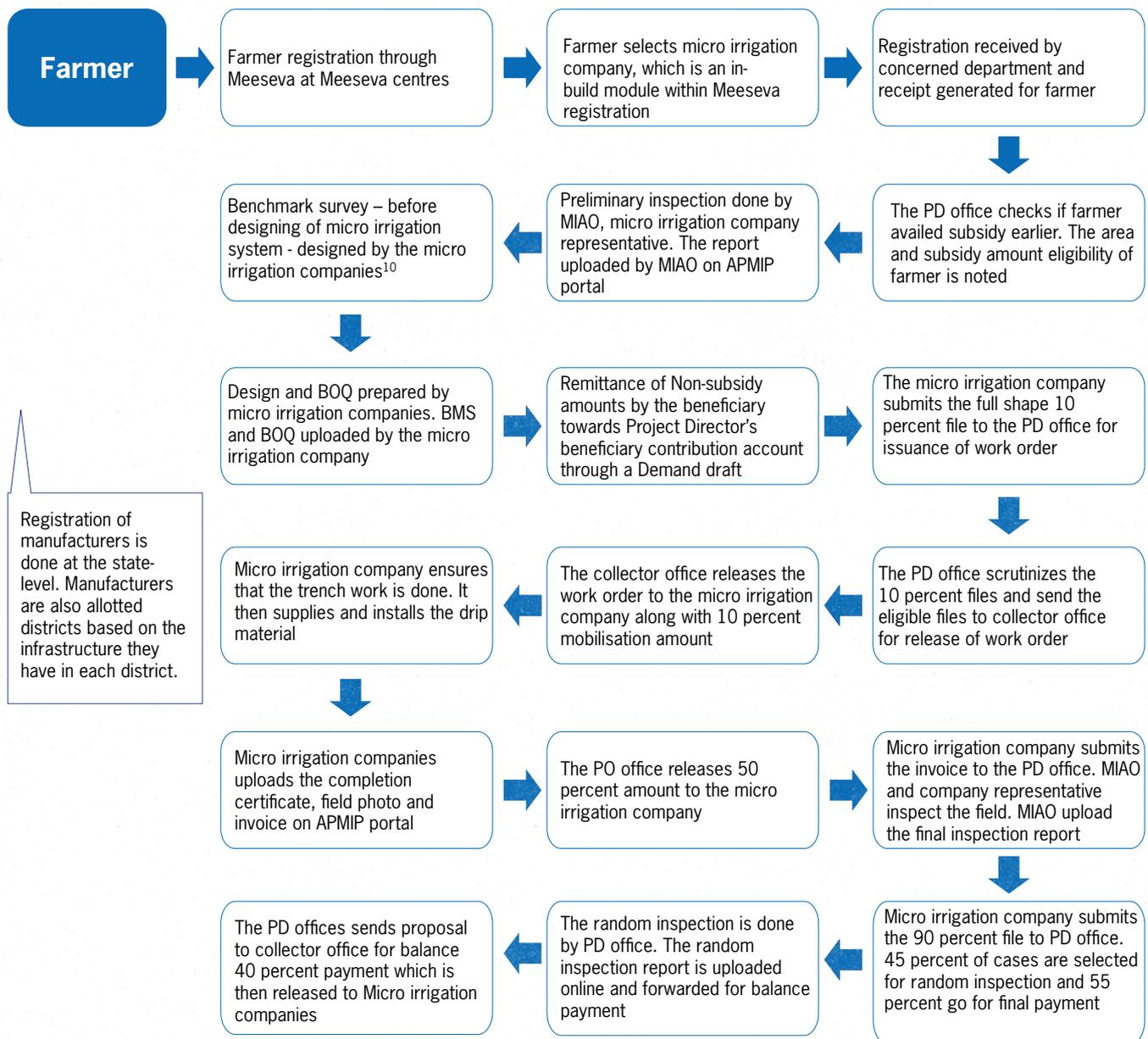
Area under Micro irrigation systems in Andhra Pradesh has seen a steady growth since the implementation of the scheme

- Area under micro irrigation systems stands at 1.16 mh now, as compared to 0.56 mh just six years ago.
- The area under drip irrigation has seen stronger growth, going from 0.11 mh in 2005, to 0.363 mh in 2009.
- The area under drip currently stands at 0.834 mh, which means that over 70 percent of the area under micro irrigation systems is amongst the more efficient of the two methods.

Area under micro irrigation
(Mn Hectares)



Andhra Pradesh Micro Irrigation Project (APMIP): Implementation



Note 10: Benchmark survey incorporates key mandatory conditions such as GPS coordinates, power availability, water yield, water availability, crop area and spacing, area proposed under MI, Motor capacity, diameter of outlet pipe;
Source – Guidelines to implement the program APMIP



Gujarat Green Revolution Company (GGRC): Overview

In 2005-06, the Gujarat government felt the need for an integrated approach in a way such that provisions under various schemes (central or state) are uniform and their inequalities and anomalies removed. They also felt that a uniform approach would allow for the efficient use of funds made available under different schemes. This led to the formation of a Special Purpose Vehicle (SPV), the Gujarat Green Revolution Company (GGRC). It came into being in 2005, to work inter alia as the implementing agency appointed by the Government of Gujarat and Government of India. GGRC was set up in the form of a public company jointly promoted by Gujarat State Fertilizers and Chemicals Limited (GSFC), Gujarat Narmada Valley Fertilizer Co. Ltd. (GNFC) and Gujarat Agro Industries Corporation Limited (GAIC).

The main objective of the company is to implement the micro irrigation scheme to save water and energy, increase the agricultural production and productivity. All this, in the larger interest of the farming community of the state.

Vision of GGRC was to achieve a sustainable natural resource management in the agriculture sector of the state of Gujarat. With this vision, GGRC had the following tenets in their vision:

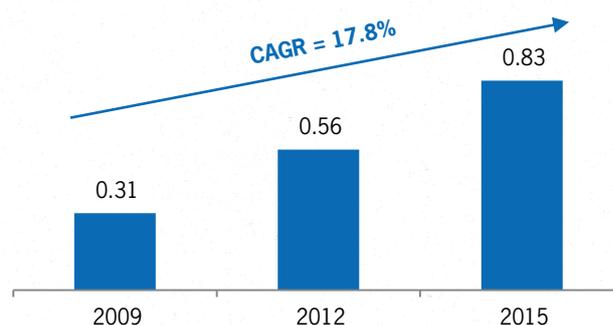
- To promote the concept of micro irrigation, protected cultivation, solar water pumping system.
- Promote the use of highly nutrient-efficient water soluble fertilisers among the farmers of Gujarat.
- As a nodal agency, using state-of-the-art technology to implement the micro irrigation scheme on behalf of the Government of Gujarat and Government of India.
- To promote use of bio fertilizers, green and clean energy to conserve the agri-ecosystem of the state.

Performance

Since the implementation of the scheme in its current modality by GGRC (i.e. since May 2005) till March 2015:

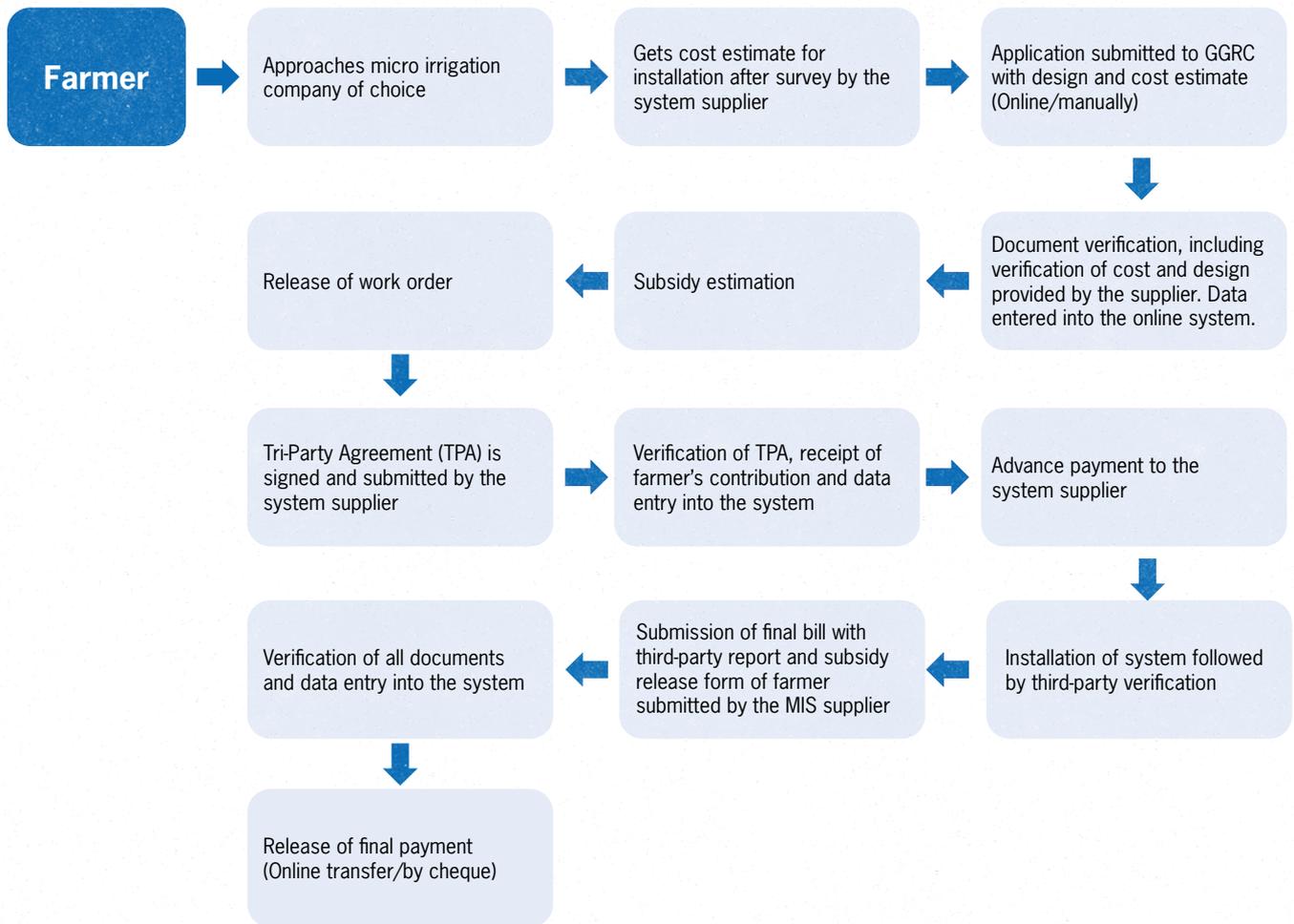
- A total of 685,714 beneficiary farmers have adopted MIS systems
- This has translated to an area of 0.83 mh¹¹ hectares being brought under micro irrigation
 - Approximately half of this area is under the more efficient, drip irrigation
 - Area under drip irrigation has grown by more than 100,000 Ha (0.3 mh to 0.41 mh) between 2012 and 2015
- A total amount of INR 3,010 crore has been disbursed as subsidy

Area under micro irrigation
(Mn Hectares)



Note 11: Area under micro irrigation in Gujarat has increased to 1,105,921 hectares (1.105 mh) as reported by GGRC in their latest report

Gujarat Green Revolution Company (GGRC): Implementation



Source – IWMI-Tata Water Policy Programme, Water Policy Research Highlight # 43; Gujarat Green Revolution Company website

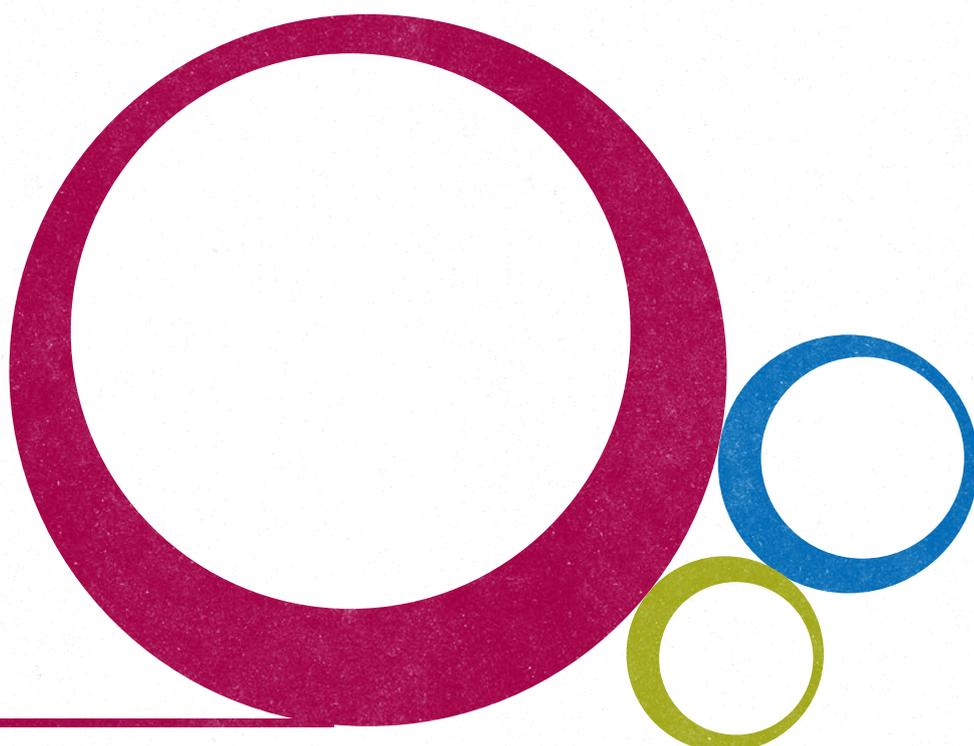
GGRC and APMIP: Pattern of assistance

Gujarat Green Revolution Company (GGRC)

Category of Farmer	Non Dark Zone Area	Dark Zone Area (For 57 talukas)
General: Small and Marginal farmers (< 2Ha)	Up to 60 percent of MIS unit cost or INR 70,000, whichever is less	Up to 70 percent of MIS unit cost or INR 70,000, whichever is less
General: Small and Marginal farmers (> 2Ha)	Up to 50 percent of MIS unit cost or INR 60,000, whichever is less	Up to 60 percent of MIS unit cost or INR 60,000, whichever is less
SC/ST farmers	Up to 75 percent of MIS unit cost or INR 90,000, whichever is less	Up to 85 percent of MIS unit cost or INR 90,000, whichever is less

Andhra Pradesh Micro Irrigation Project (APMIP)

Category of Farmer	Non DPAP Mandals	DPAP Mandals
SC/ST farmers under small and marginal farmers category	100 percent of MIS unit cost; ceiling limit INR 1 Lakh	100 percent of MIS unit cost; ceiling limit INR 1 Lakh
Non SC/ST under small and marginal farmers category	90 percent of MIS unit cost; ceiling limit INR 1 Lakh	90 percent of MIS unit cost; ceiling limit INR 1 Lakh
Other farmers (5-10 acres)	70-90 percent of MIS unit cost; ceiling limit INR 1 Lakh	70-90 percent of MIS unit cost; ceiling limit INR 1 Lakh
Big farmers (>10 acres)	50 percent of MIS unit cost; ceiling limit INR 2 Lakh	50 percent of MIS unit cost; ceiling limit INR 2 Lakh



GGRC and APMIP: A critical review

Strengths

GGRC

- GGRC has a strong IT infrastructure and is a single and independent agency with dedicated team through which the funds pass, which allows for greater efficiency and transparency in the application process.
- The farmer has the choice of approaching the supplier before having to apply, which gives power to the farmer.
- The pattern of assistance is reasonable to avoid shortage of funds. There is lesser uncertainty for the supplier with mobilising funds provided and further funds released during the process.
- Inspection done by a third party which ensures objectivity and higher efficiency.

