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Research Article

An Economic Analysis of Micro-Irrigation Development in India

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Abstract: Agriculture sector is the largest guzzler of total irrigation resources available in India. Hence, it is high time to adopt micro-irrigation methods such as drip and sprinkler irrigation in cropping system. This innovative method restricts the higher consumption of water by crops and increases the water use efficiency in agriculture. This article describes significance of micro irrigation, progress and development made in India. In addition to that it analyzed the physical and financial target achieved by India over the years under Pradhan Mantri Krishi Sinchayee Yojana Scheme (PMKSY). It also analyzed the different crops that are supported under PMKSY.

Keywords: Micro Irrigation, Development, Physical Target, Financial Achievement, PMKSY

INTRODUCTION

Micro irrigation is a modern method of irrigation which consists of drippers, sprinklers and foggers. By this method of irrigation water is directly emitted on surface or subsurface of the land to be more precise; in this method water is emittedor sprayed nearer to the root zone of the croparea. In order to maintain uniform water distribution, the drippers are installed at predetermined intervals depending on the crop spacing. There are a wide variety of emitters on the market. Different types of these drippers include inline drippers, on-line drippers, micro tubes, and pressed compensated drippers. In general, crops that have a greater distance between rows benefit more from drip watering. Most often, sandy or loamy soils are irrigated using a micro-sprinkler system. Small grasses and other horticultural crops do well with this method. Water is sprayed from a lower height in a number of different patterns. Micro sprinklers may also be purchased in a portable form. They are a step above from drippers and micro sprinklers in terms of water distribution. They can't spray more than a meter away. In areas where the soil has a poor ability to retain water, it is utilized for preparing nurseries and lawns.

Increased yield, less water waste, decreased evaporation, easier fertigation, fewer weeds and pests, and preserved soil are just a few of the many advantages of micro-irrigation (MI). The goal of promoting MI technologies is to help rural families earn more money, decrease their vulnerability to poverty, and improve their access to healthy, affordable food. Due to the prohibitive upfront expenses involved, however, micro-irrigation has been implemented in just a few regions and states throughout India. Adoption of Microirrigation (MI) is slow since it is a capital-intensive technical breakthrough. Lack of ideal physical, socioeconomic, institutional, and policy conditions contribute to the sluggish pace of MI coverage. Out of thetotal MI, the share of sprinkler and drip irrigation are 56 per cent and 44 per centrespectively (Nagaraj, 2020). MI forms 22 per cent of the total ground waterirrigation and the cost of ground water irrigation accounts to 15 to 30 per cent of thecost of cultivation of crops which is not accounted by farmer and due to this therelative economic scarcity of ground water users were responding to MI (Chandrakanth, 2015). The percentage of water used for agriculture is predicted to fall from its current 85% share to 74% by 2050 as a result of increased competition between other industries. This suggests that effective irrigation systems, such as MI, are essential for ensuring agriculture's long-term viability. According to the Ministry of Water Resources, GOI's Fifth Census of Minor Irrigation Schemes (2017), groundwater schemes have improved their irrigation potential creation (IPC) and irrigation potential utilization (IPU). While, IPC and IPU from surfacewater schemes has declined in this 5th MI Census. This suggests that farmers will rely more on ground water projects to satisfy their comparatively modest irrigation demands, and less on surface water schemes. Therefore, surface water sources must be repaired to continue deriving advantages from them in order to lessen the furtherdepletion of ground water. The presence of both major and small scale drip and sprinkler irrigation equipment makers and marketers across a wide variety of Indian states has created a fiercely competitive market for micro irrigation in the country. There are already over 200 micro irrigation businesses operating throughout the nation (Indian Council of Food and Agriculture, ICFA). Evidently, one cannot ignore the significance of MI in achieving agricultural sustainability in India. Hence this study analyzed the development put forward by Indian Government towards the progress of MI through its various schemes.

***Objectives*:**

- ✓ To identify the physical and financial progress of different states in Micro Irrigation.
- ✓ To identify importance given to various crops under PMKSY (Pradhan Mantri Krishi Sinchayee Yojana) Scheme
- ✓ To identify the use of Drip and Sprinkler irrigation.
- ✓ To understand the history of micro irrigation schemes in India
- ✓ To understand the hassles in implementing Micro Irrigation.

RESEARCH METHODOLOGY:

This study started with desk research to understand innovative micro irrigation methods and importance of micro irrigation. National and international articles on micro irrigation were reviewed to gain the in-depth information on micro irrigation. The study involved the extensive use of secondary data from PMKSY portal. Descriptive tools were used to gain the knowledge of importance given to different crops that are supported under PMKSY.

REVIEW OF LITERATURE:

International Review:

Liao *et al*(2019) Orchards in Northern China often utilize unresearched large irrigation systems, which may lead to poor water-use efficiency and possible fertilizer contamination of subsurface water. For the sake of creating water-efficient irrigation systems for orchards, further research into effective micro-irrigation technologies is necessary.

Fan *et al*(2019) surveyed and interviewed small farmers in northwest China to learn about their experiences with micro-irrigation systems and water associations, and to assess the connections between these factors. Birkenholtz (2017) reviewed the present state of micro-irrigation development programs in India and highlighted problems with their structure and distribution equality. Vico and Porporato (2010) they have examined two types of irrigation: the more common, fixed-volume approach, known as conventional irrigation; and the more recent, drip-based, or micro-irrigation, approach, known as micro-irrigation, which supplies water continually to reduce plant water stress. These two hypothetical irrigation plans are best because they prevent crop water stress while reducing water loss via runoff to the minimum. Further, they accommodate both the most severe and the most common scenarios of both constant and highly concentrated irrigation. We provide accurate solutions for the steady-state soil moisture probability density function for both irrigation techniques, accounting for stochastic variations in the timing and quantity of rainfall. Sandra *et al*(2009) proposed that an international initiative of low cost drip irrigation through private micro enterprise could boost annual net income among the rural poor. Hanson *et al*(2006) in their article suggested that a micro irrigation method with fertigation provides an effective and cost-efficient way to supply water and nutrients to the agricultural crops. However, if micro-irrigation systems are poorly managed, water and nutrients may be used inefficiently, reducing the predicted production gains and perhaps leading to ground water contamination due to excessive water and nitrogen applications. The quality of soils, ground, and surface waters is especially at risk in climate zones of California due to irrigation-related agricultural activity. Karlberg *et al*(2004) In their analysis, they found that irrigation with salt water might be a promising way to satisfy the rising demand for food without displacing more critical uses of fresh water, such as those for households and businesses in areas where potable water is in short supply. Salinated groundwater may be an abundant and underappreciated resource in sub-Saharan Africa. This supposition, however, cannot be confirmed due to a lack of evidence. It is common practice in a number of nations to utilize salty water to irrigate agricultural crops. Drip irrigation's water-saving qualities and even water distribution throughout the soil make it a good choice for usage with salt water. Drip irrigation systems have been successfully adopted at a cheap cost in sub-Saharan Africa. It is hypothesized that in times of water scarcity, horticultural crops grown using inexpensive drip irrigation using salty groundwater might be a terrific choice, having the potential to contribute to better and more sustainable crop production for smallholder farmers. Teeluck*et al*(1998) analyzed that an extruded porous pipe made up of recycled automobile tires was tested in the laboratory to study its efficiency for use as a micro irrigation lateral. The uniformity of the pipe's outflow is unknown since it is not always feasible to directly regulate the material's porosity during manufacture. It was determined that the product's porosity is not constant throughout its length, and that its permeability does not increase with time.

