

**Spatial Distribution of irrigation methods in Shirol Tahsil
of Kolhapur District (M. S.)**

Rajendra Laxman Koli

Research Student,
Department of Geography,
Shivaji University, Kolhapur

Dr. A. A. Pujari

Guide & Head,
Department of Geography,
Jaysingpur College, Jaysingpur

Abstract:

Present study is attempted to reveal irrigation patterns in the Shirol tashil. Various reports from government authorities have been collected and verified with field data during the study period so as to identify two main irrigation systems viz. Lift irrigation and well irrigation. These irrigation systems were further divided in sub-methods. This indicated that total five sub-irrigation systems were noted in the study area, namely, furrow irrigation, basin irrigation, boarder irrigation, sprinkler irrigation and drip irrigation. Among these two main irrigation systems, lift irrigation was the major irrigation system which comprises 91.32% while well irrigation system with 8.68% was minor irrigation system. Among sub-methods, furrow irrigation method was dominant while sprinkler irrigation method was at its least use.

Keywords: Irrigation patterns, lift irrigation, well irrigation, intensity, Shirol tehsil

1. Introduction

Irrigation is defined as “Artificially supplying & systematically dividing of water for agriculture & horticulture in order to obtain higher or qualitatively better production” (Sharma,1992). Water is essential for growth of plants & other living organisms. *Millenniums*, successful farmers have used different methods to provide additional water to their crops. This artificial addition of water is nothing but irrigation. Irrigation is a basic determinant of agriculture practice because its inadequacies are the most powerful constraints on the increase of agricultural production. In traditional agriculture, irrigation was recognized for its protective role of insurance against the vagaries of rainfall & drought (Palaniswami, 1980).

In the next 50 to 60 years world food production needs to be doubled to meet the demands of increased population. 90% of this increased food production will have to come from existing lands while seventy percent of increased food production will have to come from irrigated land. Without irrigation, farming is very limited especially when rainfall decreases to less than 30 cm. Irrigation improves water conditions in the soil which leads to increase the water content in plant fibers, dissolves nutrients & makes them available to plants. Irrigation affects temperature conditions by regulating surface layer temperature of the soil and also regulates ground layer of the air. Overall irrigation helps to control the growth and development of plants, which leads to improve in harvesting quality (Vasanthavigar, 2010).

The rainfall of Shirol teshil is fully depends on monsoon. So irrigation is essential tool of agriculture in Shirol teshil. The main irrigation sources in Shirol Teshil are four rivers namely Krishna, Panchaganga, Warna & Dhudhganga. These rivers flow continuously throughout the year.

The transformation of agriculture is possible only through irrigation as it is a primary input on which other inputs depend (Shah, 2006). India is a vast country with fertile plain lands suitable for Rabi and Kharif crops. It also experiences less or no rainfall during rainy and winter seasons at several places. Hence without irrigation, production of Rabi crops along with other crops is not possible. At present due to high-breed seeds, crops can be produced at any seasons but the production of crops is totally depends on water. The introduction of advanced irrigation system has enabled the farmers to produce crops even on during dry season. In view of the growing population and thereby need for food, it is urgently felt to enhance the area under irrigation in Shirol teshil.

Under the study region Bubanal Co-operative lift irrigation scheme was first sanctioned in 1950 and actually it started functioning in 1964, since electricity facility was not available in the village. Then various schemes were started in Shirol teshil after 1964, such as, Gourwad in 1964, Kutwad and Aurwad in 1965. In 1966 nearly nine cooperative societies were newly started at a time. Currently eighty cooperative societies are working under study region. The Maharashtra government provides 50% subsidy on construction of co-operative lifts irrigation schemes.

2. Objectives:-

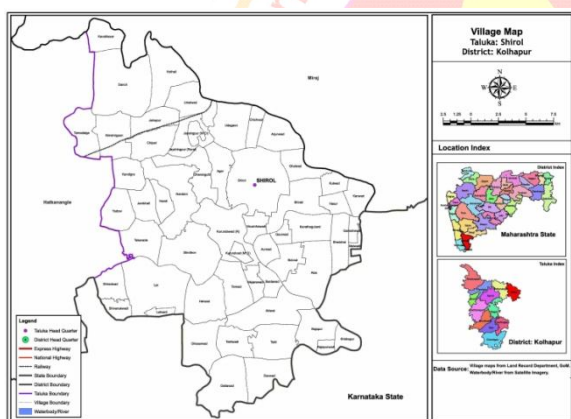
1. To identify irrigation methods in the study region, and its crop wise application.
2. To know sources of irrigation in the study area.
3. To estimate overall intensity and changes in overall intensity of irrigation in the study area.