APMIP

- Provides the farmer with the choice of micro irrigation supplier, giving the farmer more freedom.
- Sets defined timelines for the installation of the survey, ensuring efficiency and less delays in the process.
- Provides mobilisation funds to the micro irrigation supplier to reduce reliance on the final step of the process and lessening the suppliers' uncertainty.
- Good allocations sets specific targets for districts.

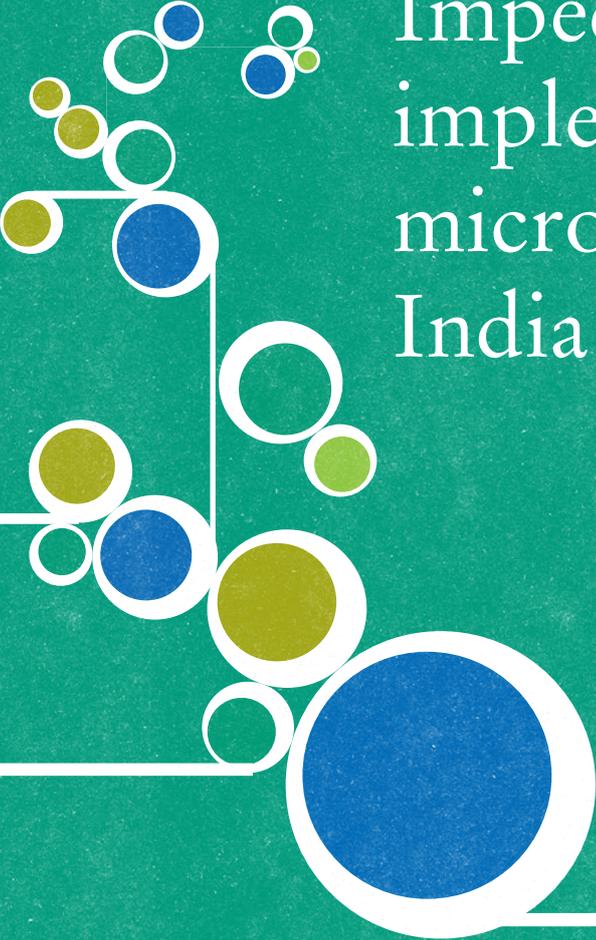
Weaknesses/ Bottlenecks

GGRC

- Large portion of amount payable to the suppliers held back till after inspection, which leads to delays and uncertainties for the suppliers
- Annual supplier registration and price setting

APMIP

- Micro irrigation companies' payments are also very delayed with some industry sources indicating a period of around 6 months in receiving payments.
- It is described as a lengthy process that takes a long time to get done.
- Inspections take longer time
- Very high level of subsidy needs higher fund allocations year on year



Impediments in implementation of micro irrigation in India

Impediments in implementation of micro irrigation in India

Impediments for micro irrigation growth in India



Lack of focus on micro irrigation: There is a lack of focus at a central level on micro irrigation, previously seen during the years of the National Mission on Micro Irrigation (NMMI). Since 2014-15, there has been a dilution of focus by subsuming micro irrigation as a component of government schemes, rather than a dedicated mission. At the state level as well, this lack of focus permeates, which has resulted in only a few states having a dedicated team for micro irrigation. This has contributed to the deceleration of growth of micro irrigation penetration in the country. Although some states have implemented successful models using exclusive and dedicated teams for micro irrigation



Lack of IT-backed operations: The entire process, from application to installation and payment, cannot be tracked online in a majority of states. In most cases, only a part, if any, of the process can be tracked, which makes monitoring the transactions and ensuring efficiency in the process a nearly impossible task. There is a lack of usage of systems such as geo-tagging and referencing, which allow real-time monitoring of projects. Gujarat, Andhra Pradesh, Maharashtra are considered to be select examples in promoting micro irrigation, use such systems, which enable real-time monitoring at the state and central level.



Uncertainty and sporadic changes in scheme guidelines: There is lack of smoother/longer-term guidelines, which causes each scheme to only be operational for a part of the year (on average five months) and not the full twelve months. On an average, it is seen that schemes are only effective for 5 months of the year and are not available to the farmers in peak demand months. As a result of this, farmers miss the cropping season and are unable to realise the true benefits of installing a micro irrigation system. [Refer page: 47]



Scheme implementation and operating process: There are various inefficiencies in the operating process, especially with regard to the time and length of the process. In some states, the Scheme implementation and launch process goes through the months of August and September (even October in some cases), due to which a time lag crops up. By this time the main season has already ended. Hence, farmers are unable to draw the optimal benefit of the available technology. Therefore, ensuring timely completion of the process (before the beginning of April) is paramount to safeguard the interests of the farmers.

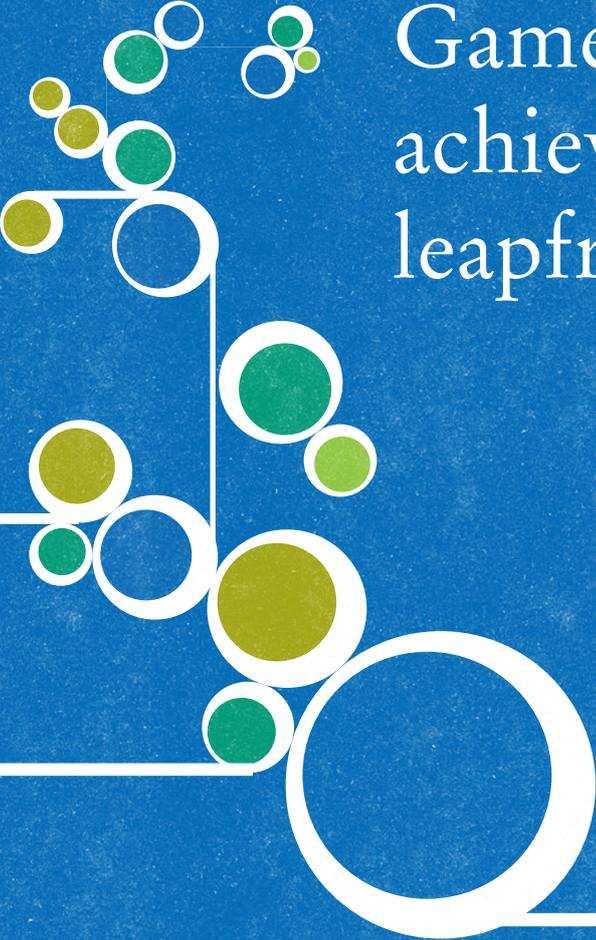


Delays in subsidy disbursement: Method of subsidy payment has been an impediment in previous schemes and continues to be one today. There is also a continued problem with unavailability of funds in certain states. This is a result of approving installation of equipment when the funds for the subsidy aren't yet available to the states. This causes a shortage of funds, which in turn causes delays in subsidy payments and therefore, uncertainty for the suppliers of micro irrigation systems.



Absence of easy financing mechanisms for farmers: Financing for farmers continues to be a major impediment. Farmers continue to have difficulty finding financing options and even once they do, the collateral is very high. Finding ways to ensure easier financing norms for farmers should be a priority. There is precedence for loans to farmers without collaterals such as crop loans.

Addressing these fundamental and persistent challenges in the industry is the need of the hour. There is a need for efforts to be made that would be game changers for micro irrigation in India and therefore, game changers in overcoming the future headwinds facing Indian agriculture.

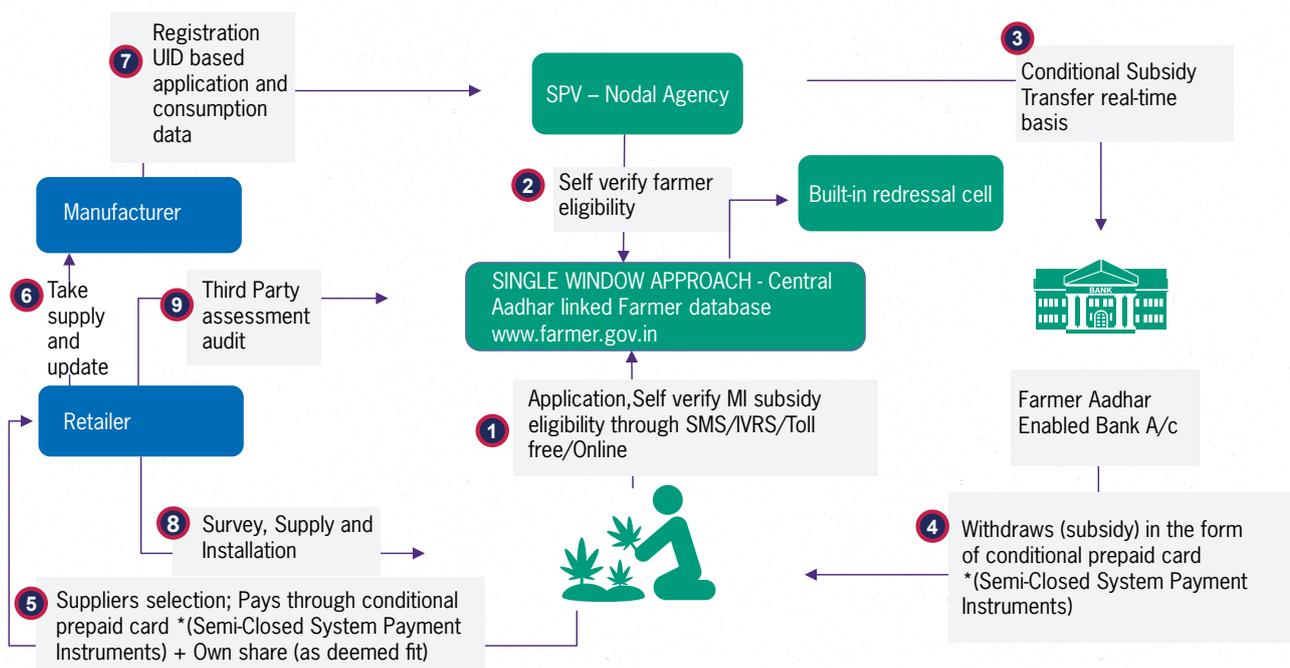


Game changers for
achieving
leapfrog growth

Game changers for achieving leapfrog growth

Game Changer#1: 'A different approach' to the subsidy process - Jam Trinity Model (1/2)

As discussed, there are a number of issues seen in the subsidy process for micro irrigation. Therefore, to meet the goal of 'minimum government, maximum governance' and accelerate the adoption rate of micro irrigation in India, there is a need to adopt 'a different approach'



Some salient features:

- This model aims to improve the process of subsidy flow. Farmer's share of the cost will be paid by the farmer upfront to the retailer.
- The online system will have a redressal mechanism so that the farmer can make complaints for system malfunctioning etc.

Source – Stakeholder Interviews; RBI guidelines for semi-closed payment systems, Guidelines on Issuance and Operation of Pre-paid Payment Instruments in India <http://rbidocs.rbi.org.in/rdocs/notification/PDFs/116MCPPI20062014FL.pdf>; Grant Thornton analysis

Game Changer #1: 'A different approach' to the subsidy process analysis (2/2)

This proposed model has been formulated to provide certain benefits to all stakeholders in the industry. Some of these benefits are highlighted below:

Freedom to the farmer

This Direct Benefits Transfer (DBT) model allows a farmer the choice of provider to go with. The subsidy is in the name of the farmer; this helps provide the technology at discounted rates (through interest subvention, credit guarantee provisions etc.; discussed in the following pages), while making the entire process easier through a simple IT enabled process. The third party assessment also ensures that the product a farmer receives is up to the mark and therefore, a farmer can avail its full utility.

Seamless application and eligibility verification process

Step 1 of the proposed model ensures that the farmer's application is posted online and the eligibility is verified by the dedicated team/ SPV on the same portal. Therefore, the delays in approval are removed and the process is initiated seamlessly

Third party verification provision

The proposed model includes a provision for third party assessment, ensuring that the conditional payment can only be withdrawn once the system is checked and verified. This ensures the interest of the farmer is being tended to.

Reduction of delays in subsidy release

A major roadblock in the subsidy process is approval of projects without the funds actually being available. Therefore, there is a backlog of subsidies that get delayed in being dispatched to the manufacturers. In Step 3, conditional subsidy transfer, ensures that the subsidy is only transferred once funds are available to the dedicated team/ SPV and therefore they are transferred forward in real-time. This increases the ease of doing business.