National Review:

Debajit and Debanshu (2020) analyzed the various benefits of micro irrigation to the farmers in terms of inputs, costs and returns. Sathaiah and Chandrasekaran (2020) addressed that to reduce the water scarcity problems in agriculture reusing waste water will be an efficient tool and revealed that the availability of water has raised significantly during both the rainy and summer season in open wells as well as the new bore wells sunk in the study area. Nagaraj (2020) analyzed about the irrigation trends in India and the importance of sprinkler and drip irrigation he also mentioned that despite the proven benefits from MI, the adoption rate is limited due to several constraints. Water and the energy to pump it are essential for MI, but they are often in short supply in hard-rock areas. Suresh and Samuel (2020) suggested that MI has the potential to address problems like water scarcity and emission of greenhouse gases from agriculture. Chand *et al* (2020) in their policy paper mentioned that MI in India played an important role in agriculture. Despite of long journey of MI the coverage still is not much and more concerted efforts are required to achieve the potential of MI in India. Jain *et al* (2019) addressed that efficient method like MI can play pivotal role in management of irrigation water demand. Yadav and Nathaniel (2019) in their research paper suggested policy interventions to fast forward MI in India and also they pointed outthe benefits and challenges of MI in improving irrigation water use in India. Sekharand Viswanathan (2018), in the state of Gujarat worked out the capital costs of MItechnologies and benefits of subsidized MI were

studied. R.P. and Verma (2018) intheir review article mentioned that water is one of key component which is directlyplay inordinate role in meeting present food and feed requirement for mankind andanimals respectively As modern MI technologies claims 20 to 50 % more efficiencyover traditional irrigation methods, which will open the way to utilize these scareresources efficiently to meet the present demand and simultaneously conserve themfor future generation. Khadeeja *etal* (2017) addressed that there is a prudent andparamount need for efficient use of the available water hence MI technology will bethe best suitable method for it. Malik *et al*(2016) studied the negative impact ofsubsidies on the adoption of drip irrigation and found that, rather than improvingaccess to drip, the subsidy system holds the technology back, because of its technicalrequirements. Suhas *et al* (2016) in their research opined PMKSY was launched toreduce poverty and ensure food security for the growing population in the face ofclimate change, scarce and limited water and land resources. Palanisami and Raman (2012) indicated that adoption of MI technologies like drip and sprinkler systems hasa positive impact in terms of water saving, yield and income enhancement at farmlevel. Narayanamoorthy (2010) made an attempt to understand whether the dripirrigation can be used as an effective tool to achieve the macro-objectives ofconservation agriculture. Narayanamoorthy (2007) found out the linkages betweenthe adoption of drip MI and electricity use. Bhattarai and Narayanamoorthy (2003) quantified the marginal impact of irrigation and other factor inputs on agriculturalproductivity of all inputs and on two key poverty measures across the states.

Government Initiatives:

Since 1987, the government has implemented a number of productive initiatives in response to micro irrigation's rising relevance. Micro-irrigation was given its first significant push by the government in 2006, when it introduced a Centrally Sponsored Scheme (CSS) to promote water-saving and conservation technologies like drip and sprinkler irrigation and encourage their adoption among farmers. It was renamed the National Mission on Micro Irrigation (NMMI) in June of that year and ran through the 2013–14 academic year. From April 1, 2014, NMMI became part of NMSA as "On Farm Water Management" (OFWM) for the 2014-2015 fiscal year. As of July 2015, the Pradhan Mantri Krishi Sinchayee Yojna (PMKSY) has been in effect. To "achieve convergence of investment in irrigation at the field level, extend cultivable area under guaranteed irrigation," as the strategy puts it. To realize the objective of "Per Drop More Crop," NABARD created a Long-Term Irrigation Fund in 2015–16, which was subsequently enhanced by the Micro Irrigation Fund.

Major centrally supported schemes pertaining to micro-irrigation promotion

Year	Name of Scheme	Brief
1987	National water policy	By 2020, the target is set to increase food grain output by 240 million tons.
1995	Rural Infrastructure Development Fund	NABARD loans money at a set rate of interest (currently 6.5% per year) for a term of 7 years. Two of the biggest beneficiaries of this program are rural infrastructure projects: roads and bridges (44% of the cash) and irrigation (34%).
1996	Accelerated Irrigation Benefit Programme (AIBP)	AIBP provides a loan to the states for small irrigation projects on a 50% matching basis.
2004	Integrated Scheme of Oilseeds, Pulses, Oil-Palm and Maize (ISOPOM)	As much as half of the fixed price of sprinklers may be covered, up to Rs. 15,000. Using drip irrigation to grow oil palms reduces the price of irrigation pipes by Rs. 15,000 for every 210 meters utilized, and uses just a quarter of the water.
2006	Centrally Sponsored Scheme on Micro- irrigation	It was recommended that the MI System's overall cost be split as follows: 40% by the Federal Government, 10% by the State Government, and 50% by the recipient herself, using either her own funds or a lenient loan from a financial institution.
2005	National Horticulture Mission (NHM)	Centrally-funded program that takes a comprehensive approach to horticultural development by addressing such issues as water management, protected cultivation, nutrition and pest control, postharvest handling, processing, and marketing.
2007	Rashtriya Krishi Vikas Yojana	To further encourage the use of technologies like micro-irrigation to increase the production of horticulture crops and vegetables, the Central Government has granted each state a total of one hundred percent.
2010	National Mission on Micro-Irrigation (NMMI)	Small and marginal farmers get a 60% government subsidy, whereas ordinary farmers receive a 50% central subsidy and a 10% state share. To lessen the financial load on farmers, several governments have boosted their subsidy contribution from 10% to 20%-50%.
2014	On Farm Water Management" (OFWM)	The original NMMI program is now known as the Office of Sustainable Agriculture's (OSA) Office of Food and Water Management (OFWM). There would be a total investment of Rs. 50,000 crore over the course of the next five years to roll out the program throughout the nation.

