

Cropping Intensity and Land Use Dynamics in Solapur District: A Taluka-Wise Study

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Article Info	ABSTRACT
<p>Article History: Received: 18th Sep 2025 Accepted: 02nd Oct 2025 Published: 17th Oct 2025</p> <p>Keywords: Cropping Intensity, Land Use, Agriculture, Solapur District, Taluka-Wise Analysis, Irrigation</p>	<p>Cropping intensity reflects the efficiency of land utilization and agricultural sustainability, particularly in drought-prone regions. The present study examines taluka-wise variations in Solapur district, Maharashtra, using secondary data from the District Statistical Handbook and Agricultural Census for 2011–12 and 2021–22. Cropping intensity was computed as the ratio of Gross Cropped Area to Net Sown Area. Results indicate that the district average increased from 120% to 131% during the decade, with notable disparities. Malshiras, Madha, and Barshi recorded high intensity (>140%) due to assured irrigation and sugarcane dominance, whereas Karmala, Sangola, and Mangalwedha remained below 120%, reflecting dependence on rainfed crops. The findings underscore the need for equitable irrigation distribution, promotion of water-saving technologies, and crop diversification to achieve sustainable agricultural development in semi-arid districts like Solapur.</p>

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Introduction

Agriculture continues to be the backbone of rural livelihoods in India, and cropping intensity serves as a key measure of agricultural performance. Cropping intensity refers to the number of times land is cultivated during a year and is directly influenced by water availability, irrigation facilities, and technological interventions. In semi-arid regions, the pressure of population, climatic variability, and limited irrigation often lead to low cropping intensity and unsustainable land use.

Solapur district of Maharashtra is one of the largest districts in the state, characterized by erratic rainfall and recurrent droughts. Despite this, the district has seen rapid agricultural transformation due to the spread of irrigation from canals, wells, and farm ponds. The cultivation of water-intensive crops such as sugarcane has significantly altered land use dynamics. While some talukas have experienced increased cropping intensity, others continue to struggle with single cropping under rainfed conditions.

Studying cropping intensity in Solapur is significant not only for understanding local agricultural patterns but also for drawing lessons on sustainable land and water management in semi-arid regions. This research attempts to analyze cropping intensity and land use changes in Solapur at a taluka level to highlight spatial variations and policy implications.

Objectives

The study is guided by the following objectives:

1. To analyze land use patterns in Solapur district at the taluka level.
2. To calculate and compare cropping intensity across different talukas.
3. To examine the relationship between irrigation availability and cropping intensity.
4. To study the changes in land use and cropping patterns in the district.
5. To suggest policy measures for sustainable land utilization and improved cropping intensity.