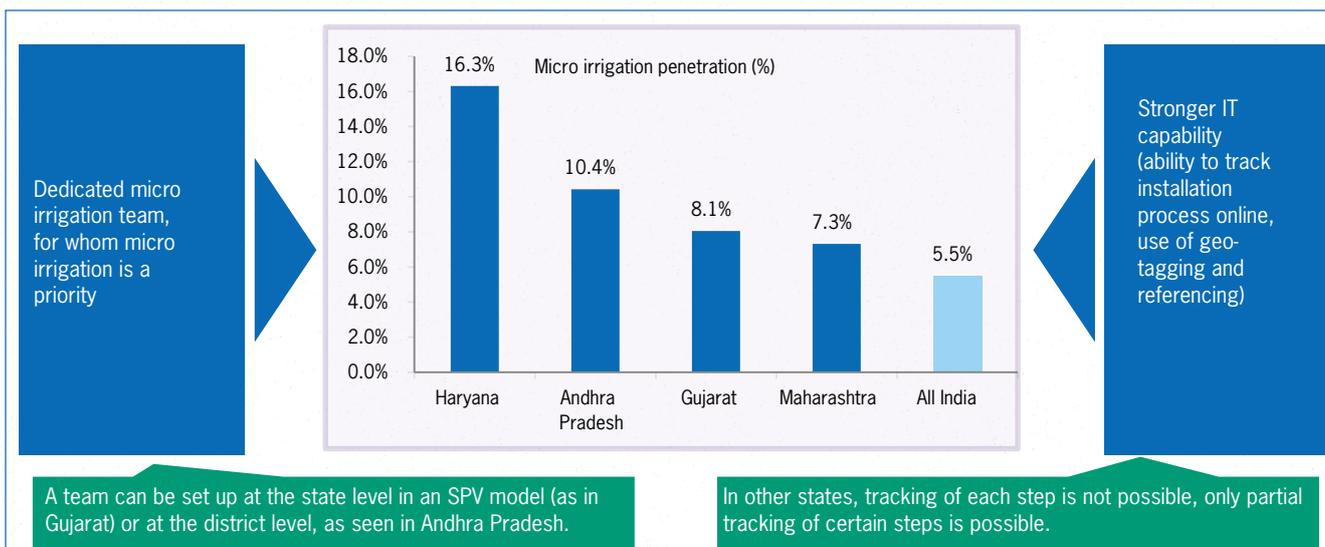
Progress monitoring at the highest level

A perhaps salient, but powerful benefit of such a system is the ability to monitor progress of projects at the central level. Since each step of the process will be updated online, the road blocks and bottlenecks can be observed in real-time and thus, there is high transparency and accountability. Therefore, the load of implementation on the government is reduced significantly and the focus can shift from policing to impact.

Game Changer #2: Better process management – Use of Information Technology and dedicated team

There is a need for greater focus on micro irrigation at the state level. Four states including Gujarat, Andhra Pradesh, Maharashtra and Haryana, which have seen strong growth of area under micro irrigation as well as have higher than average penetration of micro irrigation. The common denominators of success between these four states are a state-level focus on micro irrigation and better use of IT in their implementation. In all four of these states, there is a dedicated team whose focus is further micro irrigation. Also, in these states, one can track the installation process through all its steps, from issuance to work order to inspection. There is a need to promote such systems in other states to ensure that each state can fulfill its potential for micro irrigation since.

Case in point:



Source – Mission for Integrated Development of Horticulture (MIDH); Stakeholder Interviews; Grant Thornton analysis



Game Changer #3: Stable policy environment

An issue seen with micro irrigation schemes is the guidelines. These are often very complex and in the recent years have changed drastically year over year (NMMI to OFWM under NMSA to now PMKSY). This creates a problem in implementation wherein, states are unable to enforce these for the full length of the year. Ensuring smoother guidelines that are kept in place for a longer time frame is key in promoting accelerated adoption of micro irrigation.

Key States: Effective months of operations FY 2014-15

Key States	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Operational months
Gujarat	●	●	●	●	●	●	●	●	●	●	●	●	9
Maharashtra	●	●	●	●	●	●	●	●	●	●	●	●	5
Andhra Pradesh	●	●	●	●	●	●	●	●	●	●	●	●	4
Tamil Nadu	●	●	●	●	●	●	●	●	●	●	●	●	6
Karnataka	●	●	●	●	●	●	●	●	●	●	●	●	2
Rajasthan	●	●	●	●	●	●	●	●	●	●	●	●	1
Madhya Pradesh	●	●	●	●	●	●	●	●	●	●	●	●	3
Chattisgarh	●	●	●	●	●	●	●	●	●	●	●	●	7
India	●	●	●	●	●	●	●	●	●	●	●	●	5

Key States: Effective months of operations FY 2015-16

Key States	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Operational months
Gujarat	●	●	●	●	●	●	●	●	●	●			10
Maharashtra	●	●	●	●	●	●	●	●	●	●			4
Andhra Pradesh	●	●	●	●	●	●	●	●	●	●			5
Telangana	●	●	●	●	●	●	●	●	●	●			9
Tamil Nadu	●	●	●	●	●	●	●	●	●	●			4
Karnataka	●	●	●	●	●	●	●	●	●	●			0
Rajasthan	●	●	●	●	●	●	●	●	●	●			4
Madhya Pradesh	●	●	●	●	●	●	●	●	●	●			4
Chattisgarh	●	●	●	●	●	●	●	●	●	●			8
India	●	●	●	●	●	●	●	●	●	●			5

 	Key demand months/ sowing season
 	Key contributing months
●	Operational month
●	Partially operational month
●	Non-operational month

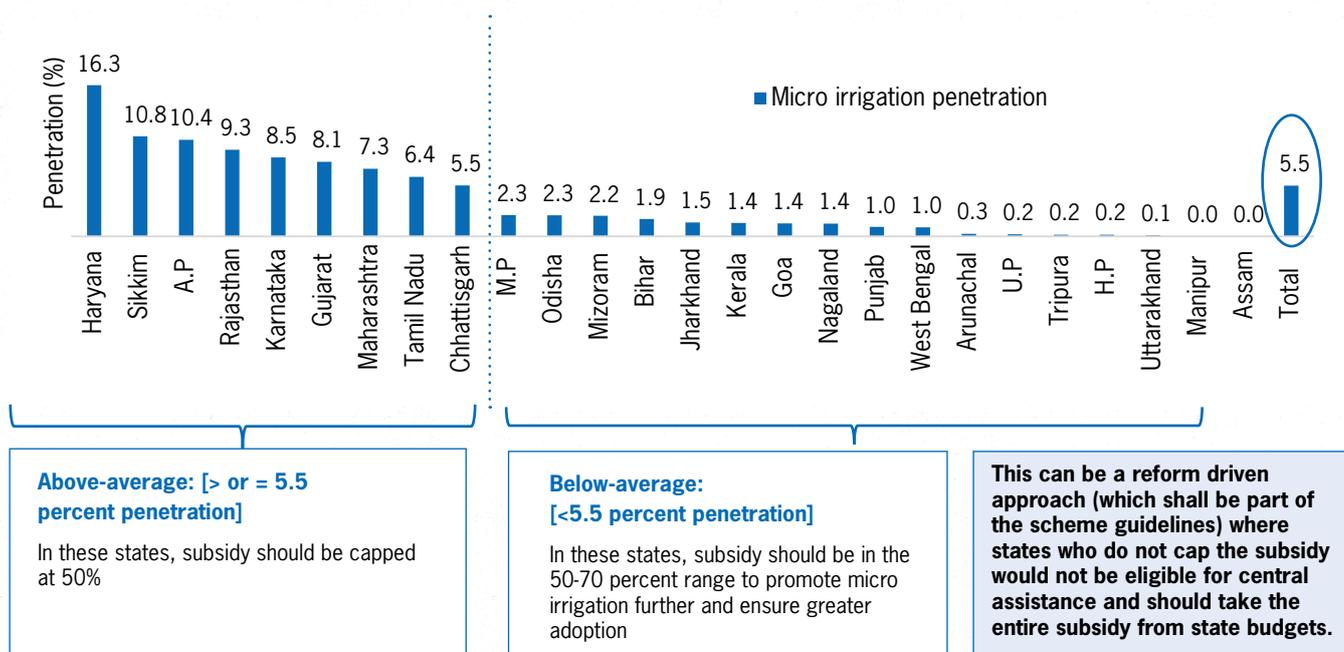
As seen, in the previous two years, schemes have been operational for an average of 5 months of the year. Therefore, for most of the year, especially during peak demand times (sowing season), the benefits of these schemes are not being availed.

Source – Based on guidelines issued by various states; Stakeholder Interviews; Grant Thornton analysis

Game Changer #4: Capping and moderating subsidy support

One of the challenges seen in the industry is the delay of and in some cases, lack of available funds to back up the high level of subsidy provided by the government. Even with successful implementation projects as seen in Andhra Pradesh (APMIP) and Tamil Nadu (TANHODA), the high subsidy rate, which for some categories of farmers goes up 75 percent-100 percent, leads inadequacy of available funds for the promised subsidy in the budget.

Moderating the subsidy level by capping it at 50 percent in states where penetration is already above the national average and re-distributing the funds where a higher subsidy is necessary to promote further penetration can help in more inclusive and uniform growth of area under micro irrigation in the country.



Note: Penetration is defined as the micro irrigation area in the state divided by net sown area in that state

Source – Mission for Integrated Development of Horticulture (MIDH); Stakeholder Interviews; Grant Thornton analysis

Game Changer #5: Financial inclusion

For the farmer:

1. Credit availability to small and marginal farmers:

Agricultural sector requires adequate financing with such a large portion of land holdings falling into the category of small and marginal farmers. With a greater focus on meeting the future production demand, various national and commercial banks have devised special plans to support the farmers through different schemes. There are several wrinkles in the procedure but a combine effort between the government and the institutions, dialogues for which are already underway, provides a good indication for the future of the industry.

2. Interest subvention for micro irrigation loans:

This would allow easier financing for farmers to cover their share of the cost of a micro irrigation system. Easier financing norms, in turn, will increase the adoption rate of micro irrigation. An additional benefit for the government would be that this step can help cut the subsidy rate as the government can promote this form of financing for purchase and installation of micro irrigation systems.

3. Credit Guarantee Funds for micro irrigation:

As seen in the case of Micro, Small and Medium Enterprises (MSMEs), which can get collateral free loans up to INR 1 crore through banks due to support provided by CGTMSE (Credit Guarantee fund trust for MSEs). Borrowers pay a small fee amounting to 1 percent guarantee fee and banks are willing to take on more risk due to the guarantee of the trust. A similar fund is also currently run by the Small Farmer Agribusiness Consortium (SFAC) for collateral free loans to Farmer Producer Organisation (FPOs).

A similar arrangement can be set up for micro irrigation, with the initial investment coming from the government and each farmer taking a loan could contribute a small percentage as guarantee to the fund therefore, keeping the fund sustainable.

A combination of the above steps would truly be a game changer to reduce subsidy reliance and therefore, the burden on the government while promoting a method of irrigation that will help build a sustainable agricultural ecosystem in India.

For the equipment manufacturer:

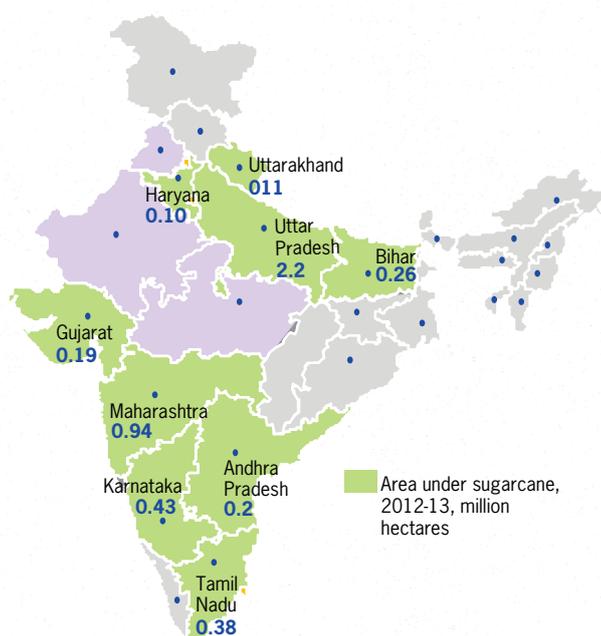
Loans to micro irrigation companies classified under 'Priority Sector Lending (PSL):

As a result of such a step, equipment manufacturers would become eligible for priority sector loans from banks and can get funding at a concessional rate, which in turn would enable lower interest cost for production of micro irrigation equipment. These benefits, would therefore bring down cost of the equipment itself as the savings would be transferred to the farmer and therefore reduce the subsidy bill for the government as well. There is precedent for such a grant since in 2015-16, loans to renewable energy companies were classified as PSL by the Reserve Bank of India (RBI).

Source – Stakeholder Interviews; Grant Thornton analysis

Game Changer #6: Crop focus: Making drip mandatory for sugarcane nationwide

Sugarcane is one of India's highest water-consuming crops. It has a year-round growing period and has an estimated water requirement of 237.50 cm, which is more than twice the requirement for crops such as cotton, wheat and even rice. Following the example set by Maharashtra and Karnataka, there is a need to make drip irrigation mandatory, which not only cuts water use in sugarcane but also actually increases its productivity, mandatory nationwide.



- Maharashtra and Karnataka, which together have 27 percent of the area under sugarcane in India, have enforced rules making drip method of irrigation mandatory for the cultivation of sugarcane in the states.
- Maharashtra government estimates that this step has the potential of saving up to 60 percent of water used in agriculture
- Karnataka government also estimates similar savings.
- Taking a crop-specific focus would yield quicker results with large areas brought under micro irrigation in shorter periods of time.
- The decision taken by these two state governments is great example of leadership and is a crucial first step. **Next crop focus could be on cotton, fruits and vegetables which are other major water guzzling crops. Oilseeds and Pulses can be other focus crops - with the current and future demand for oilseeds and pulses, the nation needs quick measures to increase productivity of these crops while saving precious natural resources**

Source – Agricultural Information Bank, Government of India; Stakeholder Interviews; Economic Times article dated 08 May 2015, The Hindu article dated 26 November 2014; Grant Thornton analysis

Game Changer #7: Command Area Development

Re-thinking of the command area development policy can also potentially be a game changer for the industry. While there are policies in place currently, there are a few amendments to these that could help the spread of micro irrigation.