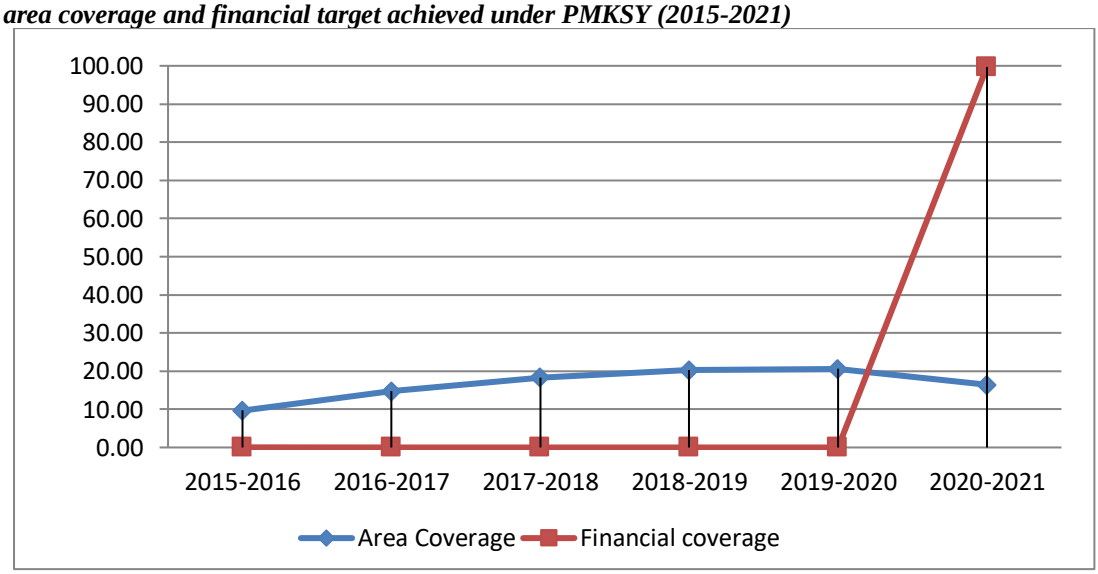
2015	The Pradhan Mantri Krishi Sinchayee Yojna (PMKSY)	To "achieve convergence of investment in irrigation at the field level, extend cultivable area under guaranteed irrigation," as the strategy puts it.

Apart from the central schemes few of the state government has launched Special Purpose Vehicles (SPV) for promotion and popularization of micro irrigation through subsidy. Gujarat Green Revolution Company Limited (GGRCL), Andhra Pradesh Micro Irrigation Project (APMIP) and Tamil Nadu Horticulture Development Agency (TANHODA) are worth to mention.

2005	Green Revolution Company Limited (GGRCL),	GGRCL is an implementing agency for implementation of Micro Irrigation Scheme on behalf of Government of India and Government of Gujarat. It is aim to bring 2nd Green Revolution in the state by saving of water, electricity and enhancing agriculture productivity.
2003	Andhra Pradesh Micro Irrigation Project (APMIP)	This project is launched with an objective of enhancing the crop productivity by improving the water use efficiency through Micro Irrigation Systems. Drip irrigation is an efficient method of applying water and nutrients to crops in the root zones
2004	Tamil Nadu Horticulture Development Agency (TANHODA)	The Tamil Nadu Horticulture Development Agency (TANHODA) was constituted with the objective to channelize the central assistance in a larger scale to promote Horticulture.

Micro Irrigation Area Coverage (2015-2021):
Under PMKSY scheme total area covered from 2015-2021 is 5710574.49 Hectares and financial target achieved for this coverage is 288053683.7 lakhs. (Source: PMKSY Portal). Various crops supported by this scheme were fruits, vegetables, cereals, pulses, nuts, oil seeds and spices. Even plants and trees were also supported.

% of Total area coverage and financial target achieved under PMKSY (2015-2021)

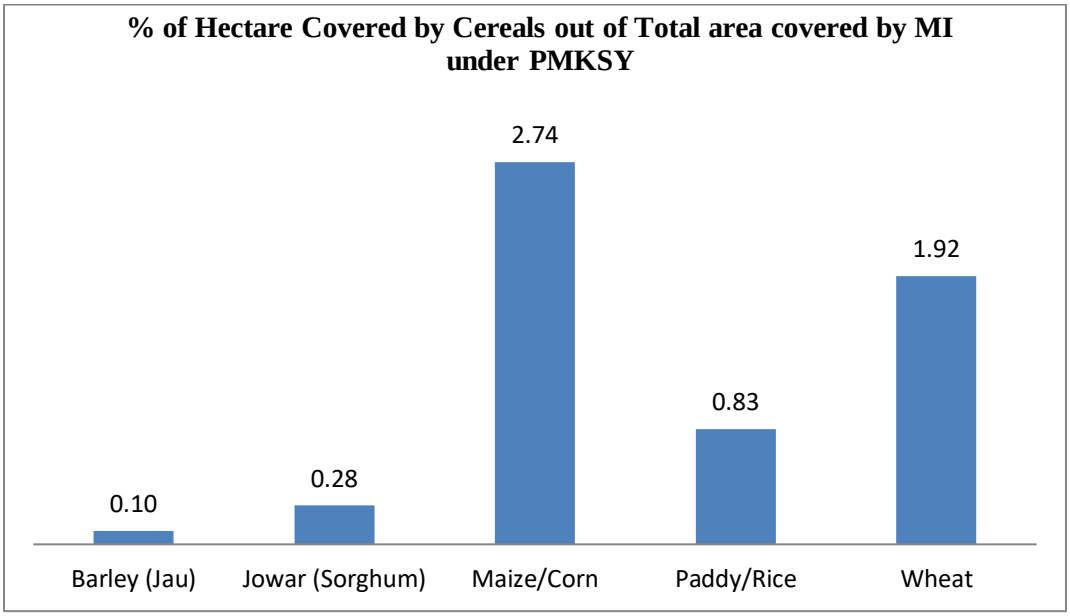


Source: Secondary data - PMKSY Portal

The above graph reveals the area coverage and financial target achieved under PMKSY scheme. From the year 2015 the area coverage has significantly raised until 2020 but during the period 2020-2021 the financial target has raised drastically. Nearly 99 percent of the financial targets were achieved during the period 2020-2021. That too this entire 99percent of financial target achieved by only one state, viz. Madhya Pradesh. To be precise total financial target achieved by all Indian states is just 1 percent. In addition to this the crop coverage during this period is the least when compared to the period 2015-2016. It's quite interesting when a least crop coverage hits almost the entire financial target.