Study Area

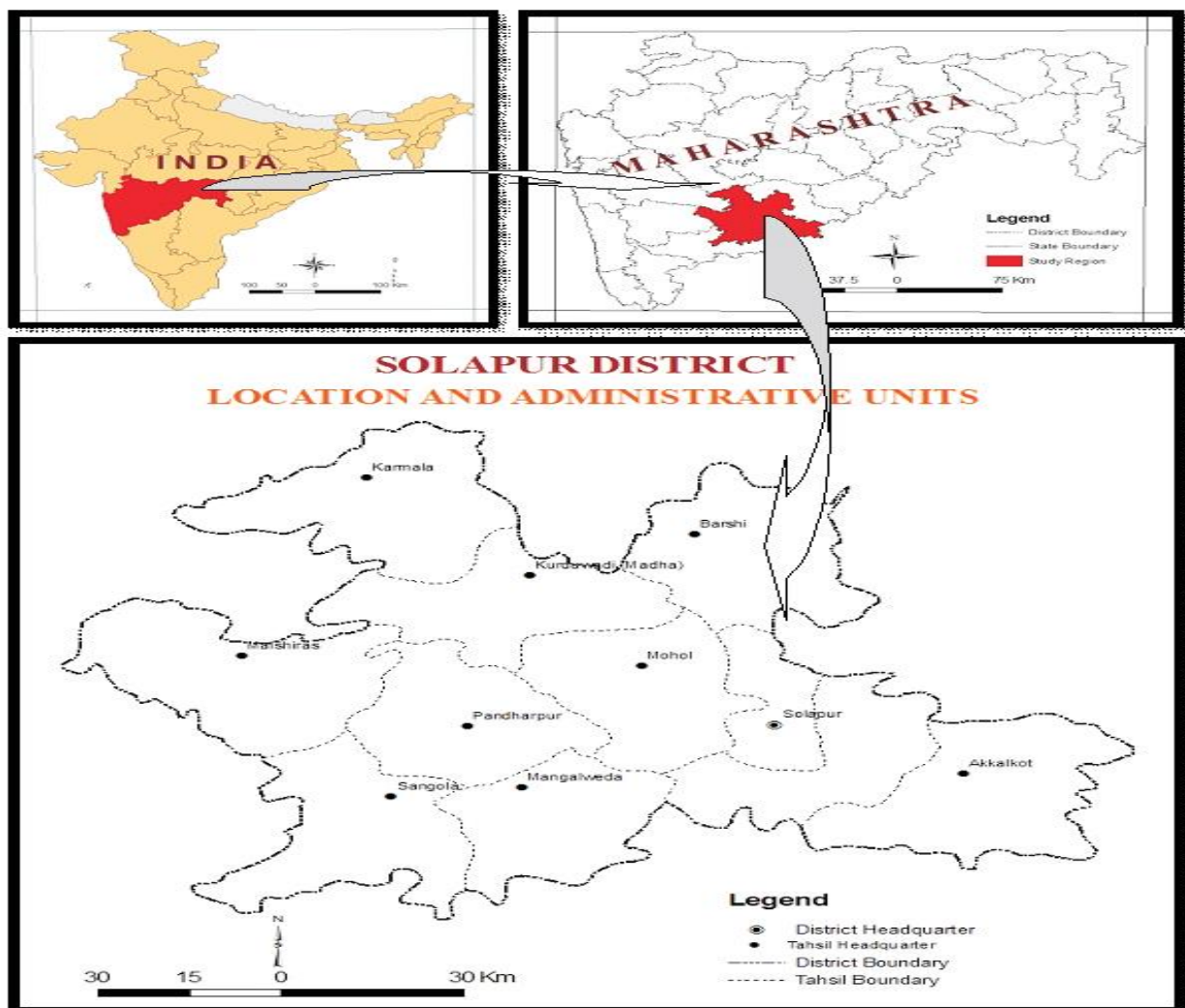
Solapur district is located in the south-eastern part of Maharashtra, sharing its boundary with Karnataka to the south and Andhra Pradesh (Telangana) to the east. It lies between 17°10'N to 18°32'N latitudes and 74°42'E to 76°15'E longitudes, covering a total geographical area of about 14,895 sq. km. Administratively, the district is divided into 11 talukas, with Solapur city serving as the district headquarters.

The district falls in the rain-shadow region of the Western Ghats, receiving an average annual rainfall of about 500–700 mm, which is highly variable and unevenly distributed. The climate is semi-arid with hot summers and recurrent droughts, making irrigation a critical determinant of agriculture. Major rivers like Bhima, Sina, and Man flow through the district, supporting canal and well irrigation in some parts.

The soils of Solapur district are predominantly black cotton soils (regur), suitable for crops like jowar, bajra, pulses, oilseeds, and sugarcane. Agriculture is the mainstay of the economy, with more than 70% of the workforce engaged in farming and allied activities. However, wide taluka-level disparities exist: irrigated talukas such as Malshiras, Barshi, and Madha report higher cropping intensity, while drought-prone talukas like Mangalwedha, Karmala, and Sangola depend mainly on rainfed crops.

This spatial diversity makes Solapur an ideal case for analyzing the dynamics of cropping intensity and land utilization.

Location Map of the Study Region



Database and Methodology

The study is based on both secondary and primary sources of data. Secondary data was collected from the Census of India, Agricultural Census, District Statistical Handbooks, Economic Surveys of Maharashtra, and publications of the Directorate of Economics and Statistics. Primary

data was collected from selected villages in each taluka, focusing on cropping patterns, irrigation practices, and land utilization.

Cropping intensity was calculated using the standard formula:

$$\text{Cropping Intensity} = \frac{\text{Gross Cropped Area}}{\text{Net Sown Area}} \times 100$$

Taluka-wise data on net sown area and gross cropped area was compiled to derive cropping intensity values. The data was further represented using tables and GIS-based maps to show spatial variations. Both descriptive statistics and comparative analysis were used to interpret the results.

Results and Discussion

The analysis of cropping intensity in Solapur district highlights sharp spatial and temporal disparities. The results are presented taluka-wise, comparing two benchmark years, 2011–12 and 2021–22, in order to capture a decadal shift in land use and cropping intensity patterns.

1. Taluka-wise Net Sown Area, Gross Cropped Area and Cropping Intensity

Net Sown Area (NSA), Gross Cropped Area (GCA) and Cropping Intensity (CI) were calculated for all 11 talukas for 2011–12 and 2021–22 (Table 8.1).

