



AN ASSESSMENT IMPACT OF IRRIGATION ON SUGARCANE
CULTIVATION IN SOLAPUR DISTRICT: A GEOGRAPHICAL
ANALYSIS

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Abstract:

Water shortage is one of the main reasons of limitation of sugarcane cultivation around the world. Sugarcane imitation models can be used to evaluate the impact of irrigation on sugarcane cultivation where water shortage causes significant losses. The aim of this study is to measurement of the impact of irrigation on sugarcane cultivation in Solapur district, by associating under the irrigated conditions. Irrigation is applied to cover the crop from the water deficit, with the highest level corresponding to full irrigation to obtain higher the level of sugarcane cultivation. The results showed that sugarcane cultivation increases depend on the interaction between levels of irrigation. This study proved that irrigation is an important strategy to improve sugarcane cultivation even in the regions where irrigation is currently not recommended.

Key Words- Sugarcane cultivation, irrigation, water shortage

Introduction

Irrigation is regarded as an important part of wide-ranging infrastructure and is one of the basic ingredients of agricultural activities. The availability of adequate irrigation facilities transforms the subsistence agricultural landscape gradually into commercial one making agrarian economy market oriented (Pawar, 1989). Solapur district is still dependent on the vagaries of monsoon. The object of irrigation is to arrangement of water for farm produce to fulfill the needs of growing population. Irrigation is influenced on the cropping pattern of the region particularly cash crop or perennial crops like sugarcane. At present, wells, tube-wells, rivers, tanks, canals and bandharas are main sources of irrigation in the study region. The proportion of irrigated land is relatively poor due to physical compel and scarcity of water.

Study Area

The study is carried out in the Solapur district situated entirely in Bhima, Sina and Man river basins in southern Maharashtra. Solapur district is extended between 17° 10' and 18° 32' north latitudes and 74° 42' and 76° 15' east longitudes. Solapur district is 4th rank in the term of area and 7th rank in term of population. The total geographical area covered by Solapur district is 14,895 sq. km with eleven tahsils, Solapur occupies 4.83% area of Maharashtra State. The intensive sugarcane cultivation is based on the availability of irrigation facilitated by the use of canals. The area is semi-arid with an annual rainfall of below 500 mm and is always uncertain with bimodal situation. The rains begin in the month of June and dry spell of two to six weeks are observed during July-August. About 40 % rainfall received in the month of September. The High daily maximum temperatures throughout the year are mostly recorded as 40.10°C while minimum is 16.10°C.

Objectives

The present study was undertaken with the following objectives

1. To study the spatial distribution of irrigated area and area under sugarcane cultivation in the study area.
2. To find out the correlation between irrigation and area under sugarcane cultivation.

Data Base and Methodology

The present study is based on secondary data collected from the District Statistical Office, Department of Agriculture Solapur district, Season and Crop Reports published by the Department of Agriculture and Socio-economic Review of Solapur District. Simple statistical method has used to compute proportion of irrigated area, individual crop area i.e. sugarcane and coefficient of correlation by Karl Pearson's techniques.

Irrigation

Irrigation is an important indicator to determine the cropping pattern and agricultural practices. The intensity of irrigation controlled by various factors such as source of irrigation, quantity and quality of water supply, intensity of network of water canals, etc. (Pawar, 1989). Wells, tube-wells, rivers, tanks, lakes, canals and dams are the means of the irrigation in the Solapur district. The proportion of total irrigation in the region is 23.42 per cent. Area under canal irrigation has been increasing day by day, Ujani irrigation project constructed on river Bhima especially for Solapur district. Nira right bank canal also useful for irrigation in study region. Rivers like Bhima, Sina, Man and their tributaries helps to irrigation in the Study region. There are many tanks such as Buddehal, Gheradi, Tawale (Sangola), Pathari (Barshi),

Hotagi (South Solapur), Wadshivane (Karamala) and Sapatane (Madha) which are useful for irrigation.

Spatial Distribution of Irrigation

Spatial distribution of irrigation expresses man's dynamic attempts to overcome the environmental limitations in the transformation of many of the barren areas into the agricultural areas.

Table exhibits that the district as a whole has 23.42 per cent area under irrigation. It varies from tahsil to tahsil ranging from 67.67 per cent in Pandharpur tahsil to 2.35 per cent in Sangola tahsil. The whole district has divided into four categories on the basis of mean and standard deviation viz. high proportion of irrigation (above mean + 1SD), moderate proportion of irrigation (mean to mean + 1SD), low proportion of irrigation (mean -1SD to mean) and very low proportion of irrigation (below mean -1SD).