Current policy framework for CADWM

- At least 10 percent or 40 hectares, whichever is maximum, of the Canal Command Areas (CCAs) of each project under micro irrigation in lieu of On Farm Development (OFD) with no restriction on the upper limit.
- Micro irrigation should be ensured to the maximum possible extent through change in cropping pattern, extension of command beyond areas under gravity flow. Micro irrigation is to include water efficient conveyance and field application devices like underground piping system, etc. for sprinklers, rain guns, pivots etc.
- Cost norm (Central share) under the XIIth plan is outlined as INR 25,000 per hectare or 50 percent of actual expenditure, whichever is minimum. Construction of infrastructure for micro irrigation is covered as a replacement for on-farm development (OFD). Estimated cost of infrastructure is taken as INR 50,000 per hectare.



Recommended policy framework for CADWM

- Detailed guidelines with components and automation for Micro irrigation in canal command areas.
- Revision in comprehensive unit cost – inclusive of infrastructure and Micro irrigation.
- Separate sub-budget for Micro irrigation in CCA's to be kept with Ministry of Water resources
- Central state sharing of 60:40 for Micro irrigation projects in CCA
- Inclusion of at least 5 pilot projects 100 percent under micro irrigation in each state

These amendments to the current policy, industry players feel, are real game-changers in terms of bringing more area under micro irrigation, aligning with the government's vision

Source –Stakeholder Interviews



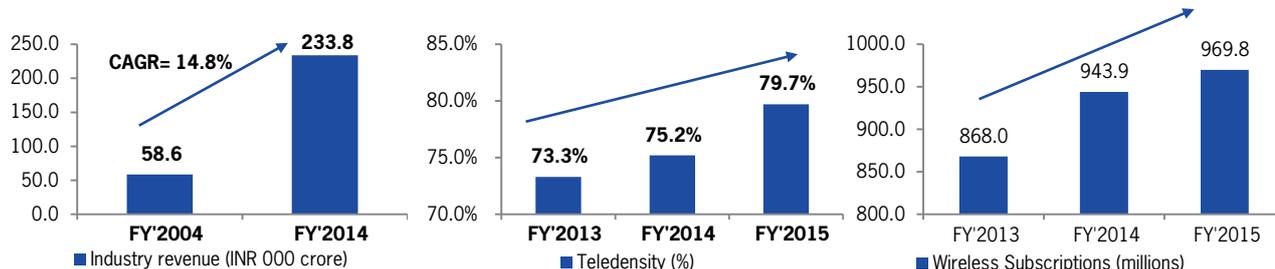
Game Changer #8: Infrastructure status to the micro irrigation industry

Granting the micro irrigation industry infrastructure status would be a great boost toward accelerating their growth. Infrastructure status would bestow the following benefits:

- Micro irrigation companies would become eligible for long-term financing from dedicated infrastructure lending institutions.
- Easier external commercial borrowings.
- Funding at concessional/cheaper rates.
- Extension of tax holiday under section 80-IA of the Income Tax Act.
- Lower interest cost for production of micro irrigation equipment.
- Financial institutions being able to source funds at cheaper rates, therefore being able to pass on concessional loans to farmers and projects.
- Long term financing available at concessional rates from world financial bodies.
- Income tax benefits that could be claimed for 10 years.
- These benefits would result in savings, which in turn, would bring down cost of micro irrigation systems.

Case in point: Indian telecom industry

The telecommunications sector and telecommunications service providers were granted infrastructure status in April 2013. The goals behind this grant were to boost investments in the sector and promote public-private partnerships (PPP) in the industry. Since the grant of this status, the telecom industry has seen strong growth. There are many tailwinds that have contributed to this growth such as an increasing per-capita income, changing lifestyles and stronger infrastructure, but policy support has played a strong role in this growth as well. Revenue of India's telecom sector grew by a CAGR of 14.8 percent between FY 2004 and FY 2014. Total subscriber base for the industry is expected to grow by 19.7 percent in FY 2016.



Note: Teledensity is defined as the number of telephone connects per 100 individuals.

Source – Stakeholder Interviews; 'Lessons of reform of the telecom sector', IIM-Ahmedabad, March 2015; Telecom Regulatory Authority of India (TRAI); Indian Brand Equity Foundation (IBEF); Grant Thornton analysis

Further recommendations: Other practically actionable steps that can be taken

In addition to game-changers discussed, there are a number of other steps that can be taken to further promote micro irrigation and other precision farming methods among the farmers:

Making water an economic commodity

As seen in earlier sections, water scarcity is an impending crisis facing the country. With agriculture taking up majority of the water resources, it is essential to promote the judicious use of the water. Taking a cue from countries such as Israel, that also face water scarcity, there is a need to consider making water an economic commodity and charging for its use:

- There could be a nominal amount that the government could charge for the use of water. The goal of the price charged is not to penalise but to promote careful usage.
- A system of water allocation, as seen in Israel could be seen as an alternative model wherein water resources are publically owned and are allocated to individual farms for recognised purposes.

Case in point:

Per capita water consumption in agriculture ranges from 4,913 kl to 5,800 kl per capita per year

Considering 11.86-14 crore farm owners

687,944 bn litres i.e. 90.4 percent of the 761 cubic kilometres of water consumption

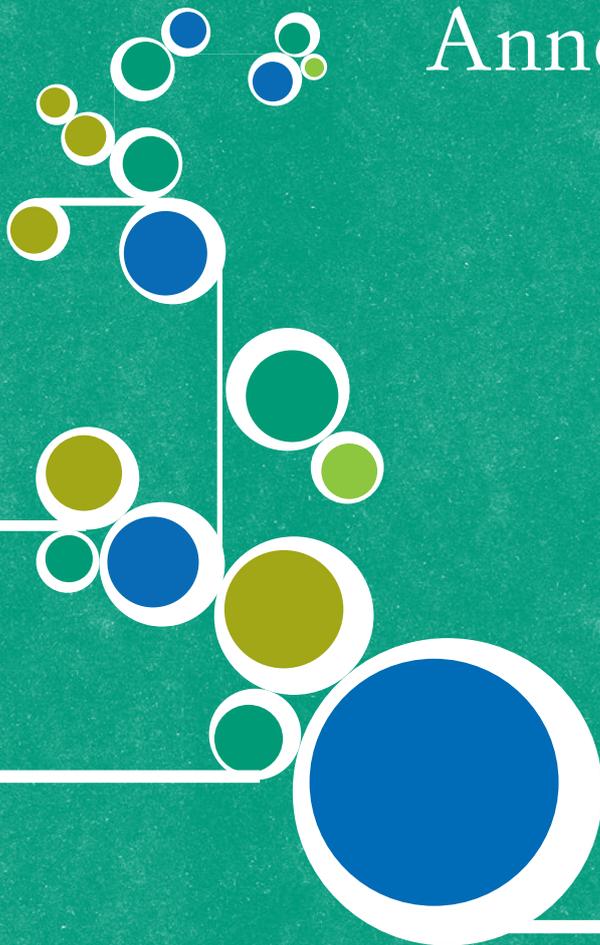
INR 687 bn annual revenue, which can be routed back to ease financing for farmers for installation of micro irrigation systems.

Charging just INR 1 per kilo litre

Region and crop-specific solutions

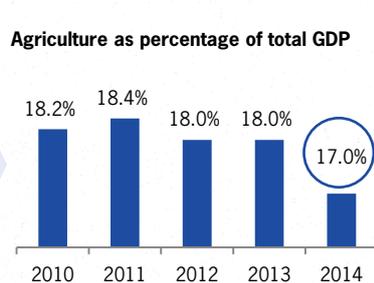
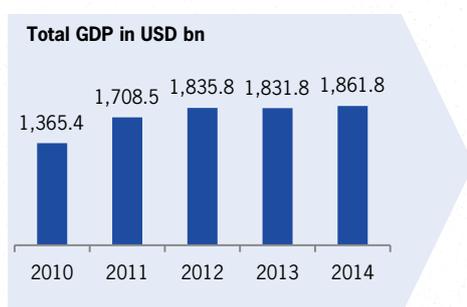
Micro irrigation suppliers should devise region and crop-specific packages. For example, a supplier could provide a “sugarcane in Maharashtra package” or “cotton in Punjab package” where the company would prescribe the equipment and guidelines for effective use of these for the specific region and crop in question.

Annexures



Annexure

Agriculture sector: Key facts and figures



Key facts	
Total geographical area	328.7 Mha
Net cropped area under agriculture	142.0 Mha
Grossed cropped are under agriculture	198.0 Mha
Net area under irrigation	65.3 Mha

Government of India envisions “Faster, more inclusive and sustainable growth” and envisages technology playing a crucial role in this endeavour. This is an important perspective, considering agriculture still contributes around 17 percent to the GDP of the country and is the principal source of livelihood for over 60 percent of rural households.



Indian agriculture is facing a number of challenges that need to be addressed to ensure the government’s vision can be fulfilled. These challenges include the rising urbanisation that is leading to a shortage of agricultural workers, low productivity, an impending water crisis and ensuring food security in a country with a steadily growing population.

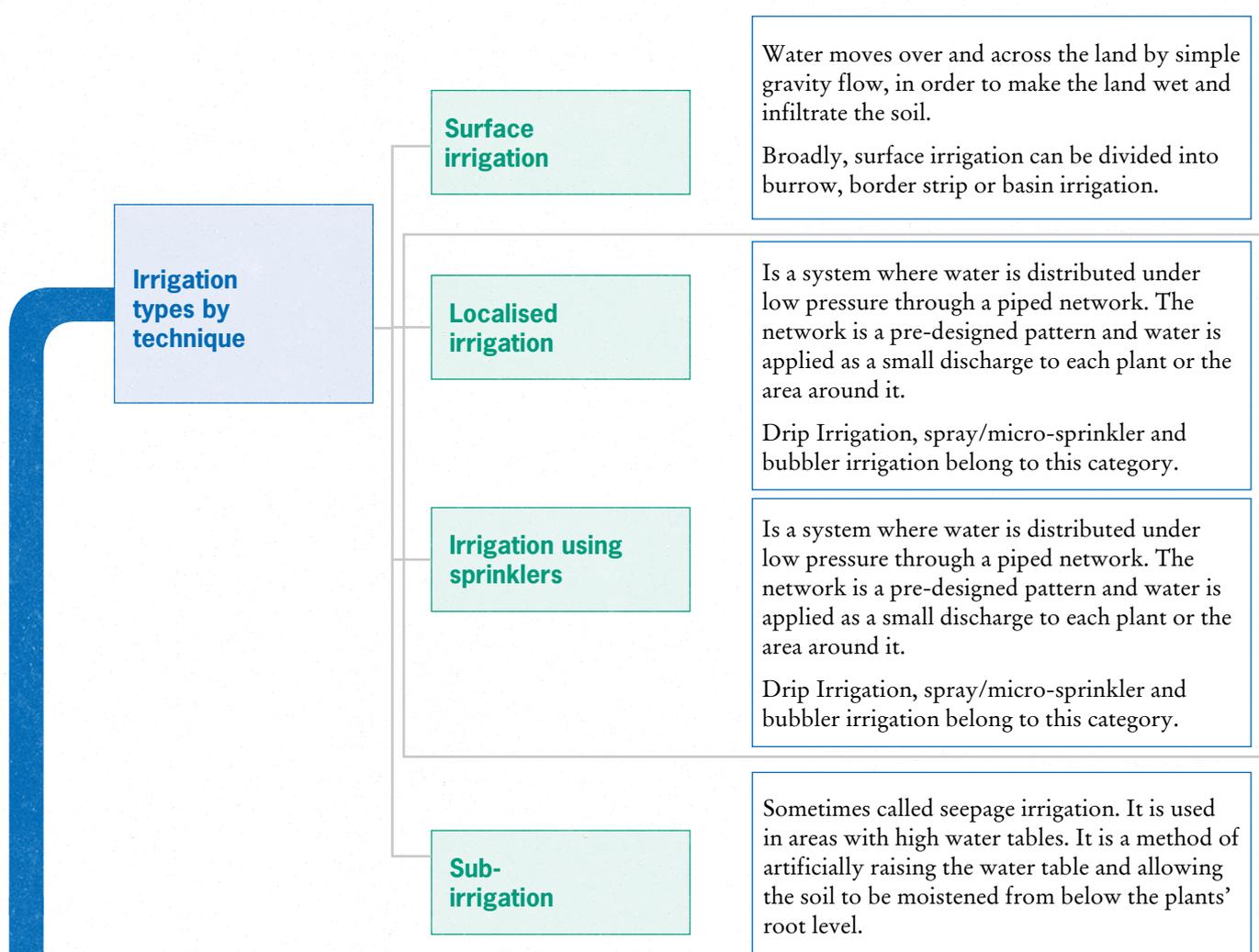


Micro irrigation, with its benefits such as savings of inputs (water, electricity, labour) and higher productivity, will play a key role in the industry to ensure that the sector is well-equipped to tackle the challenges of the future while meeting the demands of a growing economy.

Source-Department of Agriculture and Cooperation, Ministry of Agriculture

Irrigation: An introduction

Irrigation is used to deliver water to crops, in order to help them grow. It also protects crops, improves yields, suppresses weed growth and prevents soil consolidation. India has a net area under agriculture of 142.0 mn hectares with a net irrigated area of 65.3 mn hectares. With the large land area, uneven distribution of rain, different water requirements of different crops grown and the tropical climate leading to high evaporation rates, the need for increasing the gross irrigated area in India is of paramount importance. The major forms of irrigation are as described below:



Source-Ministry of Statistics and Programme Implementation (MOSPI) website

Micro irrigation systems and their components

Micro irrigation systems are essentially of two types: Drip irrigation and Sprinkler irrigation.

The focus of the drip irrigation system is irrigating the root zone of the crop, rather than the surface itself. The system allows for application of frequent but small quantities of water and therefore, a continuous supply of water throughout the day. One key reason for the superior performance of such a system is the fact that such a system can neutralise the nutrients and level of water available to the crops, in contrast to the traditional surface irrigation systems, under which, plants face stress as a result of feast and famine cycles.