3. Location of Study Retion

India is a predominantly agricultural nation and Maharashtra state in India occupies important position which ranks third in area and second in population. Kolhapur district is divided mainly in two parts, the eastern and the western. The eastern side covers Shirol, Hatkanangale, Karveer and Kagal tahsils. The western side covers Panhala, Shahuwadi, Gaganbawada, Radhanagari, Ajara and Chandgad Tahsils. In the present study Shirol tehsil was selected as the study area for investigation, which is one of the developed tehsil in Kolhapur district. It is situated from 16.37⁰ N to 16.52⁰ N latitudes and from 74.27⁰ E to 74.42⁰ E longitudes. It has 507.9 sq. km land constituting 6.15% geographical area of the Kolhapur district. The population is 4,10,136 lakh and density is 707 per sq. km as per the census of 2011. There are 54 village and 02 municipalities. Territorially, Shirol tehsil has Sangli district to its north, Belgum district of Karnataka state to its south and east while Hatkangle tehsil to its west. Shirol taluka is a vast plain area slopping eastward and bounded by the Krishna, the Panchganga, the Dudhganga and Warana rivers. The distinguishing features of topography of the taluka are unlike Deccan plateau, with an average height of 600 meters above the sea level. 41 villages from Shirol taluka are located in plain area.

4. Growth of Lift Irrigation Schemes

Co-operative Lift Irrigation Societies have great importance in the growth of agricultural production by providing water facilities to the land. These schemes are used more where there is uneven and irregular rain. In such conditions, farmers were totally depending upon nearby rivers for irrigating their crops. Shirol is the only tehsil in Kolhapur district, where co-operative lift irrigation societies have made tremendous progress as this teshil is richly drained by the rivers of Panchganga and Krishna, which are united at Narasobawadi. The Warana and the Dudhganga are two other tributaries, which flow in Shirol tehsil. All the rivers help to increase the surface irrigation by means of lift irrigation. At present there are 80 cooperative lift irrigation societies working in 54 villages of Shirol Tehsil. Among various crops, sugarcane is the main crop in irrigated land area.



5. Water Irrigation Methods:

The irrigation water available from different sources is applied to the land by various methods which vary according to slope of the land, the type of the soil and the crop to be raised. Information in this regards was collected primary level circulating the questionnaire to the sample villages and supplemented by frequent field visits. The data analysis of the information revealed that mostly surface irrigation and other sub irrigation method were practiced in this region. It includes furrow (70.5%), border (15.37%), check basin (6.15%), Drip (4.05%), Sprinkler (1.4%) and flooding (2.53%). Fig 3.3.1 gives information regarding sub-methods of water application in study region.

Table No. 5.1.
Water Application Sub-Methods in study Region

Sr. No.	Sub-methods of irrigation	Circle						
		Jaysingpur	Shirol	Shirdhon	Nandani	N.Wadi	Kurundwad	Dattwad
1	Furrow	60.05	75.11	63.07	69.02	90.34	72.06	84.25
2	Border	25.11	15.18	23.85	4.36	5.5	17.38	-
3	Basin	4.19	4.7	6.8	14.55	4.16	-	8.16

4	Drip	4.59	3.1	2.11	5.18	-	9.2	5.25
5	Sprinkler	1.9	-	-	3.6	-	1.36	2.34
6	Flooding	4.16	1.91	4.17	3.29	-		
	Total	100	100	100	100	100	100	100

Source:- Based on field work

5.1. Furrow system

Furrow system is the oldest method of irrigation in Shirol tehsil. This method is mostly used in Jaysingpur circle (60.05%), Shirol circle (75.11%), Shirdhon circle (63.07%), Nandani circle (69.02%), Narasobawadi circle (90.34%), Kurundwad circle (72.06%) & in Dattwad circle (84.25%) in Shirol teshil, highest use of this method was observed in Narasobawadi while lowest use of this method is in Jaysigpur circle. Furrow method is highly used for the sugarcane (94.9%), Soyabean (78.53%), Groundnut (35.75%), Jowar (50.51%) , Rice(13.78%), Wheat (56.39%) and Gram(75.34%) crops. This method is very popular method in tehsil.