Percentage of Hectare Covered by various crops out of Total area covered by MI under PMKSY (2015-2021):
In the following article percentage of hectare covered under PMKSY scheme by various crops such as cereals, pulses, millets, nuts, fruits, vegetables, oil seeds, plants, seeds, flowers and seeds were discussed.

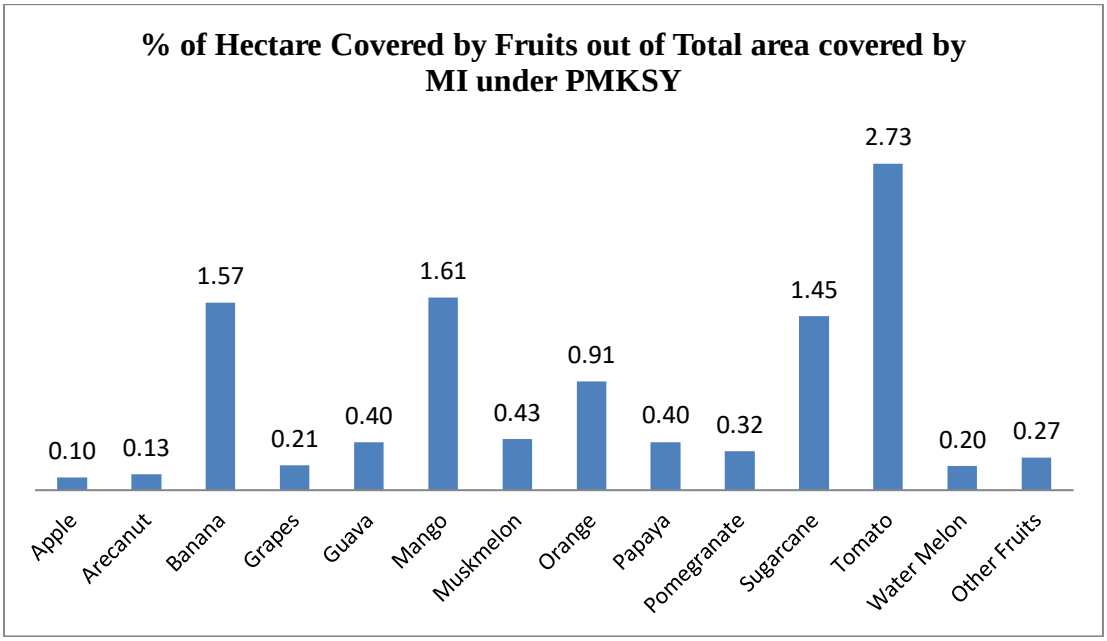
Cereals:



Source: Secondary data - PMKSY Portal

The above bar diagram depicts the percent of area (in hectares) covered by cereals out of total area covered by Micro Irrigation under PMKSY. Total area covered by cereals is 5.86 percent out of this maize covered 2.74 percent and followed by wheat which is 1.92 percent. In cereals paddy attains third position this gives an insight that people are not ready to implement micro irrigation for paddy. Paddy is crop that consumes nearly 2500 litre of water for 1 kg production (Bouman 2009) and India ranks second in paddy production (Roy, P. and Kaur, M., 2015) followed by china. The other crops in the bar diagram are not water guzzler when compared paddy. Hence implementation of micro irrigation in the paddy field will save tons and tons of water and also protects the usage of ground water.

Fruits:



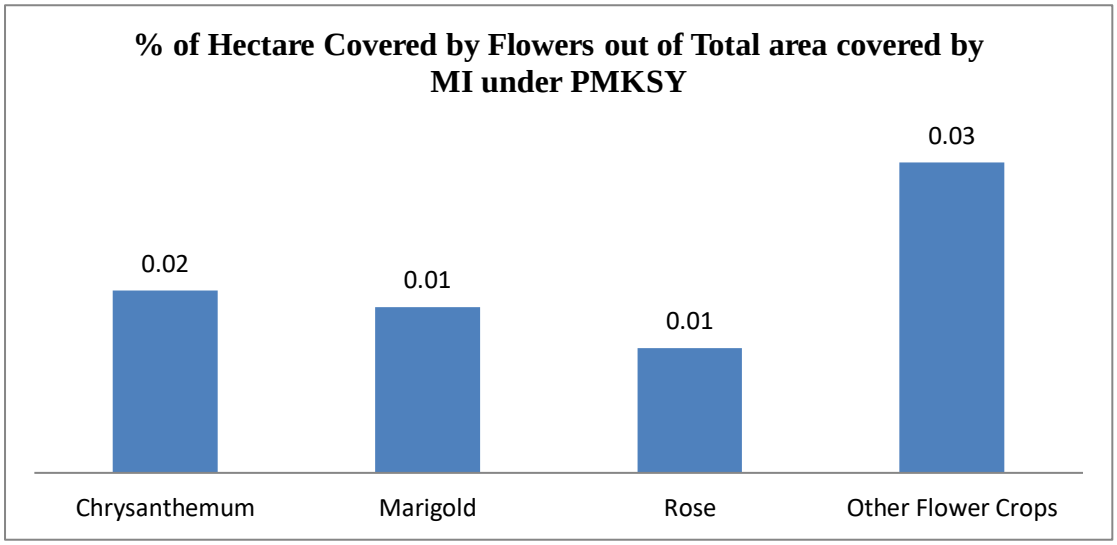
Source: Secondary data - PMKSY Portal

The above bar diagram depicts the percent of area (in hectares) covered by fruits out of total area covered by Micro Irrigation under PMKSY. Total area covered by fruits is 10.73 percent out of this tomato tops the list and covered 2.73 percent and followed by mango which is 1.61 percent.

Next to this banana, sugarcane, orange and other fruits were covering the rest. India ranks second in tomato production followed by china (Source: Data for Farmers, 2020). Regarding mango production, India is the world's largest producer that producesnearly 20 million tons of mango annually (Agribusiness Research & Analysis, 2020). In banana production also India sits in the topmost position in the world (Source: Atlasbig). In addition to this, after Brazil, India is second most producer of sugarcane in the world (Khushboo Sheth, 2017). This position gives us the insight of micro irrigation influence in the production

of tomato, mango, banana and sugarcane.India ranks fifth in apple production around the world (Source: Atlasbig), If more micro irrigation techniques gets involved, apple production in India may set a new benchmark.