Sprinkler irrigation, on the other hand, is a method of applying water akin to natural rainfall. Water, distributed through a system of pipes, is sprayed on the crops and falls as smaller water drops. This system does not apply water directly to the soil or root zone.

Components used

Components of a **Drip Irrigation** system include: (but not limited to)

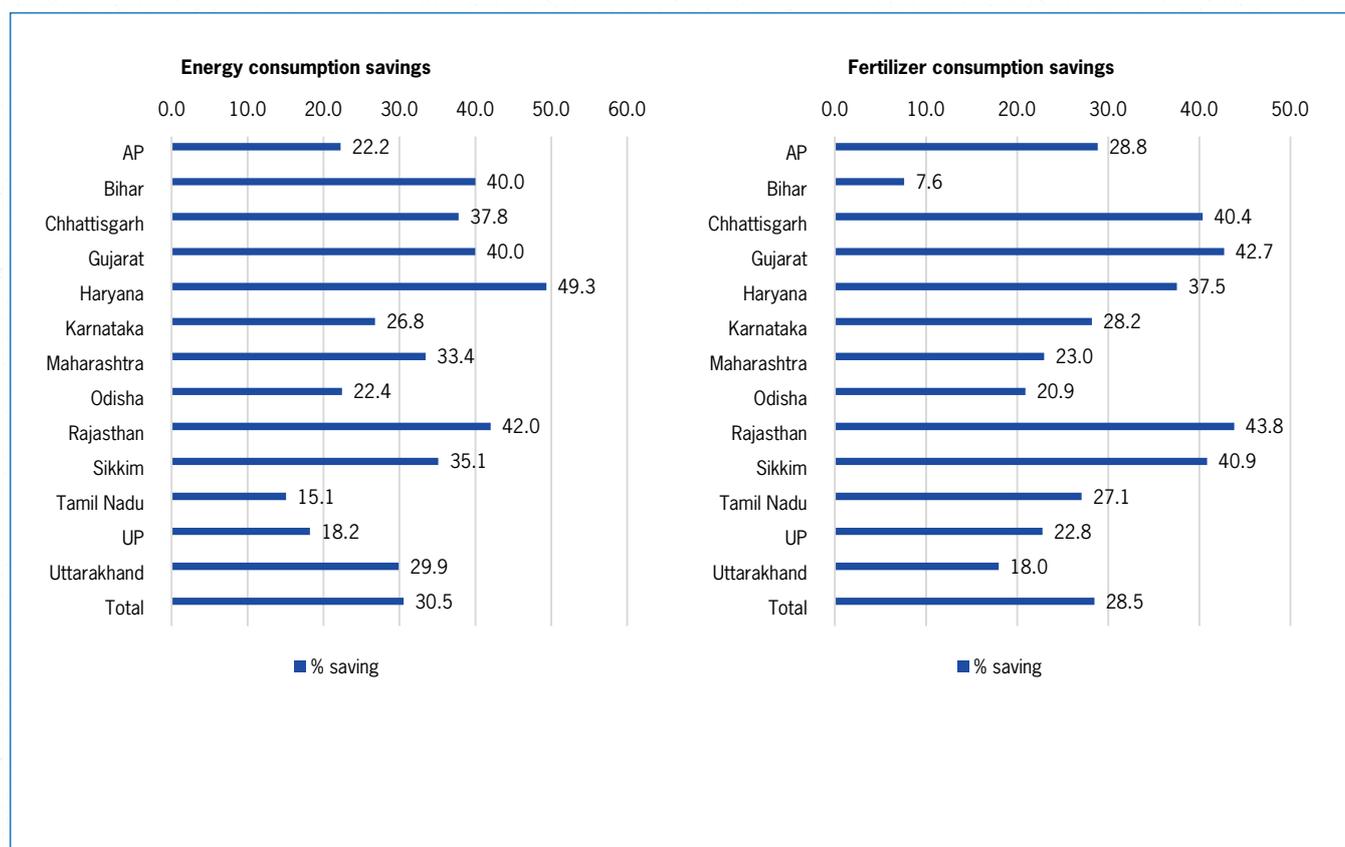
- **Controller/Timer:** Controls watering cycle, directing when, how long and how often the system operates.
- **Backflow Preventer:** prevents water from being siphoned back into drinking water.
- **Valves:** Used to turn water on/off.
- **Filter:** Keeps dirt and debris from clogging the system
- **Pressure Regulator:** reduce incoming water pressure to the ideal pressure for the system.
- **Pipe:** Carries water through the system.
- **Micro-Tubing:** delivers water from the emitters to the plants.
- **Emitters:** deliver water at a slow, consistent rate.
- **Flush Valve/Cap:** attached to the end of each irrigation line so that dirt and debris can be flushed out.

Components of a **Sprinkler Irrigation** system include: (but not limited to)

- **Prime Mover/Pump Suction Pipe:** required for lifting water from the source and pushing it through the distribution system under sufficient pressure.
- **Main Line:** carries water from the source (pumping unit) to the various parts in the field.
- **Sub-Main:** carries water from the main to the lateral lines.
- **Lateral Lines:** carries water from the main line or sub lines to the sprinkler head through the riser pipe. These are portable and equipped with quick coupling devices.
- **Sprinkler Head:** used for spraying water on to the field. These may be rotating head, fixed head or perforated type.
- **Sprinkler Lead:** classified based on pressure: low operating pressure sprinkler intermediate pressure sprinkler or high pressure sprinkler.

Impact of micro irrigation: Energy and fertiliser saving

Direct fertiliser application to the root increases the efficiency of usage. Additionally, due to the smaller power units required as a result of lower water requirement and thus lower number of hours of irrigation, very significant electricity savings per hectare have been estimated. Energy and fertiliser efficiency translate into significant cost savings.¹²

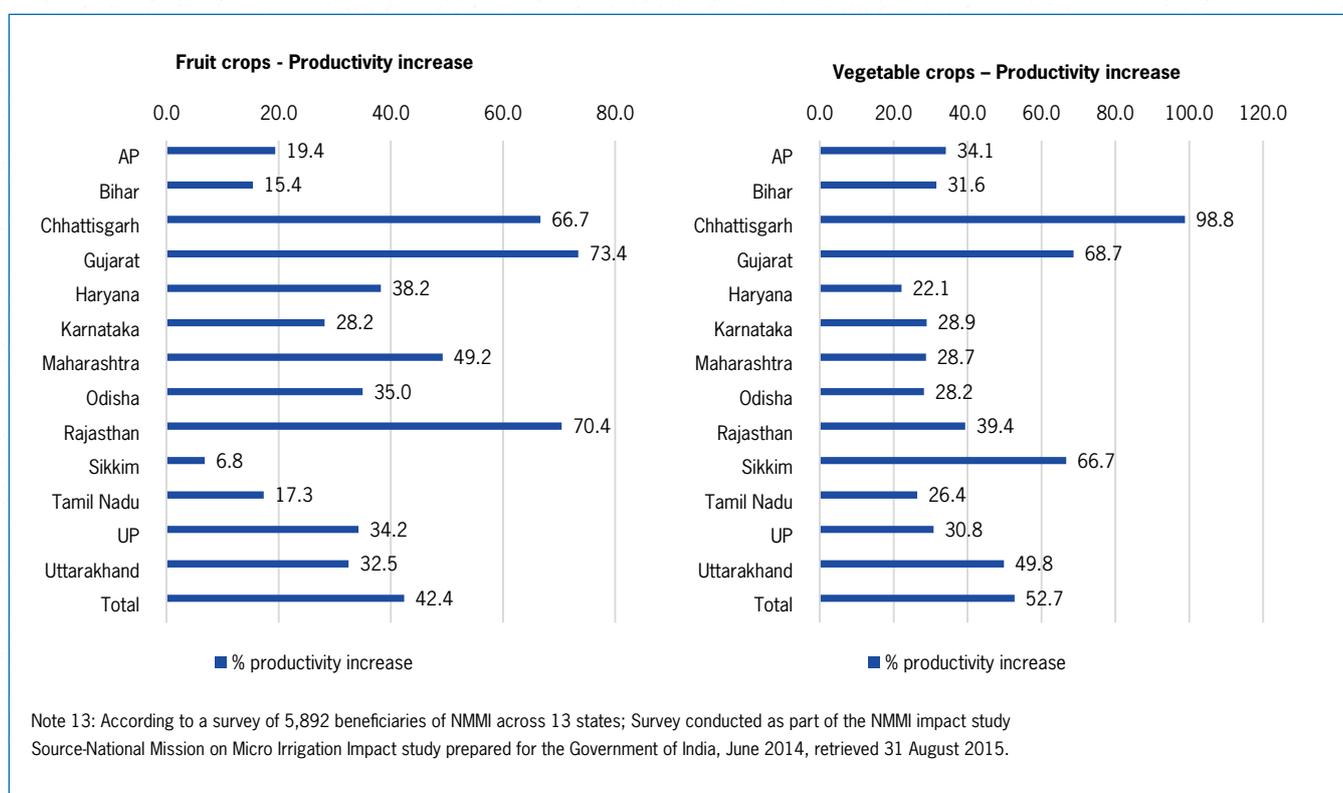


Note 12: According to a survey of 5,892 beneficiaries of NMMI across 13 states; Survey conducted as part of the NMMI impact study
Source-National Mission on Micro Irrigation Impact study prepared for the Government of India, June 2014, retrieved August 31, 2015



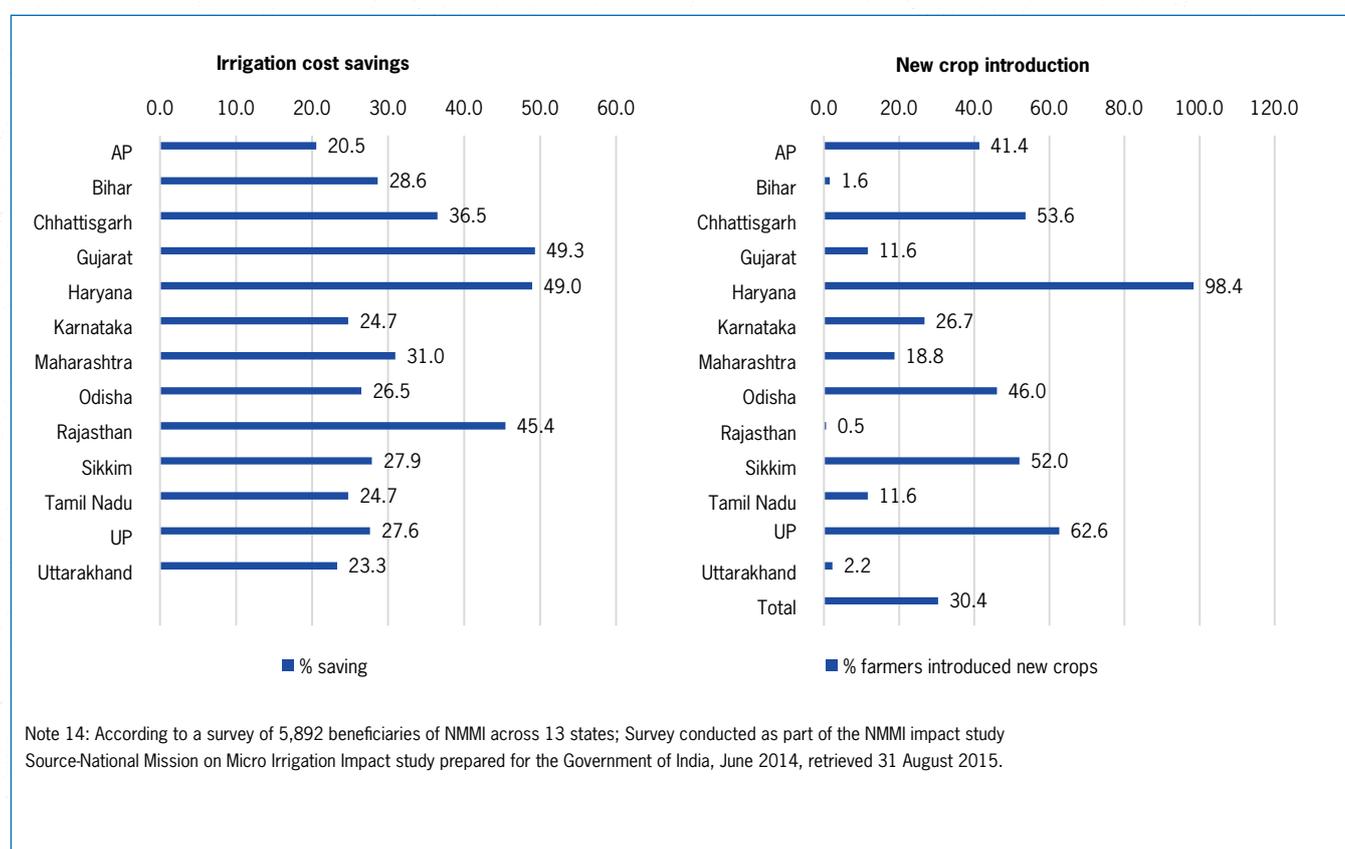
Impact of micro irrigation: Productivity increase

As a result of the controlled and targeted application of water, soil moisture can be maintained at optimum levels. This leads to an increase in the productivity of the crops. Across various studies, it has been found that the adoption of micro irrigation systems helped boost the yield of fruit as well as vegetable crops. An average increase of 42.3 percent in the productivity of fruit crops and 52.8 percent increase in the productivity of vegetable crops was seen. This in turn helps increase incomes of the farmers.¹³



Impact of micro irrigation: Irrigation cost reduction and new crop introduction

As a result of the improved water use efficiency through judicious use in micro irrigation systems, the overall irrigation cost has been shown to be brought down. An average reduction of 31.9 percent was seen. Gujarat, Haryana and Rajasthan were the leading states with farmers in Gujarat seeing their irrigation cost almost cut in half. Farmers also showed an increase in the new crops introduced on the farms as a direct result of adoption of micro irrigation. 30.4 percent farmers introduced new crops.¹⁴



Global status: Spotlight on Israel

Country Overview:

Israel is one of the most densely populated countries in the world. However, only 20 percent of the land is arable and half of that has to be irrigated. More than half of the country is arid or semi-arid, and the rest of the country is dominated by steep hillsides and forests.

