

Spatial Distribution of Drip Irrigation in Satara District (Maharashtra, India): A Geographical Analysis

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Abstract:

Drip Irrigation is an efficient method of application of Water in which water is applied at a low rate over a long period of time at frequent intervals with low pressure delivery system. (Chauhan H S and Shukla K N 1990).The research on drip irrigation has been in progress in India since 1970 onwards. However, it was only after 1980that many experiments were made on drip technique. Different technique of irrigation are available in an economy e.g. flood, basin, Furrow, sprinkler. But drip irrigation system is a relatively new method of irrigation in which water and other nutrients are delivered directly to the root zone according to the plant needs. The drip irrigation system is said to be 50 percent more effective than the conventional irrigation system. It has been estimated that water loss in conventional irrigation method is 30-40 per cent whereas it is hardly 1 or 2 per cent in drip system (SaksenaR.S.1992). In the present paper an attempt has been made to bring out the Spatial and temporal Distribution in the Drip irrigation in satara district. (2011)and to assess the comparative advantages of drip irrigation over flood irrigation in Satara district. The study is based on the primary and secondary data.

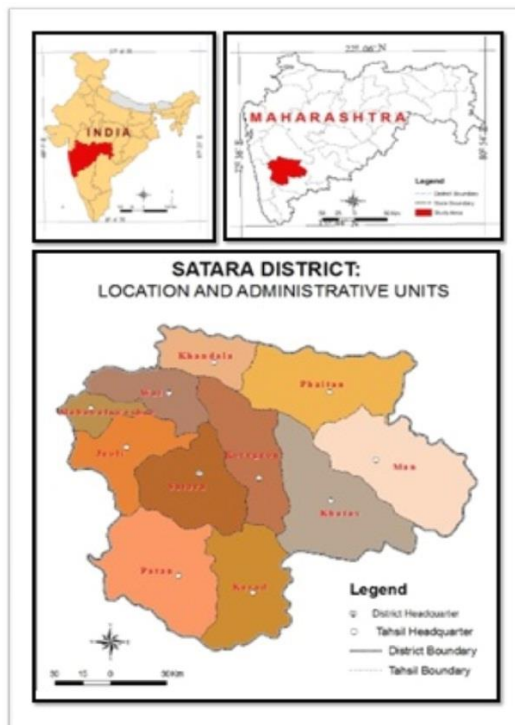
Key words: Drip, sprinkler, Irrigation, Power, Flood basin, Furrow, Tahsil, District.

Introduction:

Drip Irrigation constitutes one of the most effective technical means of raising agricultural production in the developing countries. Drip irrigation involves the slow application of Water, drop by drop as name signifies, to the root zone of a crop. (V.Shankar1961). Drip Irrigation is an efficient method of application of Water in which water is applied at a low rate over a long period of time at frequent intervals with low pressure delivery system. (Chauhan H S and Shukla K N 1990). Meaning the drip irrigation in simple words we can explain drip irrigation system in the following manners. Drip irrigation system is concerned mainly with the application of water. It is related with the use of water directly to the root of the crop. The application of water is in a lower rate over-period of time. Drip irrigation means nothing but spoon feeding to the crop. The research on drip irrigation has been in progress in India since 1970 onwards. However, it was only after 1980 that many experiments were made on drip technique. Different technique of irrigation are available in an economy e.g. flood, basin, Furrow, sprinkler. But drip irrigation system is a relatively new method of irrigation in which water and other nutrients are delivered directly to the root zone according to the plant needs. The drip irrigation system is said to be 50 percent more effective than the conventional irrigation system. It has been estimated that water loss in conventional irrigation method is 30-40 per cent whereas it is hardly 1 or 2 per cent in drip system (Saksena R.S.1992) In the present paper an attempt has been made to bring out the Spatial and temporal Distribution in the Drip irrigation in satara district.(2011)and to assess the comparative advantages of drip irrigation over flood irrigation in satara district. The study is based on the primary and secondary data

The Regions:

Satara district is the western part of Maharashtra State. Its location lies between 17° 5' to 18° 11' North latitudes and 73° 33' to 74° 54' east longitudes occupying an area of 10,492 sq. kms. Administratively, it consists of eleven tahsils (fig. 1) and the region presents diversified physiography with hilly region dominated by leeward slopes of Western Ghats in west and alternate valleys and ridges culminating gradually into plateau in the east. The soils vary from laterite patches in the west through deep medium block alluvial of the river in the center and poor gray soils in the east. The monsoon climate dominates the region with variation in heat and cold. The region receives rainfall from south west monsoon averaging between 200 mm to 5000 mm. The eastern part, which fairly falls in the rain shadow belt experiences frequent drought conditions.



Objectives

The objectives of the present paper are:

- 1) To Study the Spatial Distribution in the Drip irrigation in satara district. (2011)
- 2) To assess the Advantages and Efficiencies of Drip irrigation.