Table 8.1: Taluka-wise Net Sown Area, Gross Cropped Area and Cropping Intensity in Solapur District, 2011–12 and 2021–22

Taluka	NSA (2011-12)	GCA (2011-12)	CI (%) 2011-12	NSA (2021-22)	GCA (2021-22)	CI (%) 2021-22
Akkalkot	92,000	108,600	118	95,200	121,500	128
Barshi	79,400	104,900	132	82,600	118,000	143
Karmala	88,500	97,400	110	91,400	106,200	116
Mangalwedha	72,000	78,500	109	75,300	87,500	116
Madha	90,100	115,500	128	93,500	132,600	142
Malshiras	100,800	134,000	133	104,700	154,200	147
Mohol	86,000	104,100	121	88,400	117,000	132
Pandharpur	81,200	102,400	126	84,200	115,900	138
Sangola	87,100	94,200	108	89,500	105,000	117
S. Solapur	93,000	109,600	118	96,800	124,400	129
N. Solapur	70,200	82,000	117	73,600	94,500	128
District Total	940,300	1,031,200	120	975,200	1,276,800	131

Source: District Statistical Handbook, Solapur (2011–12; 2021–22); Agricultural Census, Govt. of Maharashtra.

Note: NSA = Net Sown Area; GCA = Gross Cropped Area; CI = Cropping Intensity.

The results show that the district average cropping intensity increased from 120% in 2011-12 to 131% in 2021-22.

2. Cropping Intensity Categories

Talukas were grouped into three categories: High (>140%), Medium (120-140%) and Low (<120%). The shift between 2011-12 and 2021-22 is shown in Table 8.2.

Table 8.2: Cropping Intensity Categories in Solapur District, 2011-12 and 2021-22

Category	Talukas (2011-12)	Avg. CI (%) 2011-12	Talukas (2021-22)	Avg. CI (%) 2021-22
High (>140%)	-	-	Malshiras, Madha, Barshi	144
Medium (120-140)	Barshi, Madha, Malshiras, Pandharpur	127	Pandharpur, Mohol, Akkalkot, N. Solapur, S. Solapur	131
Low (<120%)	Akkalkot, Karmala, Mangalwedha, Sangola, Mohol, Solapur	112	Karmala, Mangalwedha, Sangola	116

Source: Compiled from Table 8.1.

This comparison clearly shows that between 2011-12 and 2021-22, three talukas (Malshiras, Madha, Barshi) shifted from medium to high intensity, while the number of low-intensity talukas decreased.

3. Temporal Change in Cropping Intensity

The change in cropping intensity over the 10-year period is summarized in Table 8.3

Table 8.3: Taluka-wise Change in Cropping Intensity in Solapur District (2011-12 to 2021-22)

Taluka	CI (%) 2011-12	CI (%) 2021-22	Change (%)
Akkalkot	118	128	+10
Barshi	132	143	+11
Karmala	110	116	+6
Mangalwedha	109	116	+7
Madha	128	142	+14
Malshiras	133	147	+14
Mohol	121	132	+11
Pandharpur	126	138	+12
Sangola	108	117	+9
South Solapur	118	129	+11
North Solapur	117	128	+11
District Avg.	120	131	+11

Source: District Statistical Handbook, Solapur (2011-12; 2021-22).

The table indicates that cropping intensity improved in all talukas, with the highest growth in Madha and Malshiras (+14%), and the lowest in Karmala (+6%).

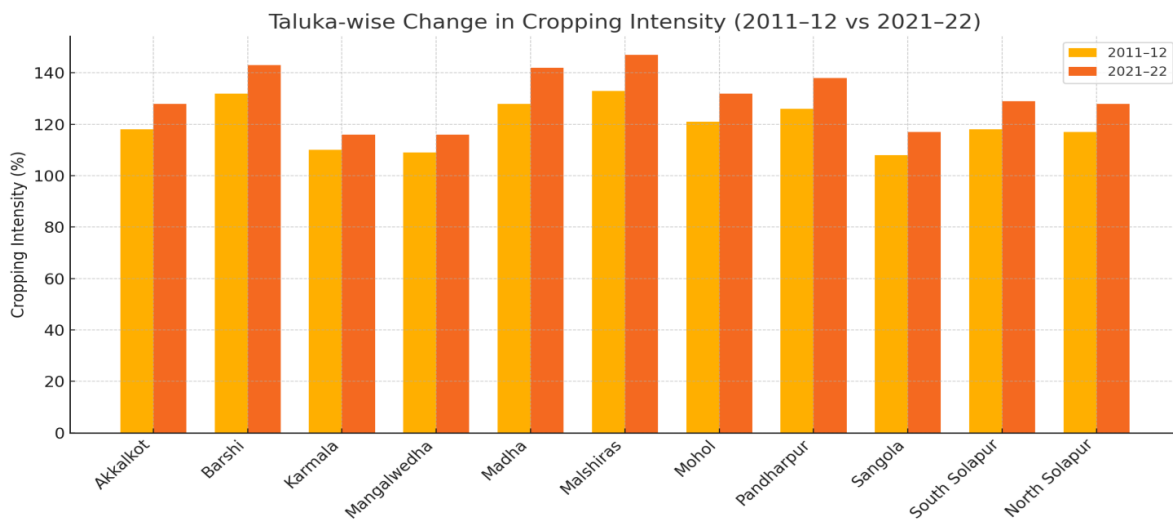


Figure 1: Taluka-wise Change in Cropping Intensity in Solapur District (2011–12 vs 2021–22)