The country also has scattered rainfall, with the northern region receiving a generous 700mm per year, the central region only 400-600mm annually and the south a meagre 25mm annually.

Addressing issues through technology :

- 80 percent of farms in the country are owned and run by kibbutzim (collective villages) and moshavim (cooperative villages).
- Kibbutzim often develop, design, manufacture and market their own agri-technology inputs. Drip irrigation was developed in such a kibbutz, which subsequently gave birth to Netafim.
- These farmers work closely with the country's ten agricultural research institutes including the Agricultural Research Organisation (ARO), part of the Ministry of Agriculture. 25 professional and marketing associations also fund R&D, as do various government bodies and hundreds of private firms in the biotechnology and computer software sectors.

Performance and reasons for success:

- There is a real focus, as a result of the climatic conditions and scarcity of natural resources, in Israel on the concept of sustainable agriculture. These unique conditions have also necessitated a close collaboration between farmers, scientists, the government and localised agricultural concerns.
- The Ministry of Agriculture is dedicated to the efficient use of water and treated waste water and promoting water recycling. The ministry allocates grant to farmers who practice sustainable agriculture practices such as drip irrigation.
- Free-market forces also play a crucial role in the country, taking on turnkey projects that incorporate more efficient water use, irrigation systems, crop and seed choice.
- Strong political will with a focus on the concept of sustainable agriculture and special emphasis on R&D has resulted in virtually all irrigation being done through drip in a matter of four decades.

Source –Stakeholder interviews; Grant Thornton analysis; United Nations profile on Israel



Government schemes on micro irrigation: Overview (1/3)

Centrally Sponsored Scheme on Use of Plastic in Agriculture (1992):

The centrally sponsored scheme was introduced during the eight plan to popularise plasticulture applications such as drip irrigation, mulching and green house all over the country. INR 81 crore was provided for this scheme during 1997-98.

- Pattern of assistance (from 1996-97) for drip installation was 90 percent of the cost of the system or INR 25,000 per hectare, whichever is less, for small and marginal farmers, SC/ST farmers and women farmers.
- For the other farmers the assistance cap is 70 percent of the cost of the system or INR 25,000 per hectare, whichever is less.
- For setting up drip demonstrations farm subsidy was INR 22,500 per hectare or 75 percent of the cost per hectare, whichever is less.

Rural Infrastructure Development Fund (1995):

National Bank for Agriculture and Rural Development (NABARD) initiated the Rural Infrastructure Development Fund in 1995-96, with a corpus of INR 2,000 crore to provide loans to the state governments for financing rural infrastructure projects and 31 activities, including irrigation

- Cumulative amount sanctioned till 31 March 2007 was INR 61,540 crores.
- Under the scheme, NABARD provides assistance at fixed interest rate (6.5 percent currently) for a period of 7 years.
- Under the programme, NABARD sanctioned INR 230 crore for the Andhra Pradesh Micro Irrigation Project under its RFD – XVII to increase the area under micro irrigation in the state.
- It has earlier also sanctioned INR 19 crore for increasing micro irrigation area in Punjab.

Accelerated Irrigation Benefit Programme (AIBP) (1996):

Launched in 1996-97 by the Government of India with an outlay of INR 900 crore (subsequently revised to INR 500 crore) to accelerate the completion of selected on-going irrigation projects.

- Initially, the policy had two components: first was designed to include major/multi-purpose projects each with a cost of over INR 1,000 crores (later revised to INR 500 crores) and the project being beyond the resource capability of the states. Second was for irrigation projects where, with just a little additional resource, the projects could be completed and farmers could get assured water supply to the extent of one lakh hectares over the next four seasons (2 years).
- Funding for AIBP was in the form of loan to the states on 50 percent matching basis. In 1996-97, INR 500 crores was released to various states and during the 1997-98 and 1998-99 annual plans outlays of INR 1,300 crores and INR 1,500 crores respectively, were approved.

Source –Stakeholder interviews; Grant Thornton analysis; United Nations profile on Israel



Government schemes on micro irrigation: Overview (2/3)

Integrated Scheme of Oilseeds, Pulses, Oil-Palm and Maize (ISOPOM) (2004):

Technology mission on oilseeds was launched by the central government to improve production of edible oils in the country. Subsequently, pulses, oil-palm and maize were also brought within the purview of the mission. During the tenth plan (2004), Department of Agriculture and Cooperation restructured the development programmes of these crops into a centrally sponsored integrated scheme (ISOPOM).

- Financial assistance is provided to farmers for the purchase of sprinkler systems and water distribution pipes, besides other activities to encourage farmers to grow pulses.
- Assistance mainly provided for women farmers taking up cultivation of oilseeds, pulses or oil palm.
- Assistance is up to 50 percent of the cost of the sprinkler sets or INR 15,000 whichever is lesser.
- In case of irrigation pipes, assistance was set as INR 15,000 for 210 meters of pipe and 50 percent of the cost of drip systems used for oil palm cultivation.
- State governments advised to ensure that of the total assistance, at least 15 percent went to SC farmers and 7.5 percent to ST farmers.
- 8,790 sprinkler sets were distributed for oilseeds, 5,086 sets for pulses and 13,235 sets for maize under the scheme in 2005-06 and 909 hectare was brought under drip irrigation for oil palm cultivation in the same period, although these fell short of the targets set.

Integrated Scheme of Oilseeds, Pulses, Oil-Palm and Maize (ISOPOM) (2004):

The Task Force on Micro Irrigation (2004) indicated a potential of 69.5 Mha potential with only 2 Mha covered until 2006. The centrally sponsored scheme on MI was launched in January 2006 during the tenth plan for implementing drip and sprinkler irrigation in the country.

- Scheme was to be implemented by an identified agency at the district level with the focus on horticulture crops being covered by the National Horticulture Mission (NHM).
- Of the total cost of the MI system, 40 percent of the cost covered by the central government, 10 percent by the state government (making the subsidy 50 percent of the cost of the system).
- All categories of farmers were eligible for the assistance, with at least 2 percent small and marginal farmers and 30 percent women farmers.
- Subsidy could be availed for 5 Ha.
- The scheme aimed at achieving better water use efficiency, increase the crop yields, provide savings in fertiliser consumption, reducing weeding costs and inter-cultural operations with initial targets to cover an area of 1.5 Mha under drip and 0.5 Mha under sprinkler irrigation.
- INR 240.48 crores were released under the scheme 2005-06 to cover an area of 0.21 Mha, INR 337 crores for 0.33 Mha in 2006-07 across 16 states, INR 550 crore to cover 0.4 Mha in 2007-08.
- NCPAH was responsible for coordinating the scheme, the Executive Committee on MI (ECMI) approved the state action plans. State Micro Irrigation Committees coordinated the scheme at state level and District Micro Irrigation Committees was responsible for district-level implementation.

Source - An Analysis of Resource Conservation Technology: A case of Micro-Irrigation (Drip Irrigation), Centre for Management in Agriculture, Indian Institute of Management, Ahmedabad, August 2014.

Government schemes on micro irrigation: Overview (3/3)

National Horticulture Mission (NHM) (2005):

Was launched during 2005-06 as a centrally sponsored scheme to promote holistic growth of horticulture through an integrated approach of water management, protected cultivation, nutrition and pest management, post-harvest, processing and marketing.

- Aimed at increasing the production of horticulture produce from 153 MT to 300 MT by 2012.
- This also included micro irrigation as a primary strategy for growth of horticulture.

Technical Mission for Integrated Development in North-East States:

Based on an end-to-end approach taking into account the whole spectrum of horticulture development, in a holistic manner, integrating backward and forward linkages,

- INR 400 crore was assigned during 2005-06 for promoting micro irrigation techniques among all categories of farmers.
- Scheme also being implemented in J&K, Himachal Pradesh, and Uttaranchal besides the north-east states.

Rashtriya Krishi Vikas Yojna (RKVY) (2007):

RKVY, a.k.a National Agriculture Development Plan (NADP), was launched in 2007 to improve growth in agriculture and its allied sectors.

- Focused on strategies to achieve an agriculture growth rate of 4 percent. The scheme aimed to incentivise state spending in the agriculture sector by providing financial assistance for expenditure incurred over and above the average expenditure of the previous years
- Government further incentivised use of technology like micro irrigation to further improve productivity of horticulture crops and vegetables.
- States are required to make a State Agriculture Plan (SAP) and a District Agriculture Plan (DAP). Funding provided based on these plans.
- Central government, also introduced the Vegetable Initiative for Urban Clusters under the RKVY. Central government has allocated INR 300 crores for the financial year 2011-12.

National Food Security Mission (2007):

National Development Council (NDC) launched this centrally sponsored scheme during 2007.

- Aimed at increasing the production of some key crops for India by the end of the eleventh five year plan (2011-12), such as:
- Production of rice by 10 mn tons, wheat by 8 mn tons and pulses by 2 mn tons.
- The scheme could also be used for funding micro irrigation.

Source - An Analysis of Resource Conservation Technology: A case of Micro-Irrigation (Drip Irrigation), Centre for Management in Agriculture, Indian Institute of Management, Ahmedabad, August 2014.

Government schemes: National Mission on Micro Irrigation (NMMI) (2010)

Background and nature of the scheme

The micro irrigation scheme being implemented by the Ministry of Agriculture (MoA) since 2005-06 to promote drip/sprinkler irrigation was re-introduced as the National Mission of Micro Irrigation (a national mission) during the 11th plan period (2010). Under the centrally sponsored scheme, 40 percent of the total cost of installing the micro irrigation system would be borne by the central government, 10 percent by the state government, making it an overall subsidy of 50 percent up to a limit of 5 Ha per beneficiary family. The remaining cost would be borne by the beneficiary. While all category of farmers could get assistance under the policy, small marginal farmers could receive additional assistance equivalent to 10 percent of the cost of the micro irrigation system. Also, 75 percent of the cost of drip and sprinkler demonstration for a maximum area of 0.5 Ha per demonstration would also be borne by the central government. Assistance would be made available for both drip and sprinkler for wide-spaced and close-spaced crops. Assistance for sprinkler would be available only for those crops for which, drip is uneconomical. Assistance would also be made available for irrigation systems for protected cultivation (including greenhouses, poly-houses and shade net structures). Assistance would also be available for the implementation of advanced technologies such as fertigation with fertiliser tank/venture systems, sand filters/media filters, hydroclone filters/sand separators and other types of filters and valves required for the micro irrigation system.

Participants

Panchayati Raj Institutions (PRIs)	Involved in promoting the scheme and identifying priority areas
Executive Committee of NMMI	Responsible for reviewing progress of policy and approving annual action plans of the states
State Micro Irrigation Committee (SMIC)	Responsible for overseeing implementation in the districts
District Micro Irrigation Committee (DMIC)	Responsible for overseeing implementation in the districts
NCPAH	Responsible for coordinating and monitoring programme in different states

Implementation

- At the state level, would be the responsibility of an Implementation Agency (IA), duly appointed by the state government. Funds would be released directly to the IA on the basis of plans for each year.
- IA would prepare the annual action plan for the state on the basis of district plans and get it forwarded by the SMIC for the approval of the NMMI executive committee.
- Payment would be made through RTGS to the IA, who would then transfer the funds to the identified districts. DMIC would provide funds to the system suppliers through the farmers/beneficiaries.
- Registration of system manufacturers would be done by the SMIC for use in the districts.
- Supply of good quality systems with BIS marking and proper after-sale services being paramount.

Source – National Committee on Plasticulture Applications in Horticulture (NCPAH) website

Government schemes: Centrally sponsored schemes timeline

National Mission on Micro Irrigation:

In June 2010, the Centrally Sponsored Scheme (CSS) on micro irrigation was up-scaled to the National Mission on Micro Irrigation, which continued till 2013-14.

Pradhan Mantri Krishi Sinchayee Yojna:

From 01 April 2015, micro irrigation component of OFWM has been subsumed under the Pradhan Mantri Krishi Sinchayee Yojna (PMKSY). It will implemented as a centrally sponsored scheme on micro irrigation under PMKSY during the financial year 2015-16 as per the same pattern of assistance and cost norms as were prevailing under OFWM, unless revised.

In FY 2015-16, funding pattern between central and state government PMKSY has been fixed as 50:50 percent.

Centrally Sponsored Scheme on micro irrigation:

Launched in January, 2006 by the Department of Agriculture and Cooperation, Ministry of Agriculture. The aim was to enhance water use efficiency in the agriculture sector by promoting appropriate technological interventions (such as drip and sprinkler systems) and also to encourage farmers to use these water saving technologies.

National Mission on Sustainable Agriculture:

NMMI was subsumed under the National Mission on Sustainable Agriculture. In the financial year 2014-15, it was implemented under NMSA as On Farm Water Management (OFWM).