Table 1

Tahsil-wise percentage of irrigated area and percentage of area under sugarcane cultivation in Solapur district, 2018

| Sr. No. | Tahsil | % of Irrigated Area | % of Area under Sugarcane |
|-------------------------|---------------|---------------------|---------------------------|
| 1 | Karmala | 14.14 | 8.85 |
| 2 | Madha | 31.52 | 16.48 |
| 3 | Barshi | 9.20 | 1.95 |
| 4 | North Solapur | 25.47 | 5.90 |
| 5 | Mohol | 31.81 | 7.38 |
| 6 | Pandharpur | 67.67 | 17.74 |
| 7 | Malshiras | 47.70 | 18.01 |
| 8 | Sangola | 2.35 | 0.00 |
| 9 | Mangalwedha | 20.04 | 5.03 |
| 10 | South Solapur | 26.38 | 13.81 |
| 11 | Akkalkot | 18.44 | 4.70 |
| Solapur District | | 23.42 | 9.58 |
| Mean | | 26.79 | 9.08 |
| SD | | 17.42 | 6.13 |
| r | | 0.84 | |
| r² | | 0.70 | |

Source: Socio-economic Review and District Statistical Abstract, Solapur District, 2018.

High Proportion of Irrigation

The proportion of high level of irrigation i.e. above 44.22 per cent (more than Mean+ 1SD) was recorded in Malshiras and Pandharpur tahsils in the study area during the period of 2018. These tahsils are located in Nira-Bhima river basin, flat land, fertile soil, and development of surface irrigation through the Bhatgar and Ujjani canals.

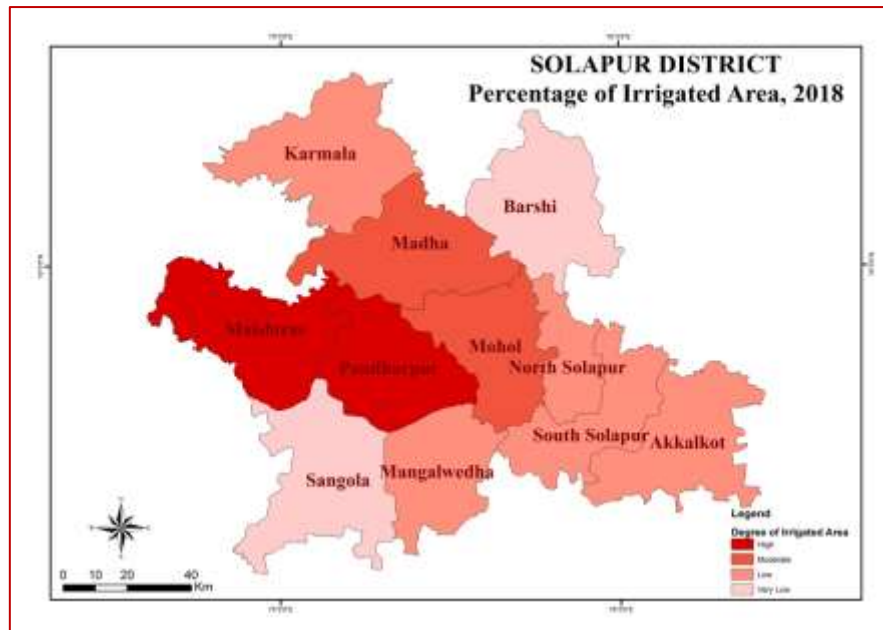


Fig. 1

Moderate Proportion of Irrigation

The moderate proportion of irrigation i.e. ranging between 26.79 to 44.22 per cent (Mean+ 1SD - Mean) is found in Madha and Mahol tahsils. Relief feature is an important role for the moderate level of irrigation. Relief is hilly and undulating, canals are not proper developed in these tahsils so sub-surface water is very deep; therefore it is costly affairs to sink wells and tube-wells in this area. Furthermore, the economic conditions of the farmers are poor so the construction of well or sinking of tube-well is not reach farmer.

Low Proportion of Irrigation

The low proportion of irrigation i.e. 9.31 to 26.79 per cent (Mean-1SD to mean) is found in Karmala, North Solapur, Mangalwedha, Solapur and Akkalkot tahsils. It is giving a way to rain fed agriculture. The intensity of irrigation is very low in these tahsils. Physical settings are responsible for the low intensity of irrigation.

Very Low Proportion of Irrigation

The very low proportion of irrigation i.e. below 9.31 per cent (below Mean-1SD) is found in Barshi and Sangola tahsils, due to the low rainfall, low development of surface irrigation and shallow soil.