Table No. 5.2.
Crop-wise Application of irrigation in study region

Sr. No.	Sub-methods Irrigation	Crops							
		Sugarcane	Soyabean	Groundnut	Jowar	Rice	Wheat	Gram	Other
1	Furrow	94.9	78.53	35.75	50.51	13.78	56.34	75.34	51.9
2	Border	-	10.84	29.75	25.45	48.12	16.43		13.96
3	Check Basin	1.1	3.26	-	24.04	19.05	27.23	20.67	15.26
4	Drip	4	-	-	-	-	-		8.42
5	Sprinkler	-	3.57	20	-	5.01	-		3.92
6	Flooding	-	3.8	14.5	-	14.04	-	3.99	6.54
	Total	100	100	100	100	100	100	100	100

Source:- Based on field work

5.2. Boarder Irrigation

Irrigating the filed by dividing it into a number of strips, generally varying from 6 to 18m with 30-150m length, leveling the land & separating the strips by the earth bund about 30cm high is known as border method of irrigation. This method is locally known as “Sara method” locally. The high practice of border irrigation (above 20%) was observed in Jaysigpur & Shirdhon circles. The moderate practice of this method (10 to 20%) was observed in Kurundwad & Shirol circles. The low practice of border irrigation method (below 10%) was observed in Narasobawadi and Nandani circles. The border irrigation method is majorly used for rice (48.12%), groundnut (29.75%), Jowar (25.45%), Wheat (16.43%), Soyabean (10.84%) and other crops (13.96%).

5.3. Basin irrigation

Use of basin irrigation has many variations. But generally it involves dividing the filed area into smaller units so that each unit has a nearly level surface (fig. 3.3.5.). Bunds or ridges are constructed around the areas of forming basins within which the irrigating is applied to the desired depth which is also called as “Vafa method” (Qadir, 2003). Fig. 3.1.3 reveals the spatial distribution of basin irrigation method. This method is used for crops like wheat (27.23%), jowar (24.04%), gram (20.67%), rice (19.05%), soybean (3.26%), sugarcane (1.10%) and other crops (15.26%).

Relatively high practice of basin irrigation (above 14%) was seen in Nandani circle. The moderate (6 to 9%) practice of this method is observed in the Dattwad & Shirdhon circle. The less practice (below 5%) this method was noted in the Narasobawadi, Shirol and Jaysingpur circles.

5.4. Flooding irrigation

If water is allowed to flow quickly over the surface of field then less amount will percolate into the soil, where as if water is kept on soil surface too long, water will percolate beyond the root zone(K Palanisami, 2010). In this method, smoothness of land surface and skill of irrigation are very important. Use of this irrigation method in study region is only 2.53%. The significant use of this method above 3% is

observed in Jaysingpur, Shirdhon and Nandani circles. The low practice of flooding irrigation (below 2%) was observed in the Shirol. Under study region, this method was used for groundnut (14.5%), rice (14.04%), Soabean (3.8%) & other crops (6.54%).(Fig.3.3.3)

5.5. Sprinkler Irrigation System

The sprinkler irrigation system is a very suitable method for irrigation on sloppy lands and also on shallow soils. It is best suited to coarse sandy terrain where the percolation loss is more and where as a consequence, the frequency of irrigation required is more (Wang, 2006). The sprinkler irrigation system is less used in Shirol tehsil viz. Jaysingpur circle 1.9%; Nandani circle 3.6%; Kurunwad circle 1.36% and Dattwad circle 2.34%. The sprinkler irrigation system is not used in Nurshiwadi, Shirol and Shirodhon circles due to excess availability of water since rivers are passing through these circles. It is suitable in undulating terrain where land shaping is expensive or technically not feasible. The removal of fertile soil cover by land shaping is not advisable. Sprinkler irrigation system can also be adopted in hilly regions where dwarf crops are grown. In study region this method is used for crops like groundnut (20.00%), rice (5.01%), soyabean (3.57%) and other crops (3.92%). The use of this method in study region is only 1.4%. Maximum use of this method (only 2 to 4%) is observed in Nandani and Dattwad circles. Comparatively low use (below 2%) of this method is observed in Jaysingpur and Kurundwad circles.

5.6. Drip irrigation

The Drip irrigation system is widely used in Shirol Tehsil. Relatively high practice (above 9%) of this method is observed in the circle of Kurundwad. The moderate practice (4 to 6%) of this method is noted in the Dattwad, Nandani and Jaysingpur circles. The low practice (below 4%) of this method is observed in the Shirol & Shirdhon circles. In the study region, this method is used for the sugarcane crop (3.77%) and other crops like fruit farms (8.42%) etc.