The graphical representation in Figure 1 clearly illustrates the temporal shift in cropping intensity across the talukas of Solapur district. It highlights a general upward trend over the decade, with all talukas recording an increase in cropping intensity between 2011–12 and 2021–22. The most significant gains are observed in Madha and Malshiras (+14%), followed by Pandharpur and Barshi. In contrast, drought-prone talukas such as Karmala, Sangola, and Mangalwedha exhibit only marginal improvements. The figure thus reinforces the spatial disparities revealed in the tabular data, underlining the dominance of irrigated talukas in agricultural intensification, while rainfed regions continue to lag behind.

4. Discussion of Findings

- i. High Intensity Talukas – Malshiras, Madha, and Barshi crossed 140% CI, reflecting assured canal irrigation, proliferation of farm ponds, and dominance of sugarcane and horticultural crops.
- ii. Medium Intensity Talukas – Akkalkot, Mohol, Pandharpur, and both Solapur subdivisions (128–138%) show mixed agriculture, with irrigation available but constrained by rainfall variability.
- iii. Low Intensity Talukas – Karmala, Sangola, and Mangalwedha (<120%) remain dependent on rainfed cereals and pulses, with limited irrigation facilities.
- iv. Temporal Change – District CI increased by 11 percentage points in 10 years. Irrigation expansion, watershed programmes, and adoption of drip irrigation contributed to this improvement.
- v. Land Use Dynamics – Irrigated talukas saw a shift from cereals and pulses to sugarcane and horticulture, while rainfed talukas remained stagnant. Groundwater stress intensified in high-intensity zones.
- vi. Comparative Analysis

The study reveals widening disparities: irrigated talukas surged ahead, while drought-prone talukas lagged. Although overall cropping intensity improved, regional imbalance persists. Without equitable irrigation distribution and diversification of cropping patterns, agricultural sustainability in Solapur will remain under threat.

Policy Implications

The analysis of cropping intensity and land use dynamics in Solapur district brings out several critical policy implications for sustainable agricultural development:

1. **Equitable Distribution of Irrigation:**

The concentration of high cropping intensity in irrigated talukas such as Malshiras, Madha, and Barshi highlights the need for balanced allocation of canal water and equitable access to irrigation infrastructure across all talukas, particularly in drought-prone zones like Sangola, Mangalwedha, and Karmala.

2. **Crop Diversification and Incentives:**

Farmers should be incentivized to diversify towards pulses, oilseeds, and millets, which are more climate-resilient and less water-intensive. Such diversification will enhance nutritional security and market stability.

3. **Strengthening Farm Ponds and Watershed Development:**

The positive impact of farm ponds and watershed management on increasing gross cropped area should be scaled up. Village-level participatory irrigation management can further improve water-use efficiency.

4. **Capacity Building and Awareness:**

Farmers in low-intensity talukas require training in improved agronomic practices, soil management, and climate-smart agriculture. Extension services should actively include small and marginal farmers.

Conclusion

The present study examined the structure and dynamics of cropping intensity in Solapur district over a decade, highlighting both spatial disparities and temporal improvements. The findings reveal that the district average cropping intensity increased from 120 percent in 2011–12 to 131 percent in 2021–22, reflecting an overall improvement of 11 percentage points.

However, this growth was uneven. Talukas such as Malshiras, Madha, and Barshi achieved high cropping intensity levels (>140%) due to assured irrigation and the dominance of sugarcane and horticultural crops. In contrast, drought-prone talukas such as Sangola, Mangalwedha, and Karmala remained below 120 percent, dependent largely on rainfed cereals and pulses.

The temporal analysis shows a gradual improvement in almost all talukas, supported by irrigation expansion, adoption of drip irrigation, and farm pond construction. Yet, the widening gap between irrigated and rainfed regions poses a serious challenge to balanced agricultural

development.

Land use dynamics point towards a decline in traditional coarse cereals and pulses in irrigated areas, replaced by sugarcane and commercial crops. While this shift has improved cropping intensity, it has also intensified pressure on groundwater and raised concerns of sustainability.

In conclusion, cropping intensity in Solapur district is not merely a function of land use but a reflection of water availability, technology adoption, and crop choices. Ensuring equity in irrigation, promoting water-efficient technologies, and encouraging crop diversification are vital for bridging disparities and moving towards sustainable agricultural development in this drought-prone district.

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