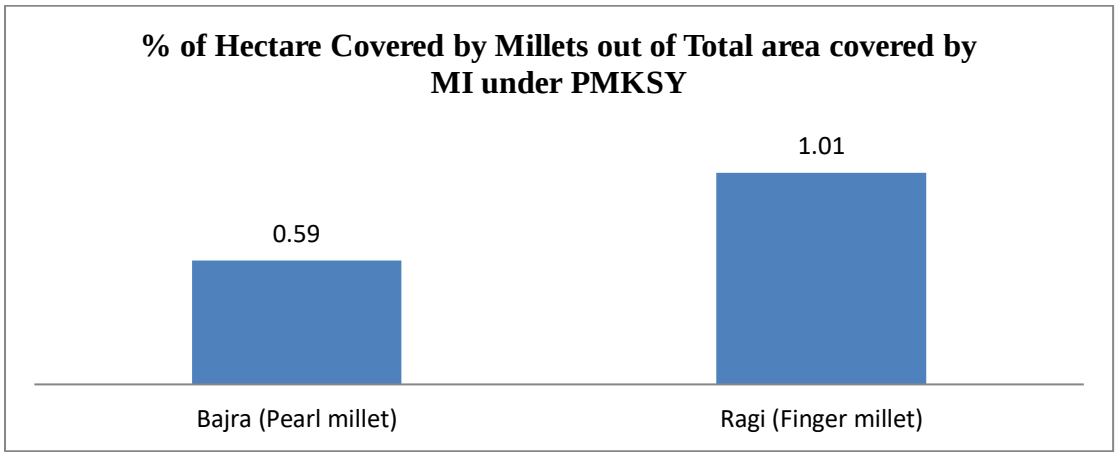
Flowers:



Source: Secondary data - PMKSY Portal

The above bar diagram shows the percent of area (in hectares) covered by flowers out of total area covered by Micro Irrigation under PMKSY. The data clearly indicates that flowers didn't get much importance under PMKSY scheme. The percentages of area covered by all flowers were not even close to one percent. The highest among those flowers is chrysanthemum which is 0.02 percent.

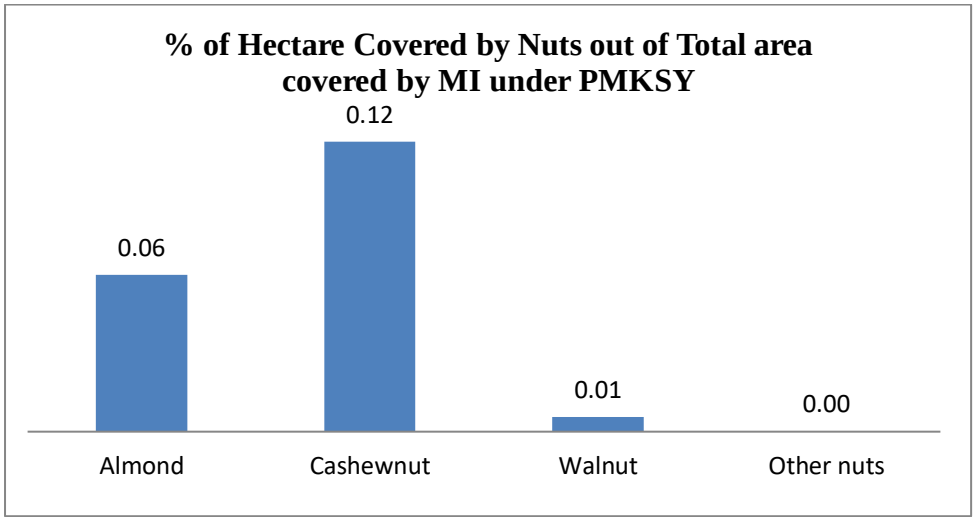
Millets:



Source: Secondary data - PMKSY Portal

The above bar diagram shows the percent of area (in hectares) covered by millets out of total area covered by Micro Irrigation under PMKSY. India is the world largest producer of millets (Oishimaya Sen Nag, 2017) under PMKSY scheme the total area covered by millets is 1.60 percent. Generally, the millet crops are rain-fed hence they didn't get much area covered by micro irrigation. But if micro irrigation involved in millet production they can be cultivated throughout the year.

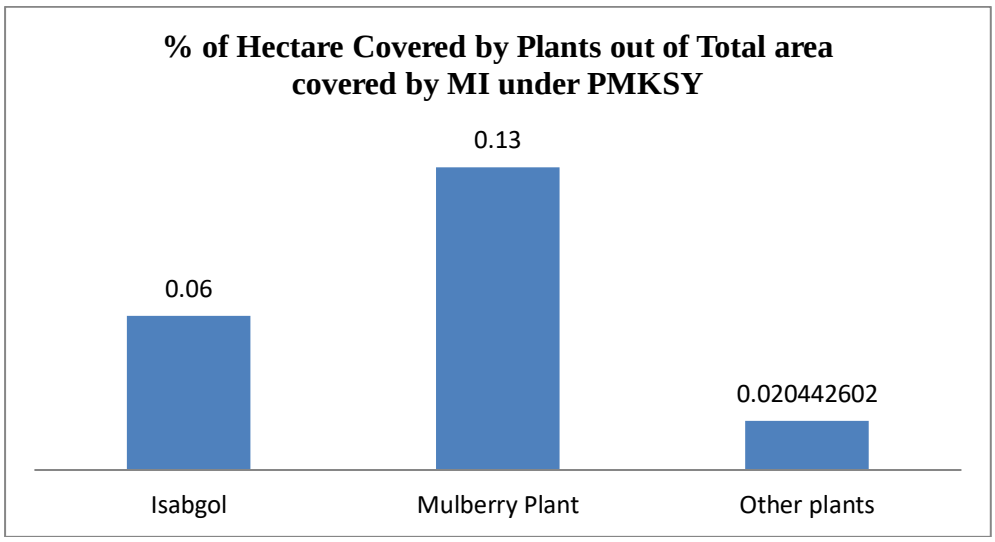
Nuts:



Source: Secondary data - PMKSY Portal

The above bar diagram shows the percent of area (in hectares) covered by nuts out of total area covered by Micro Irrigation under PMKSY. India ranks second in cashew production, but the application of micro irrigation to nuts seems to be very less.