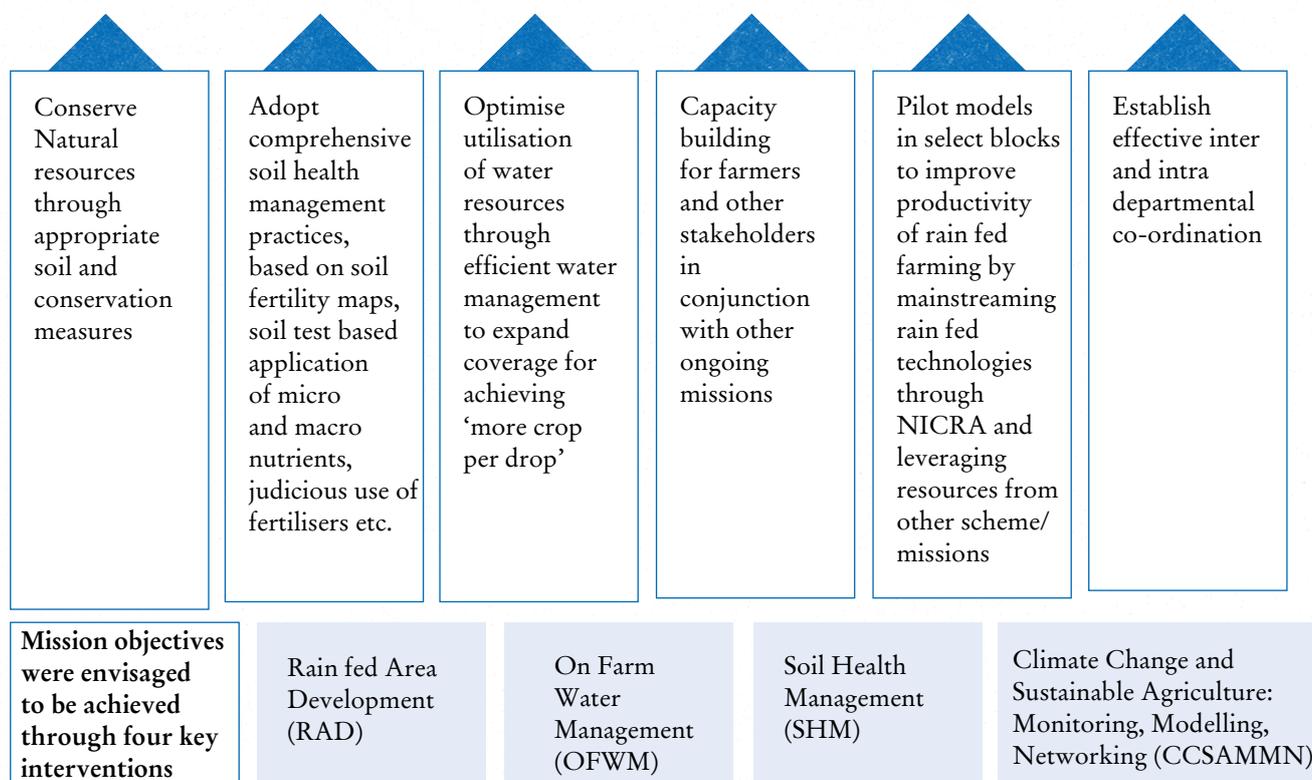
National Mission for Sustainable Agriculture (NMSA): Introduction

Background and nature of the scheme

This mission was formulated for enhancing agricultural productivity, especially in rain fed areas focusing on integrated farming, water use efficiency, soil health management and synergising resource conservation. It was devised based on the basic premise that sustaining agricultural productivity depends on quality and availability of natural resources such as soil and water. NMSA derived its mandate from Sustainable Agriculture Mission, one of the eight missions outlined under the National Action Plan on Climate Change (NAPCC). The architecture of the mission was designed by converging, consolidating and subsuming all ongoing as well as newly proposed activities/programmes related to sustainable agriculture with a special emphasis on soil and water conservation, water use efficiency, soil health management and rain fed area development.

The mission was launched in 2014, with an expected outcome of “transforming Indian agriculture into a more climate resilient production system through suitable adaptation and mitigation measures in domains of both crops and animal husbandry.”

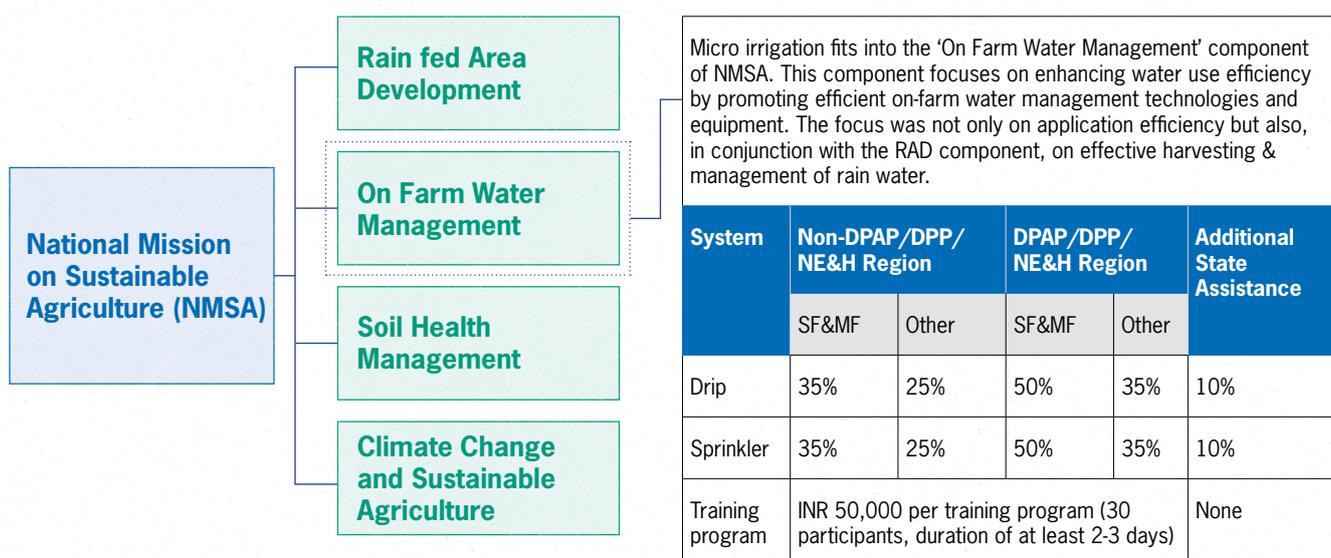
Mission objectives: Make agriculture more productive, sustainable, remunerative and climate resilient by promoting location specific integrated/composite farming systems.



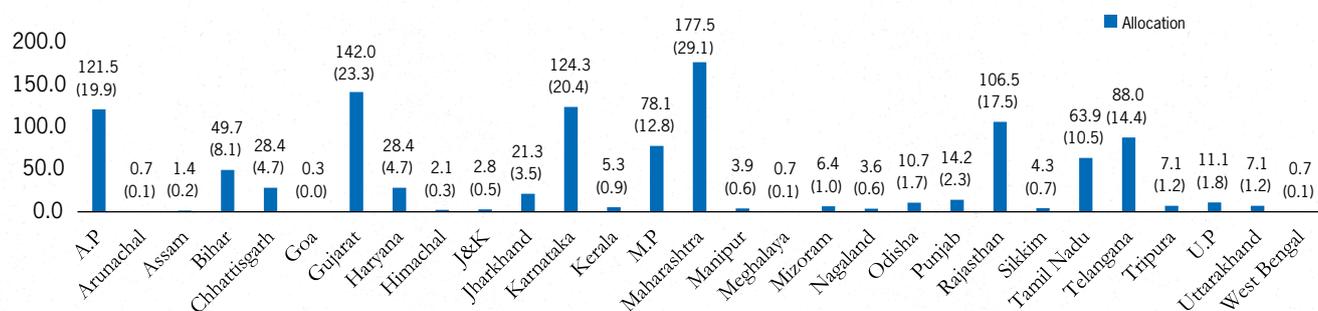
NMSA programme architecture: Agencies and their composition



Micro irrigation in the Nation Mission for Sustainable Agriculture (NMSA)



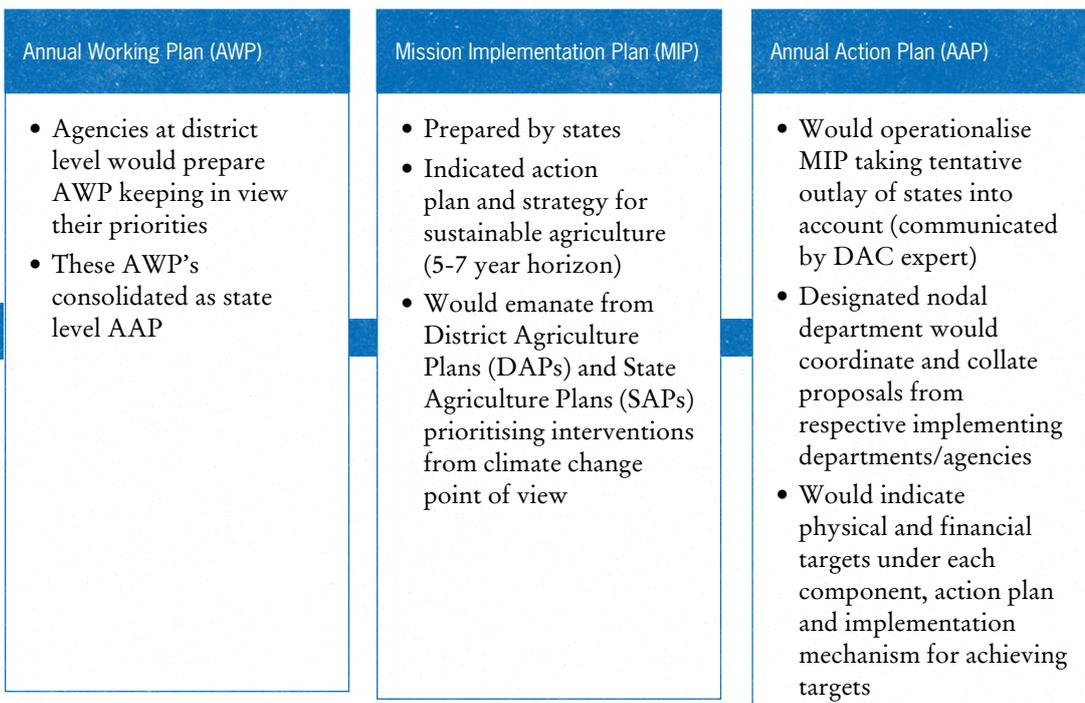
State-wise allocation of Funds to OFWM under NMSA in 2014-15 in INR crore(US\$ mn)



A total of INR 1,111.82 crore (US\$ 182.3 mn) was allocated for On Farm Water Management under NMSA for the year 2014-15.

NMSA implementation and analysis:

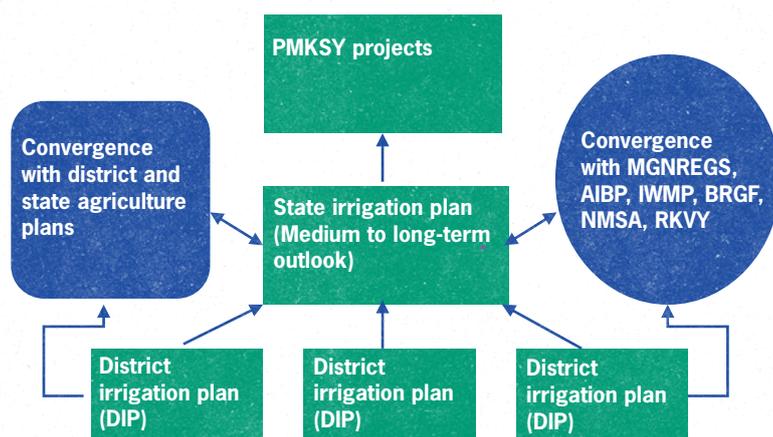
Scheme Implementation



Consequent to approval of AAP, funds released to nodal department or designated implementing agency notified by state.

State Department of Agriculture would have the overall responsibility of implementing NMSA in a mission mode at state level.

Pradhan Mantri Krishi Sinchayee Yojna: Implementation structure

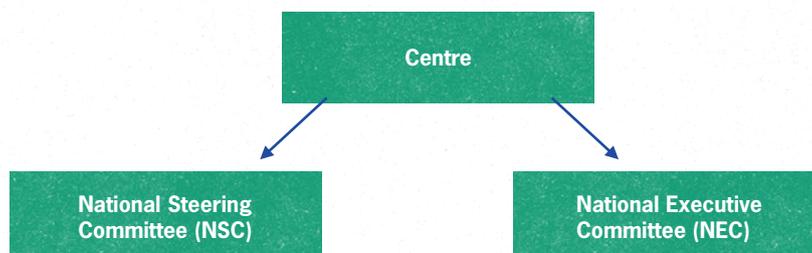


Under the scheme, Ministry of Rural Development will focus on rain water conservation and construction of farm ponds, water harvesting structures, small check dams and contour buildings under the Integrated Watershed management Programme (IWMP). Ministry of Water Resources will undertake various measures for completion of ongoing projects and construction of diversion canals and field channels under the Accelerated Irrigation Benefit Programme (AIBP). While the Agricultural Ministry will promote efficient water conveyance and precision water application devices such as drips, sprinklers and rain-guns in the farm. Ministry will also focus on construction of micro irrigation structures to supplement source creation activities and secondary storage structures at the tail end of the canal system (to store water when available in abundance or from perennial sources) for use during dry periods. Additionally, promote capacity building, training for encouraging potential use of water sources through technological, agronomic and management practices.

Decentralised state level planning and convergence model

As per the guidelines, a district level (and if need be, sub-district level) water use plan would be drawn up in order to achieve 'convergence of investments in irrigation at the field level', and form the cornerstone of the scheme. DIPs will identify gaps in the irrigation infrastructure after taking into consideration District Agriculture Plans (DAPs) already prepared for the Rashtriya Krishi Vikas Yojna (RKVY). This means taking in to consideration the irrigation infrastructure currently in place and resources that would be added during the XIIth plan from other ongoing schemes (central and state), such as, Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS), Rashtriya Krishi Vikas Yojna (RKVY), Rural Infrastructure Development Fund (RIDF), Member Parliament Local Area Development (MPLAD) Scheme, Member Legislative Assembly Local Area Development (MLALAD) Scheme, Local body funds etc. The gaps identified under the Strategic Research and Extension Plan (SREGP) will be made use of in the preparation of DIP. Preparation of DIP will be taken up as a joint exercise of all participating departments and approved DIPs will subsequently be added to the SIP (State Irrigation Plan).