Spatial Distribution of Area under Sugarcane Cultivation

Sugarcane is a major cash crop in Solapur district. The cultivation of sugarcane has been steadily increasing because of the opening of sugar factories in this district and also due to the increasing availability of irrigation facilities. Sugarcane is mainly an irrigated crop and

is grown all over the district of the deep black soils except the hilly areas of the part of Barshi, part of Malshiras, Sangola and part of Karmala tahsils.

The table exhibits that the proportion of sugarcane cultivation to total cultivated area has a whole district as 9.58 per cent in 2018. But the distribution of sugarcane cultivation is uneven throughout the district i.e. ranging from 0.00 per cent Sangola tahsil to 18.01 per cent in Malshiras tahsil. The district has also divided into four categories on the basis of mean and standard deviation.

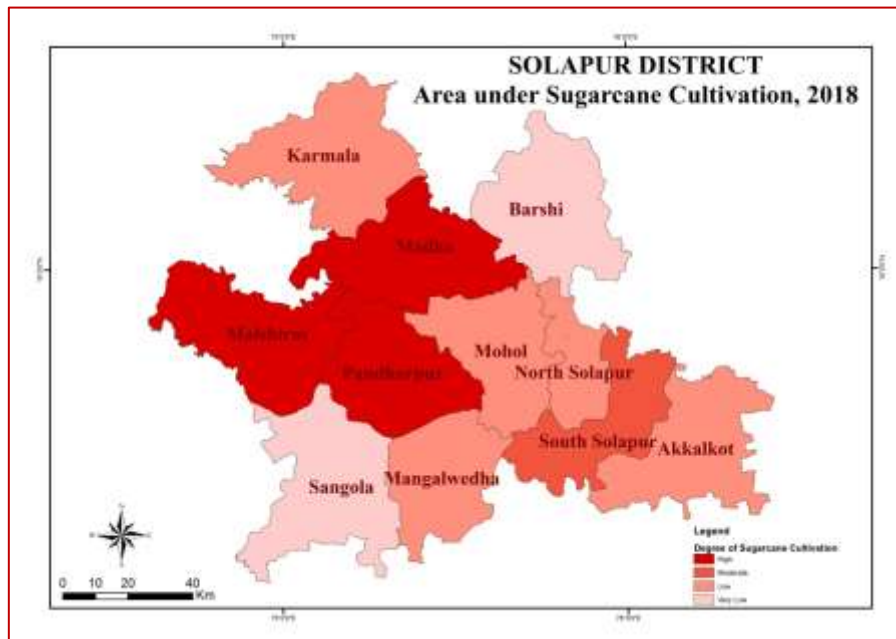


Fig. 2

High Proportion of Sugarcane Cultivation

The high proportion of sugarcane cultivation i.e. above 15.21 per cent (above Mean +1SD) is recorded in Malshiras, Pandharpur and Madha tahsils due to the located in Bhima-Nira and Sina river basin area, flat topography, fertile black soil, well-developed agricultural infrastructure, and mainly high development of surface irrigation through Bhatgar and Ujani irrigation projects.

Moderate Proportion of Sugarcane Cultivation

The moderate proportion of sugarcane cultivation i.e. ranging from 9.08 to 15.21 per cent (mean to mean +1SD) is registered only in South Solapur tahsils. Because of contains well fertile soil, but moderate development of surface irrigation facilities and insufficient development of agricultural infrastructural facilities.

Low Proportion of Sugarcane Cultivation

The low proportion of sugarcane cultivation i.e. 2.94 to 9.08 per cent (mean -1SD to man) is recorded in In this category the tahsils which have included proportion of area under

Prof. Shelake Sambhaji Tatyaba

sugarcane cultivation low mean minus one standard deviation. Lowest sugarcane cultivation was found in the tahsils of Karmala, North Solapur, Mohol, Mangalwedha and Akkalkot tahsils due to lack of irrigation facilities, hilly, low fertile and shallow soil, and drought prone conditions, etc. Therefore, jowar is dominant crop in these tahsils.

Very Low Proportion of Sugarcane Cultivation

The very low proportion of sugarcane cultivation i.e. below 2.94 per cent (below mean -1SD) is recorded in Barshi and Sangola tahsil due to sugarcane crop is a water consuming crop as resulted low development of irrigation facilities in these tahsils as well as shallow and infertile soil, rugged topography leads to very low proportion sugarcane cultivation in these tahsils of the study area. In short, it has been recorded that the highly irrigated areas having highly cultivation of sugarcane. It means positive correlation between the irrigation and area under sugarcane cultivation.