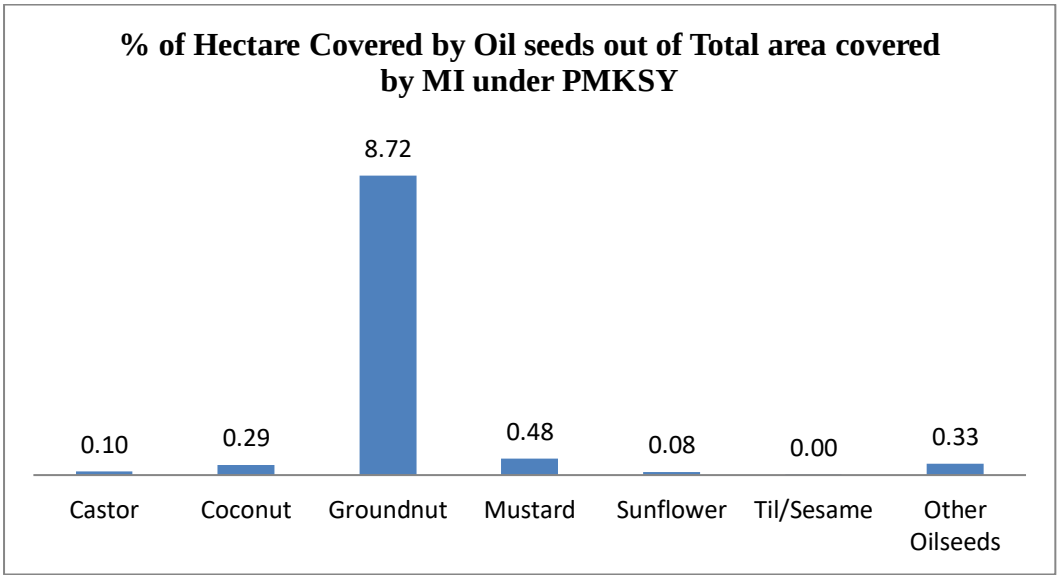
Plants:



Source: Secondary data - PMKSY Portal

The above bar diagram shows the percent of area (in hectares) covered by plants out of total area covered by Micro Irrigation under PMKSY. Plants like Aloe vera, Anthurium, Betelvine, Coleus, Tulsi, Isabgol, Mulberry Plant, Palmarosa, Patchouli, Shatavari, White Musli, aromatic plantsand medicinal plants were supported under PMKSY scheme but they didn't covered much area, in fact all the plants covered under PMKSY is just 0.21 percent. Out of these mulberry (0.13) and isabgol (0.06) tops the list.

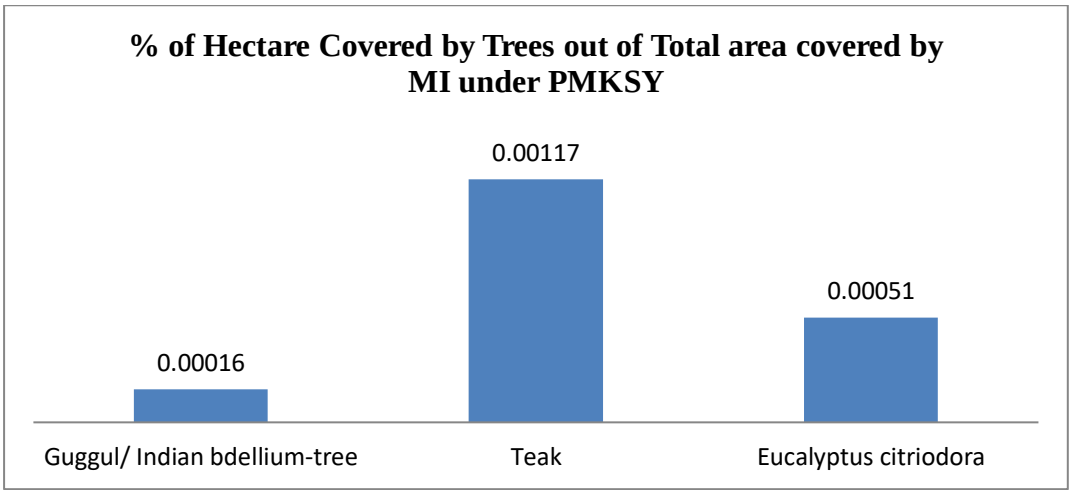
Oil Seeds:



Source: Secondary data - PMKSY Portal

The above bar diagram shows the percent of area (in hectares) covered by oil seeds out of total area covered by Micro Irrigation under PMKSY.Out of total area covered by PMKSY supported crops, oil seeds alone have covered nearly 10 percent. Groundnut is an important oilseed crop in India which occupiesfirst in terms of area and second position in terms of production (Source: Agricultural Market Intelligence Centre, PJTSAU). Hence ground nut has gained the most importance under PMKSY scheme, which covered nearly 8.72 percent of hectares. After that mustard covered 0.48 percent. The other oil seeds such as castor, coconut, sunflower and sesame covered the rest.

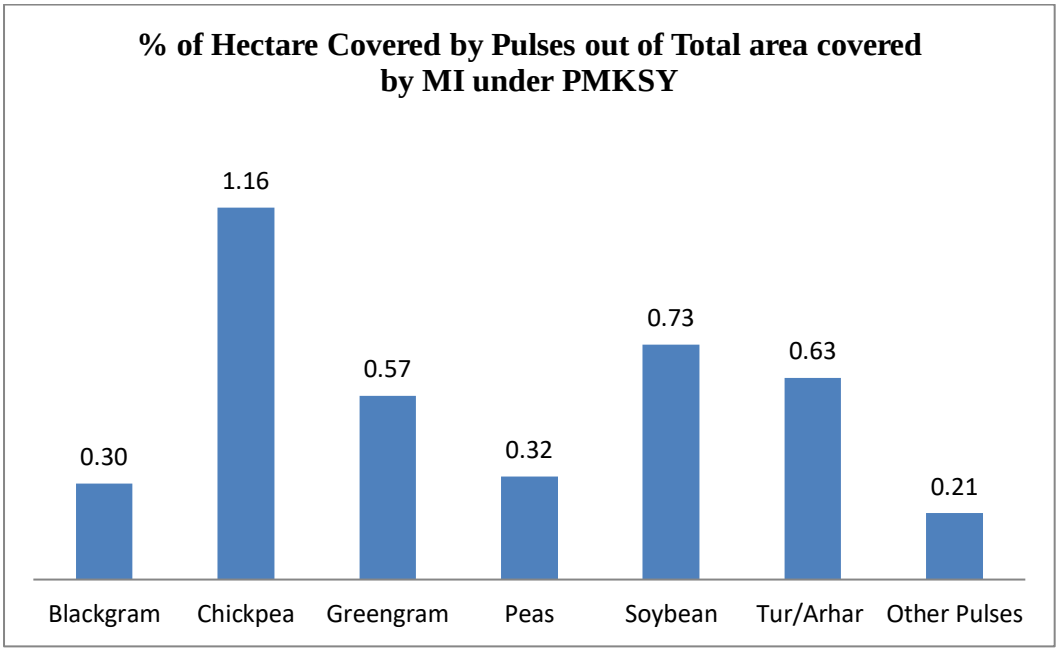
Trees:



Source: Secondary data - PMKSY Portal

The above bar diagram shows the percent of area (in hectares) covered by trees out of total area covered by Micro Irrigation under PMKSY. Trees were got very least support from PMKSY. The total area covered under by trees under PMKSY is 0.0018 percent. Only few trees (guggul, teak and eucalyptus citriodora) got support.