6. Sources of Irrigation:

Irrigation plays a vital role in the agricultural regeneration of a district. As such, great importance has been laid on accelerating the extension of water in the dry season within the shortest possible time. The rabi cultivation depending on irrigation suffers because of low moisture rotational capacity of the soil. The major sources of irrigation in study region are the Krishna, the Panchaganga, the Warana & the Dudhaganga rivers which supplies water through lift irrigation schemes, to the crops and also increase the irrigation facilities. The sources of irrigation are greatly affected by the geological, physical and climatologically conditions. According to the availability of surface of ground water, types of relief, soils and moisture requirements of crops, the sources of irrigation have been categorized (Sharma, 1992).

The important irrigation sources available in the study area were categorized into the three traditional types, namely Lift, wells and other sources of irrigation. The different modes of irrigation were characterized by the changes in their ranking order. Consequently the lift irrigation system is the most dominant and it irrigates larger area than any other irrigation system.

The distribution of area under irrigation by different sources at the circle level shown in the Table No.6.1 The fact reveals that all circles including Jaysingpur, Shirol, Nandani, Narshihawadi, Kurundwad, Dattwad & Shirdhon from shirol teshil have lift & well irrigations. It is mainly due to banks of rivers flowing in the teshil. Over all, irrigation systems in the teshil are well channelized.

Table No. 6.1
Different Sources by Irrigation in Study Region

Sr.No.	Year	Well Irrigation		Lift Irrigation		Total Irrigated		Intensity of irrigation
		Hectare	%	Hectare	%	Hectare	%	
1	2001-02	1301	9.71	12099	90.29	13400	100	64.25
2	2015-16	1719	8.68	18096	91.32	19815	100	84.17

Source: - Agriculture Department, Shirol

6.1. Lift Irrigation:-

The advantage of lift irrigation is the minimal land acquisition problem and minimum water losses. The lift irrigation scheme are instrumental in stabilizing agriculture production particularly during the years of droughts and increase crop production as water is available whenever it is required and thereby increase in income level.

The study region is well known for lift irrigation schemes. At present the share of lift irrigation is 91.32% out of total irrigation in the study region. it has increased from 90.29% to 91.32% to total irrigated area during the study period (Table No. 6.1.)

6.2. Well Irrigation:-

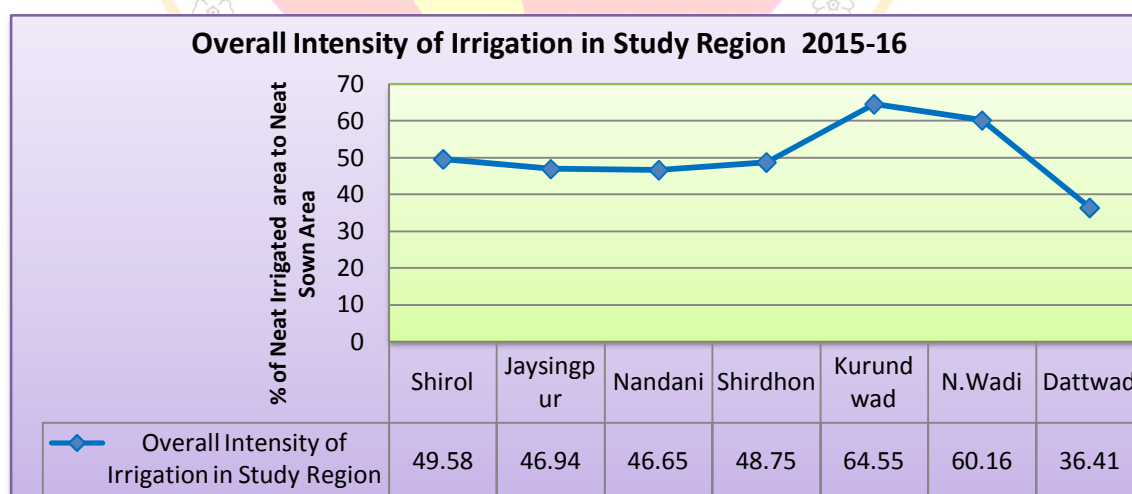
The present work is purely based on the data obtained through intensive field work. Present work was carried out to assess the comparative details. At present, the well irrigation contributes 8.68% out of total irrigation. it has decreased from 9.71% to 8.68% to total irrigated area during study period (Table 6.1) The sugarcane is a perennial crop and wheat is a seasonal crop, which were grown in rabbi season and it depends mainly on irrigation. The circles, are located in the Krishna, Warna, Dhudhaganga and Panchaganga river Basin were selected which are having the simultaneous availability of both lift and well irrigation facilities.