Data Base and Methodology:

The present study is based on the primary and secondary data. The Secondary data obtained from the records of Zilla Parishad and various records of Agricultural Department of Maharashtra State. Primary data has been collected through the questionnaire and interviews of the selected Farmers. The analysis crop wise economy of drip irrigation. The per cent to total net sown area of Drip irrigation values classified with the help of standard deviation Method, three different zones.

Spatial Distribution of Drip irrigation in the Satara District. (2011)

Drip and Sprinkler irrigation method is of recent technique in the field of irrigation .They have little significance in the irrigation. The area under drip irrigation is about 2 per cent of total irrigated area of the district. The Main them of study is related with a new methods adopted by the various farmers in the district. Here an attempt has been made to examine the spatial distribution of the drip irrigation.

Table No 1 Area under Drip Irrigation in Satara District

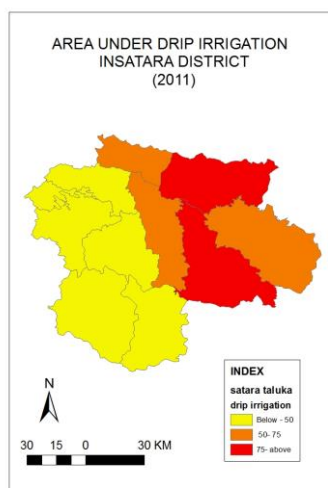
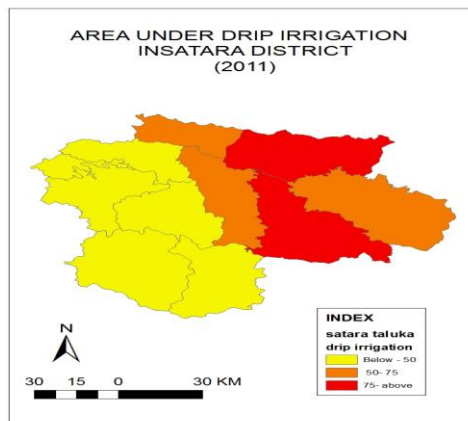
Sr.No	Name of Tasil	1991	2011	change
1	Satara	3.94	15.23	+11.29
2	Wai	5.44	22.08	+16.64
3	Khanala	1.70	34.48	+32.78
4	Koregaon	6.13	51.99	+54.86
5	Phaltan	11.67	107.09	+96.23
6	Man	23.19	51.83	+28.64
7	Khatav	3.00	98.61	+95.61
8	Karad	4.74	20.74	+16

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9	Paten	1.20	NA	-
10	Jaoli	1.14	1.55	+0.41
11	Mahabaleshwar	1.61	10.25	+8.64
		63.76	414.66	+350.9

Source: Agriculture Department, Government of Maharashtra

The present study reference period of the study is 20 Years i.e. from 1991 to 2011 Table No 1 Explain is that during the decade land under drip has increased from 63.76 hectares in 1991 to 414.66 hectares in 2011. The composite index values classified with the help of standard deviation method depicted in **fig. 2** exhibit three different zones described as under.



Area under high drip irrigation in satara district:

It includes two tahsils namely Phaltan and Khatav which have Area under high drip irrigation above 75 hect. due to the Low intensity of irrigation, deep black and alluvial soils, assured rainfall and dominance of Horticultural cultivation one together responsible for Area under high drip irrigation.

Area under Moderate drip irrigation in Satara district:

This zone includes Koregaon and Man which have Area under Moderate drip irrigation above 75 to 50 hect. The physiographic limitation low use of improved seeds less area under cash crop have resulted the moderate Area under drip irrigation in these tahsils.

Area under Low drip irrigation in satara district:

The tahsils of Patan, Jaoli, Mahabaleshwar and Khandala in west and Karad South in the East have Area under low drip irrigation below 50 hect. The hilly terrain, in the Western part and acute scarcity of water in the eastern arid areas have set a bar in the development of irrigation and frequent drought conditions, meagre water supply dependence on rainfall have resulted in Area under low drip irrigation. Karad in south have well irrigation facilities i.e. Canal and lift irrigation, have resulted in Area under low drip irrigation.

Area Change under drip irrigation in Satara district:-

I have used here the data of 1991 and 2011 period for temporal analysis. Then I have tried to find out the Area change under drip irrigation. If you look at the **Table No 1**. We find that the low level of changes are confined to western part of the district due to the lack of irrigation facilities and adverse environmental conditions. The moderate change has take place along the rivers belts and wells irrigation developed due to the dominance of Horticultural cultivation one together responsible

for Area under moderate drip irrigation, in tahsils namely Koregaon and Man. The high levels change (above 75 hect.) namely Phaltan and Khatav due to the change in the cropping pattern i.e. horticultural cultivation a variety of improved implements are being used in this tahsils.