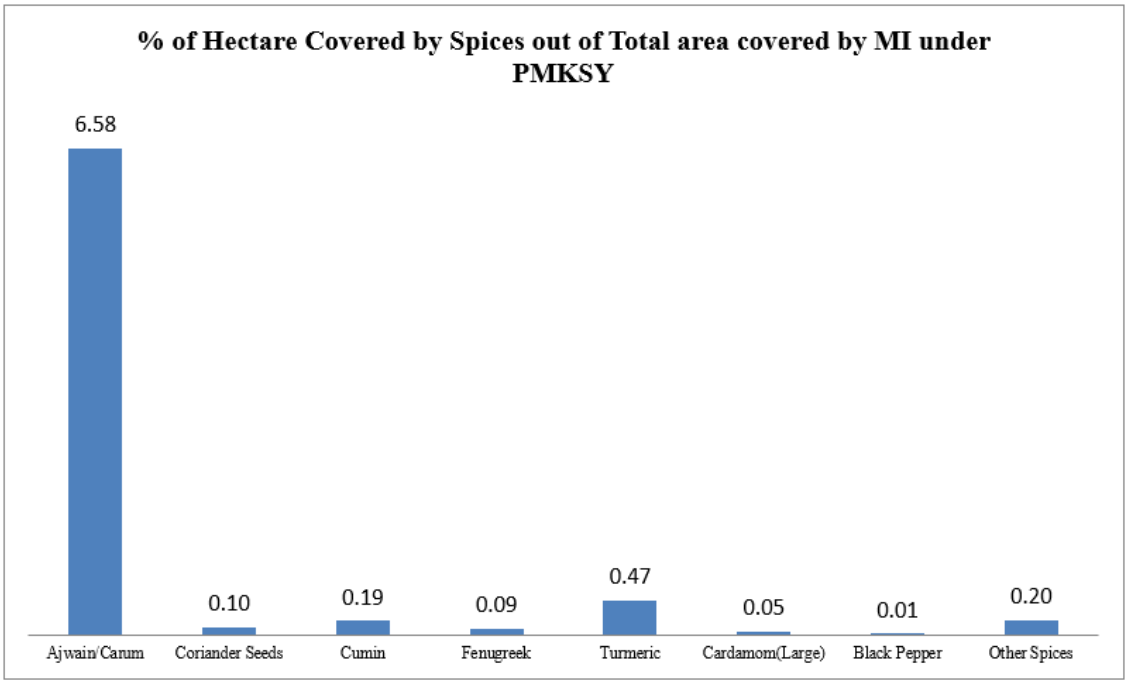
Pulses:



Source: Secondary data - PMKSY Portal

The above bar diagram shows the percent of area (in hectares) covered by pulses out of total area covered by Micro Irrigation under PMKSY. India is the largest consumer,producer, and importer of pulses in the world (Source: Food and Agricultural Organization, FAO). Out of total area covered by PMKSY supported crops, pulses have covered nearly 3.93 percent in which chickpea tops the list by covering 1.16 percent next to that soybean covers 0.73 percent. Then other pulses such blackgram (0.30%), greengram (0.57 %), peas (0.32 %), arhar (0.63%) covers the rest.

Spices:

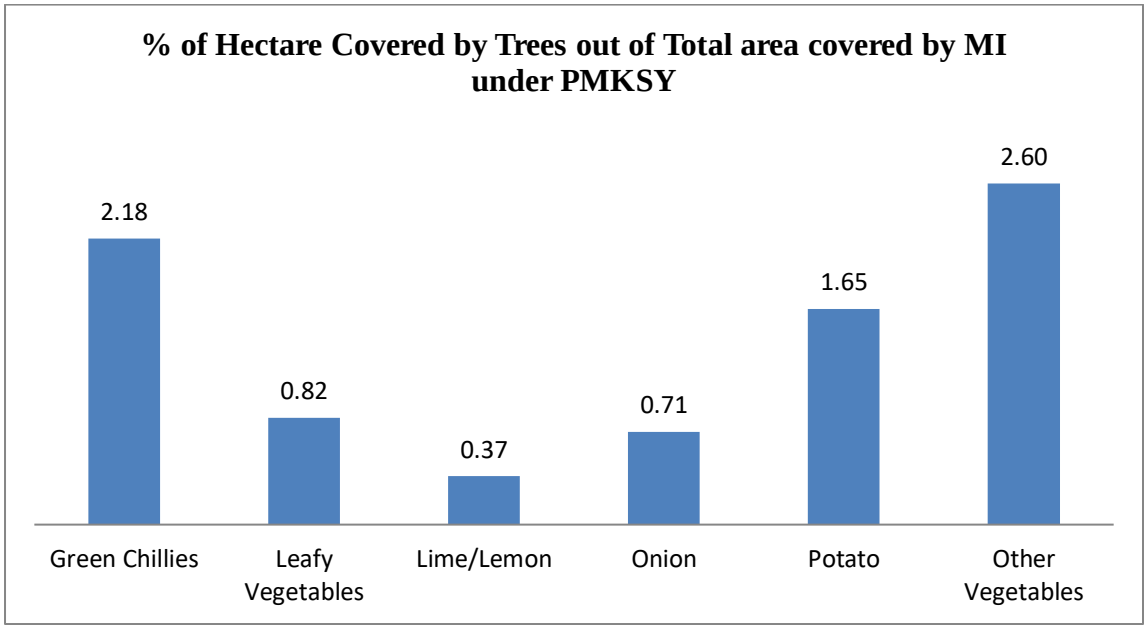


Source: Secondary data - PMKSY Portal

As we all know that India is the home of spices and has a long and rich history. Today, Indian spices are the most demanded for its texture, aroma taste and medicinal value. India is the world's largest producer, consumer and exporter of spices (India brand equity foundation, IBEF); the country produces about 75 of the 109 varieties listed by the International Organization for Standardization (ISO) and accounts for half of the global trading in spices (Source: Directorate General of Commercial Intelligence and Statistics Spices Board of India). The above data shows the different types of spices supported under PMKSY scheme and the percentage of area covered by them. Spices covered around 7.7 percent of area out of total area covered under PMKSY. Among spices supported under PMKSY ajwain/carrum gained the most importance and covered an area of 6.58 percent. Then spices such as coriander seeds (0.10%), cumin (0.19%), fenugreek (0.09%), turmeric (0.47%), cardamom large

(0.05%), Black pepper (0.01%) and other spices (0.20%) covers the rest.