Association between Irrigation and Sugarcane Cultivation

Here, an attempt is made here to assess the impact of percentage of irrigated area on sugarcane cultivation. The very high positive relationship between the percentage of irrigated area (X) and sugarcane cultivation (Y) has been registered in the Solapur district. The coefficient of correlation in this regard is at $r = 0.84$ i.e. very high positive correlation. It designates that there is a very high positive relation in between the variable X and Y.

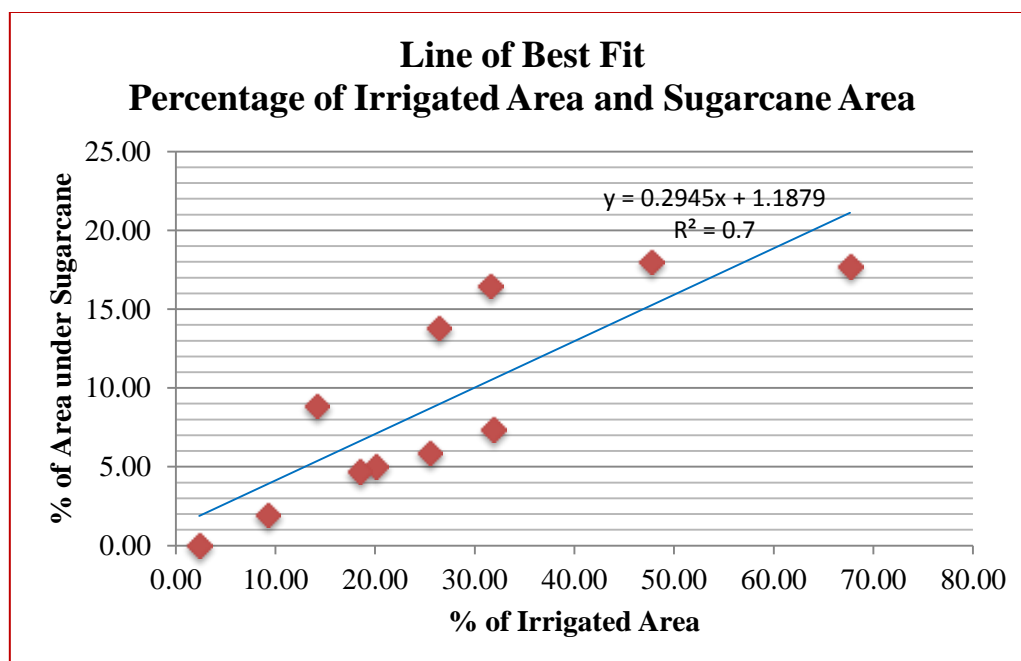


Fig. 3

The degree of linear relationship between these two variable obtained by using the coefficient of determination is found to be at 0.70, which reveals that the independent

variable (X) i.e. irrigation is explaining 0.70 per cent of the total variations in dependent variable (Y) i.e. sugarcane cultivation in the study region. It is a very high to high explanation because 0.70 per cent of variation in 'Y' i.e. proportion of gross irrigation to be influenced by the variable 'X' i.e. sugarcane cultivation and about 99.30 per cent to be influenced by other variables. The functional form of linear relationship of 'Y' on 'X' found to be at $y = 0.2945x + 1.1879$. The regression coefficient indicates that increase of one composite index of cropping intensity causes for increase of 0.2945 composite index of cropping intensity in the study area.

Conclusion

Water shortage is one of the main reasons of limitation of sugarcane cultivation around the world. Irrigation is applied to cover the crop from the water deficit, with the highest level corresponding to full irrigation to obtain higher the level of sugarcane cultivation. The district as a whole has 23.42 per cent area under irrigation. The proportion of high level of irrigation is recorded in Malshiras and Pandharpur tahsils. Because of these tahsils are located in Nira-Bhima river basin, flat land, fertile soil, and development of surface irrigation through the Bhatgar and Ujjani canals. The very low proportion of irrigation is found in Barshi and Sangola tahsils, due to the low rainfall, low development of surface irrigation and shallow soil.

The proportion of sugarcane cultivation to total cultivated area has a whole district as 9.58 per cent in 2018. The high proportion of sugarcane cultivation is recorded in Malshiras and Pandharpur tahsils due to the located in Bhima-Nira river basin area, flat topography, fertile black soil, well-developed agricultural infrastructure, and mainly high development of surface irrigation through Bhatgar and Ujjani irrigation projects. The very low proportion of sugarcane cultivation is recorded in Barshi and Sangola tahsil due to sugarcane crop is a water consuming crop as resulted low development of irrigation facilities in these tahsils as well as shallow and infertile soil, rugged topography leads to very low proportion sugarcane cultivation in these tahsils of the study area.

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Prof. Shelake Sambhaji Tatyaba

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