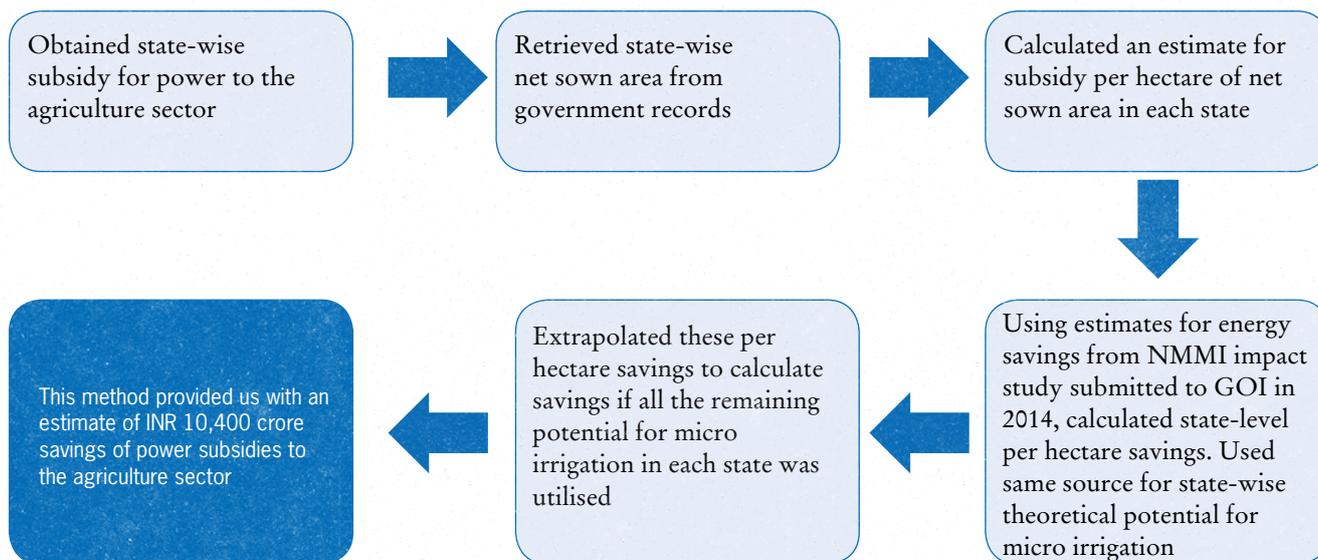
PMKSY programme architecture: Agencies and their composition



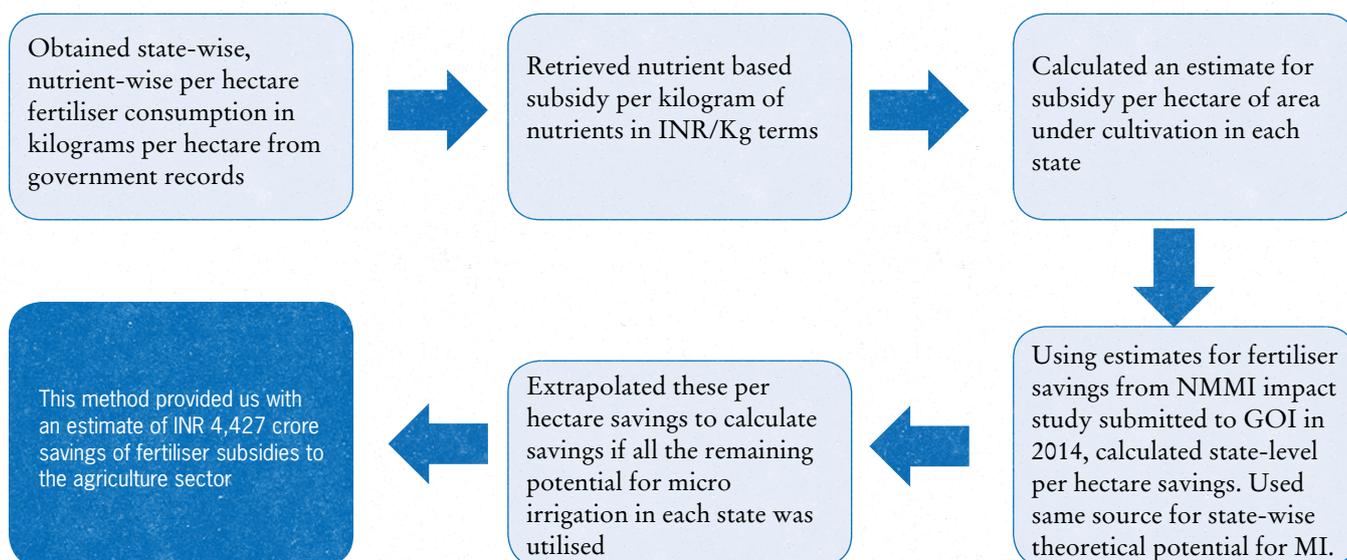
State	State Agriculture Department	<ul style="list-style-type: none"> • It is the State Level Nodal Agency (SLNA) • Can include additional members to address the mandate of the PMKSY
	State Level Sanctioning Committee (SLSC)	<ul style="list-style-type: none"> • Already constituted under RKVY, chaired by the Chief Secretary of the state • Existing SLSC shall be strengthened to include members from relevant departments (e.g. irrigation/water resources, watershed, rural development/rural works, forest and the SLNA) and will be supported by the Inter Departmental Working Group (IDWG)
	Inter Departmental Working Group (IDWG)	<ul style="list-style-type: none"> • Chaired by the Agriculture Production Commissioner/Development Commissioner • Comprising of Secretaries of all the line departments concerned with the water sector (agriculture, horticulture, water resources/irrigation etc.)
District	District Level Implementation Committee (DLIC)	<ul style="list-style-type: none"> • Chaired by the Collector/District Magistrate (DM) • Will comprise the CEO of the Zila Parishad/PD DRDA, Joint Director/Deputy Director of the departments of horticulture, agriculture, rural development, surface and groundwater resources, irrigation and any other line department in the district, Direct Forest Officer, Lead Bank Officer of the district • The Project Director, Agriculture Technology Management Agency (ATMA) will be the Member Secretary of the DLIC • DLIC may have two progressive farmers and a leading NGO in the district, if any

Government savings of input subsidies calculation: Methodology

Power subsidy savings calculation



Fertiliser subsidy savings calculation



Credits and Acknowledgement

Grant Thornton	FICCI
Authors Rahul Kapur Sukrit Gulati Swarnima Chouhan	Acknowledgement Ruchira Saini
Editorial and review Devesh Chandra Srivastava Samridhi Jamwal	
Design Mrityunjay Gautam Rakshit Dubey	

For further information, please contact:

Rahul Kapur

Partner

Grant Thornton India LLP

M: +91 98112 10501 | **E:** Rahul.Kapur@in.gt.com

Swarnima Chouhan

Manager

Grant Thornton India LLP

M: +91 95604 94666 | **E:** Swarnima.Chouhan@in.gt.com

Acknowledgement

A special note of thanks to Shree Sanjeev Chopra, IAS, Ex-Mission Director, Ministry of Agriculture, National Horticulture Mission, Department of Agriculture and Cooperation, Shree Krish S. Iyengar, National Committee on Plasticulture Applications in Horticulture (NCPAH), Shree Naresh Modi, National Committee on Plasticulture Applications in Horticulture (NCPAH), Shree Chiranjeev Choudhary, Andhra Pradesh Micro Irrigation Project (APMIP) and Shree R.K Sugoer, Gujarat Green Revolution Company (GGRC) for their inputs and expert guidance.

We would also like to acknowledge the support of:

K. Radha Krishna, Nagarjuna Fertilizers and Chemicals Ltd.	Sanjeev Mohoni - EPC Industries Ltd
M.S Mruthyunjay, Sujay Irrigations Pvt. Ltd.	Satish Ghatpande - Fimi Irrigation India Pvt Ltd
Pravin Lath- Nimbus Pipes Ltd	Shrikant Goenka, Premier Irrigation Adritec Pvt Ltd
Primal Oswal, Harvel Agua India Pvt. Ltd.	Vijay Chhabria - Finolex Plasson Industries Pvt Ltd
Randhir Chauhan, Netafim Irrigation India Pvt. Ltd.	

for providing valuable suggestions and guidance throughout the period of this project.

Disclaimer

This report has been prepared from various public sources and interaction with stakeholders, the information thus received from these sources is believed to be reliable. This report considers data from various sources with a cut-off date of December 2015.

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About Federation of Indian Chambers of Commerce & Industry

Established in 1927, FICCI is the largest and oldest apex business organisation in India. Its history is closely interwoven with India's struggle for independence, its industrialisation, and its emergence as one of the most rapidly growing global economies.

A non-government, not-for-profit organisation, FICCI is the voice of India's business and industry. From influencing policy to encouraging debate, engaging with policy makers and civil society, FICCI articulates the views and concerns of industry. It serves its members from the Indian private and public corporate sectors and multinational companies, drawing its strength from diverse regional chambers of commerce and industry across states, reaching out to over 2,50,000 companies.

FICCI provides a platform for networking and consensus building within and across sectors and is the first port of call for Indian industry, policy makers and the international business community.

About An introduction to Irrigation Association of India

Irrigation Association of India (IAI) is an apex body representing irrigation system manufacturers and its allied organisations in India. Founded and registered in 1998, IAI is a non-government, not-for-profit; industry led and managed association, proactively involved in development and progress of the Irrigation sector in India which has huge untapped potential.

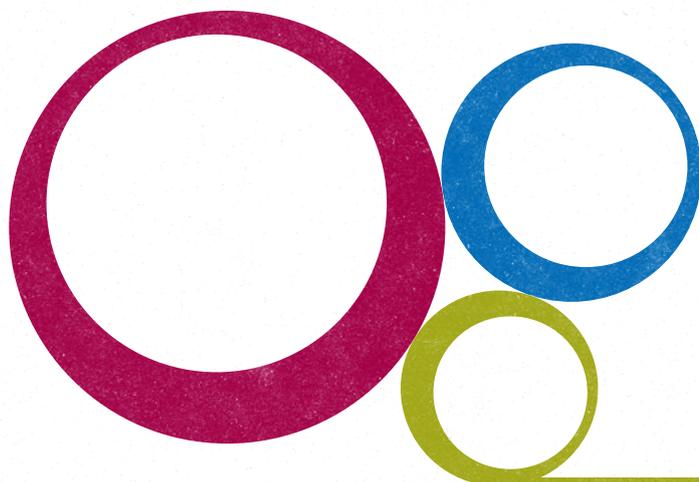
IAI is a member of FICCI, CII and MCCIA, and is recognised for articulating the views and concerns of the industry from local to international platforms.

Guarding the interest of end-users i.e the farmers' and the irrigation equipment manufacturers', IAI promotes high standard of quality and ethical business practices in all contractual and warrant obligations. The association renders its services with over 100 members reaching out to farming society across the Nation.

IAI is instrumental in bringing about the changes by raising the issues to the Central and State Government and effectively plays its role till implementation and channelizing the policy till it achieves its end result.

Extending its agenda beyond regular business, IAI supports major Agriculture and Irrigation related Seminars, Exhibitions, trainings etc. for improvement of the available skill sets and safety in this sector as per ISI norms.

It also encourages research and development to induct latest state-of-the art technologies available worldwide for inclusive benefit of this industry.



Abbreviations

AIBP	Accelerated Irrigation Benefit Programme	KI	Kilo Litre
AO	Agriculture Officer	Km3	Kilometre Cube
APMIP	Andhra Pradesh Micro Irrigation Project	Mha	Million Hactares
CADWM	Command Area Development And Water Management Programme	MI	Micro Irrigation
CAGR	Compound Annual Growth Rate	MIAO	Micro Irrigation Area officer
CCEA	Cabinet Committee On Economic Affairs	MIDH	Mission for Integrated Development of Horticulture
DD	Demand Draft	MT	Million Tons
GAIC	Gujarat Agro Industries Corporation Limited	NHM	National Horticulture Mission
GDP	Gross Domestic Product	NMMI	National Mission on Micro Irrigation
GGRC	Gujarat Green Revolution Company	NMSA	National Mission on Sustainable Agriculture
GNFC	Gujarat Narmada Valley Fertilizer Co. Ltd.	OFWM	On Farm Water Management
GSFC	Gujarat State Fertilizers & Chemicals Limited	PMKSY	Pradhan Mantri Krishi Sinchayee Yojna
Ha	Hectares	PSL	'Priority Sector Lending
HO	Horticulture Officer	RKVY	Rashtriya Krishi Vikas Yojna
INR	Indian Rupee	ROI	Return on Investment
ISOPOM	Integrated Scheme of Oilseeds, Pulses, Oil-Palm and Maize	SPV	Special Purpose Vehicle
IT	Information Technology	UN	United Nations

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National Office
Outer Circle
L 41 Connaught Circus
New Delhi 110001
T +91 11 4278 7070

AHMEDABAD

BSQUARE Managed Offices
7th Floor, Shree Krishna
Centre
Nr. Mithakali Six Roads
Navrangpura
Ahmedabad 380009
T +91 76000 01620

BENGALURU

5th Floor, 65/2, Block A,
Bagmane Tridib, Bagmane
Tech Park,
C V Raman Nagar,
Bengaluru - 560093
T +91 80 4243 0700

CHANDIGARH

B-406A, 4th Floor
L&T Elante Office Building
Industrial Area Phase I
Chandigarh 160002
T +91 172 4338 000

CHENNAI

Arihant Nitco Park,
6th Floor, No. 90,
Dr. Radhakrishnan Salai
Mylapore
Chennai 600004
T +91 44 4294 0000

GURGAON

21st Floor, DLF Square
Jacaranda Marg
DLF Phase II
Gurgaon 122002
T +91 124 462 8000

HYDERABAD

7th Floor, Block III
White House
Kundan Bagh, Begumpet
Hyderabad 500016
T +91 40 6630 8200

KOCHI

7th Floor, Modayil Centre
point
Warriam road junction
M. G. Road
Kochi 682016
T +91 484 406 4541

KOLKATA

10C Hungerford Street
5th Floor
Kolkata 700017
T +91 33 4050 8000

MUMBAI

16th Floor, Tower II
Indiabulls Finance Centre
SB Marg, Elphinstone (W)
Mumbai 400013
T +91 22 6626 2600

MUMBAI

9th Floor, Classic Pentagon
Nr Bisleri factory, Western
Express Highway
Andheri (E)
Mumbai 400099
T +91 22 6176 7800

NOIDA

Plot No. 19A, 7th Floor
Sector – 16A
Noida 201301
T +91 120 7109 001

PUNE

401 Century Arcade
Narangi Baug Road
Off Boat Club Road
Pune 411001
T +91 20 4105 7000

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