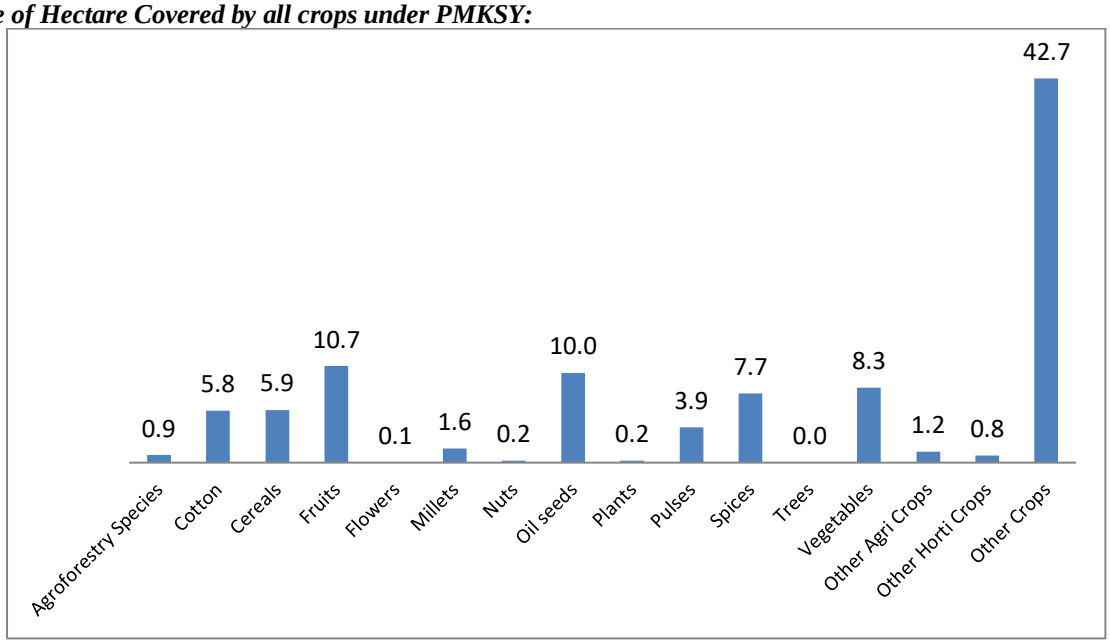
Vegetables:



Source: Secondary data - PMKSY Portal

The above bar diagram shows the percent of area (in hectares) covered by vegetables out of total area covered by Micro Irrigation under PMKSY. Vegetables covered around 8.33 percent of area out of total area covered under PMKSY. Among vegetables green chilies top the list by covering 2.18 percent of area, followed by potato which covers 1.65 percent of area and leafy vegetables covers 0.82 percent, lemon covers 0.37 percent, onion covers 0.71 percent and other vegetables covers 2.60 percent that are arbi, ash gourd, bael, beetroot, bitter gourd, bottle gourd, brinjal, cabbage, capsicum, carrot,, cauliflower, chilies nursery, cole crops(cabbage & cauliflower), cucumber, cucurbitaous vegetables(cucumber,pumpkin,all gourds,coccinia), drumstick, elephant foot/yam, fennel, french beans, garlic, ginger, green chilies, guar (cluster bean), lemon grass, mint, mushroom, okra/ladyfinger/bhindi, pointed gourd, potato, pumpkin, radish, red chilies, ridge/sponge gourd, roots and tuber crops, snake gourd, sweet potato, tapioca / cassava and turnip

Percentage of Hectare Covered by all crops under PMKSY:



Source: Secondary data - PMKSY Portal

The above bar diagram reveals the area covered by different crops. Under PMKSY scheme fruits gained much importance by having 10.7 percent of area coverage then oil seeds attain second position by having 10 percent of area coverage. Vegetables covered 8.3 percent and attain third position, spices covered 7.7 percent and attain fourth position, cereals covered 5.9 and attain fifth position, cotton covered 5.8 percent and attains sixth position, pulses covered 3.9 percent and attain seventh position, and

millets covered 1.6 percent and attain eighth position. Interestingly the other horticulture crops just covered 0.8 percent and consume approximately 99 percent of financial achievement according to the data collected from PMKSY portal.

Hassles in implementing Micro-irrigation:

- ✓ Installation and administration of micro irrigation systems are labor-intensive and complex processes that call for specialized knowledge and administrative chops.
- ✓ It is claimed that Micro Irrigation techniques may not be ideal for densely planted crops, such as grains, which are farmed on vast acreages throughout the nation.
- ✓ Even with horticultural crops that are highly favorable for drip irrigation, the majority of farmers are unwilling to invest in micro-irrigation systems despite the availability of state and federal subsidies.
- ✓ In some areas easy availability of bore well water, free electricity to farmer, unrestricted use of ground water makes them reluctant to adopt Micro Irrigation.
- ✓ Government need to follow cluster approach rather than a wide spread national approach.
- ✓ Climatic change fluctuation makes insufficiency in irrigation.
- ✓ Farmers are not giving importance to High Value Crops (HVC).
- ✓ Due to group cultivation small and marginal farmers are not independent to choose HVC.

CONCLUSION:

In this study an attempt is made to studythe development and progress of micro-irrigationin India using the available information. This study shows that micro irrigation is not only limited for horticulture crops but also for other commercial and high value crops. Hence this study gives us the great insight that micro irrigation method seems to be highly eco-friendly approach by limiting ground water exploitation and continuous and uniform application of water across the field will have a positive impact on the quality cum quantity of the produce.It is visible that micro irrigation technology has the potential to conserve the irrigation water but the effects will be visible only when the adoption shall be done at large scale and PMKSY is main objective is to upscale micro irrigation. It is believed that people showing hesitance to adopt micro irrigation because of its high initial costs but PMKSY scheme has put an end by providing micro irrigation facilities to people on their expectation.

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