The advantages of drip irrigation are:

- Fertilizer and nutrient loss is minimized due to localized application and reduced leaching.
- Water application efficiency is high if managed correctly
- Field levelling is not necessary.
- Fields with irregular shapes are easily accommodated.
- Recycled non-potable water can be safely used.
- Moisture within the root zone can be maintained at field capacity.
- Soil type plays less important role in frequency of irrigation.
- Soil erosion is lessened.
- Weed growth is lessened.
- Water distribution is highly uniform, controlled by output of each nozzle.
- Labour cost is less than other irrigation methods.
- Variation in supply can be regulated by regulating the valves and drippers.
- Foliage remains dry, reducing the risk of disease.
- Usually operated at lower pressure than other types of pressurized irrigation, reducing energy costs.

The disadvantages of drip irrigation are:

- Initial cost can be more than overhead systems.
- The sun can affect the tubes used for drip irrigation, shortening their usable life.
- If the water is not properly filtered and the equipment not properly maintained, it can result in clogging.

- For subsurface drip the irrigator cannot see the water that is applied. This may lead to the farmer either applying too much water (low efficiency) or an insufficient amount of water, this is particularly common for those with less experience with drip irrigation.
- Drip irrigation might be unsatisfactory if herbicides or top dressed fertilizers need sprinkler irrigation for activation.
- Drip tape causes extra cleanup costs after harvest. Users need to plan for drip tape winding, disposal, recycling or reuse.
- Waste of water, time and harvest, if not installed properly. These systems require careful study of all the relevant factors like land topography, soil, water, crop and agro-climatic conditions, and suitability of drip irrigation system and its components.
- In lighter soils subsurface drip may be unable to wet the soil surface for germination. Requires careful consideration of the installation depth.
- The PVC pipes often suffer from rodent damage, requiring replacement of the entire tube and increasing expenses.
- Drip irrigation systems cannot be used for damage control by night frosts (like in the case of sprinkler irrigation systems)

Table No 2 Comparative Advantages of Drip Irrigation over Flood Irrigation

Sr.No	Variables	Drip Method	Flood Method
1	Water Saving	400-100 Per cent	Less owing to evaporation losses
2	Irrigation efficiency	80-90 Per cent	30-50 per cent
3	Input cost	Less especially in labour, Fertilizers, pesticides and tilling	Comparatively higher
4	Weed Problem	Reduced significantly	Very High
5	Suitable Water	Even saline Water can be used	Only normal Water

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			can be used
6	Disease and pest Problem	Relatively less	High/ moderate
7	Water Logging	Nil	About 8.5 mha is under Water logging in India
8	Water control	Easily Manageable	Difficult to manage
9	Evaporation and transportation losses	Very low	Very High
10	Labour requirement	Relatively low	High
11	Efficiency of fertilizer use	Very high and constant supply	Heavy losses owing to leaching and evaporation
12	B-C ratio	Excluding water Saving	In the range 1.8-3.9
13	Capital Cost/ha	Rs 15000-40000 Varies with space and crops	Rs. 70000 for MMI projects during 7th plan
14	Product quality	Relatively better	Normal
15	Increase in yield	About 20-100 per cent higher vis- a-vis Flood method	Yield is less compared to drip irrigation

Source: Narayanamoorthy, (1997)

Table No 3 Irrigation Efficiencies under Different Methods of Irrigation.

Irrigation Efficiencies	Methods of Irrigation		
	Surface	Sprinkler	Drip
Conveyance efficiency	40-50 Canal 60-70 Well	100	100
Application efficiency	60-70	70-80	90
Surface Water moisture evaporation	30-40	30-40	20-24
Overall efficiency	30-35	50-60	80-90

Source: Sivanappan(1998)

Conclusions:

Based on the spatial analysis for the years 2011 the region present three different levels of Drip irrigation. Accordingly three regions can be identified i.e. low, moderate and high. of the lift irrigated area. It enjoys relatively more favorable environmental conditions. Pedagogically too, the tract is

endowed with a fertile alluvial soil cover. Besides, these tahsils enjoy favorable position in irrigation facilities, application of technical implements, agricultural credit facilities, and power input.

Considering the growth of population in Satara district as well as requirement of various agricultural commodities, it is necessary to bring new area under cultivation. The net sown area of the study region is almost constant for the last 30 years, as all the productive lands have already been brought under cultivation. Most of the unutilized areas are available in the form of undulating terrain and hilly areas. Drip irrigation method is Water saving, high efficiency cost benefit technique. Drip irrigation is used by farms, commercial greenhouses and residential gardeners. Drip irrigation is adopted extensively in areas of acute water scarcity and especially for crops and trees such as Pomegranate, containerized landscape trees, grapes, bananas, strawberries, sugarcane, cotton, maize and tomatoes. Drip irrigation for garden available in drip kits are increasingly popular for the homeowner for the homeowner and consist of a timer, hose and emitter. Hoses that are 4 mm in diameter are used to irrigate flower pots.

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