7. Overall Intensity of irrigation:

Generally the intensity of irrigation is expressed in two ways viz. the percentage of Gross irrigated area to net-irrigated area or the percentage of net-irrigated area to net-sown area, Shirol is sufficient irrigated taluak. The calculated the intensity of irrigation by applying both the methods and explained well irrigation method in general and lift irrigation method in particular, for the detailed intra-regional analysis of the intensity of irrigation in the study region.

During the period under review the overall intensity of irrigation in study region is 50.86%. Therefore, irrigation has been identified as decisive factor to improve agricultural production per hectare. Even a cursory glance at the statistics of last fifteen years, shows that there is gradual development in irrigation. Irrigation is both evolutionary and revolutionary in nature. To find out overall intensity of irrigation; net area irrigated is taken as a percentage in relation to net area sown. Very high intensity of irrigation (above 64%) is confined to circle of Kurundwad in the investigating area. High intensity of irrigation (60 to 64 %) is observed in Narsobawadi circle. The water is supplied to these circles through the lift irrigation societies. Moderate intensity of irrigation (45 to 50%) is seen in Shirdhon, Nandani, Jaysingpur, Shirol. These circles are benefited by lift irrigation as well as well irrigation. Low intensity of irrigation (below 40%) is recorded in Dattwad circle. (Fig7.1.) It could be said from the above discussion that in areas having intensity of irrigation over 40 percent moderate changes can be brought with improved farming techniques. In areas having intensity of irrigation fewer than 40 %t there is great scope for further expansion of the irrigation facilities. It is very true that the higher the intensity of irrigation the lesser the area under sugarcane the greater that under economic cash crop. It is also observed that cropping pattern is diversified in an area where Irrigation facilities are significantly developed.

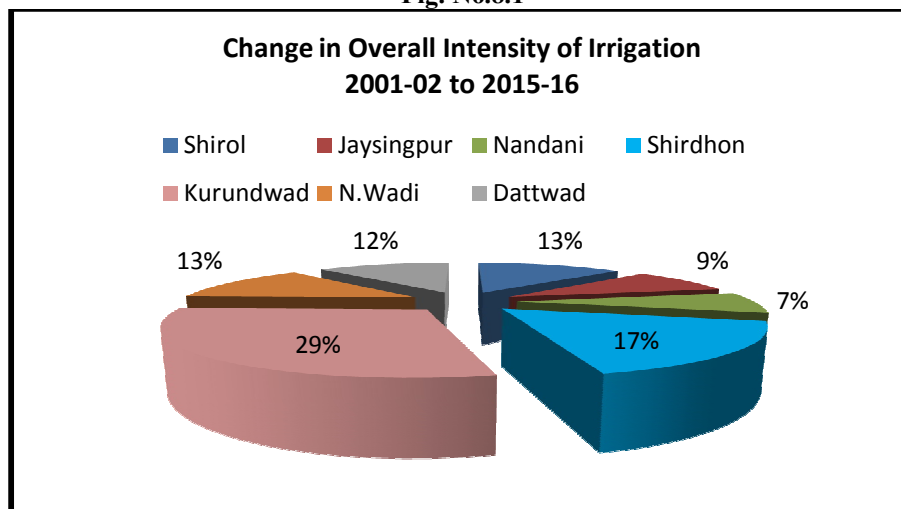
Fig. No.7.1



Source:- Based on field survey

8. Overall Change in Intensity of irrigation

Fig. No.8.1



During the period under investigation the intensity of irrigation has been increased by 16.65%. however, very high change (above 20%) in the intensity of irrigation is confined to the circle of Kurundwad. Relatively high intensity (15 to 20%) is observed in the Shirdhon circle. This is due to the development of lift irrigation schemes after completion of Dudhaganga and Warna projects. The moderate positive change (10 to 15%) is found in the circles of Narsobawadi, Dattwad and Shiroli (Fig.8.1). The low positive change (below 10%) is noted in the circles of Jaysingpur and Nandani.

In the study region, Jaysingpur is the fast developing circle, as the result of its areal extent, most of the cultivatable area around the city has been utilized for settlement and industries.

9. Conclusion:-

The growth and development of agriculture in the study region is due to, eighty co-operative lift irrigation societies. It can be concluded that lift irrigation contributes 91.32% and it holds a leading irrigation system. It showed a tremendous increase with 16.39%. However, second leading source of irrigation is well irrigation with 8.68%. During study it is also concluded that well irrigation was increased by only 0.33%. The overall intensity of irrigation was about 50.86%. Overall intensity of irrigation has been increased by 16.65%.

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