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Agricultural Productivity of Madha tehsil of Solapur District of Maharashtra

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ABSTRACT

Agriculture sector of India backbone of rural economy, 70 percent of rural household depends on agriculture it contribute 18.3 percent (2023-24) india's GDP. Madha lies between the Bhima and Sina River in Solapur district. Agriculture in Madha was largely rain fed farmers, grew jowar, wheat, mung bean or green gram and pigeon peas or tur etc. with the construction of Ujani Dam on Bhīma River. There a major shift improved irrigation allowed switching to more water intensive and commercial crops. On the other hand very low level of agriculture productivity is confirmed in some village of Madha tehsil having irregular rainfall, rugged topography and poor irrigation facilities, inadequacy of water is main hurdle in agriculture productivity.

Secondary data for the current study was gathered village wise from the Tehsil office Madha, District Statistical Abstract and the Socioeconomic Review. After processing the data, the yield coefficient approach was used to determine the levels of agricultural productivity. The results are displayed both tabular and on a map using the choropleth method. Therefore, an attempt has been made in this article to evaluate the regional differences in agricultural productivity in villages of Madha tehsil in Solapur District.

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Introduction:

Agriculture has always been the backbone of India's economy. It plays a vital role in Food security, Employment generation, Export earnings, Livelihood for rural population, India has one of the largest and most diverse agricultural sectors in the world, supported by various agro-climatic zones and cropping patterns. Traditional Agriculture Predominantly subsistence farming with low inputs and yields. Agriculture remains a critical sector for India's development, ensuring food security and rural livelihood. While significant progress has been made in production, India must now focus on Increasing farmers' income, Ensuring sustainability, Promoting modern agri-practices, Strengthening, infrastructure and market linkages, The future of Indian agriculture lies in technology, sustainability, value addition, and inclusive policies that empower small and marginal farmers.

Solapur is a leading district for Rabi Jowar in Maharashtra both in terms of area and production. Some talukas (e.g., Sangola, Akkalkot) have relatively high jowar yields compared to others. This suggests potential in certain areas to do well under existing conditions. There is increasing crop diversification, especially in irrigated pockets – with fruit, vegetable cultivation growing.

Irrigation infrastructure: canals (Bhima right bank, Sina etc.) and seasonal rivers help in some parts. Where irrigation is available, yields and cropping options are much better. On the other hand Low yields for many talukas: some areas are well below potential due to water scarcity, poor soil depth or quality, limited inputs. Eg. Madha's 4.06 q/ha for rabi jowar. Dependence on Rainfed Agriculture: Much of the area is under dry land; rainfall is erratic. This makes productivity volatile. Limited Irrigation in many areas: Irrigation coverage is not evenly distributed; many talukas remain with low water access. Soil constraints: Shallow soils, low moisture-retention in some talukas; soil fertility issues. In Solapur district Overall productivity is moderate to low, especially for traditional dryland cereals like Rabi Jowar. Many talukas have yields in the range of 500-700 kg/ha, which is well below what is possible under ideal conditions. Areas with irrigation and better inputs show significantly higher productivity, especially for irrigated crops (vegetables, fruits, wheat etc.). Thus, the productivity gap is largely due to water access, soil quality, and input usage. The shift in crop patterns, abandonment of some less profitable or more risk-prone crops (or ones with low yields), suggests farmers are adapting; but this involves trade-offs (food security vs income, risk exposure etc.).

Objectives: The goal of the current study is to identify several techniques for measuring agricultural productivity and assess the main crop productivity as well as the spatial variation in agricultural production within the study area.

Data Base and Methodology:

Present study mostly relies on the secondary data collected through Agriculture Department, District statistical Department of Solapur and socio-economic abstract of Solapur

district. For the present investigation, tehsil is selected as in general and Village in particular. Firstly, major crops productivity is measured and the productivity indices have been calculated on the basis of a statistical technique formulated by Jasbir Singh. The Figers and tehsil maps are used for comparative study of spatial distribution. The yield index of each crop is calculated by the equation given below:

Crop yield index $$Y_i = \frac{Y_{ae}}{Y_{ar}} \times 100$$

Where,

Yi - is the crop yield index.

Yae - is the average yield per hectare of a specific crop *a* in the component unit being studied.

Yar - is the average yield per hectare of the same crop *a* in the entire region.

Study Area:

Madha Taluka is an administrative subdivision within the Solapur District of Maharashtra, India, comprising 117 villages and serving as a significant administrative and political entity. Madha is one of the eleven talukas (tehsils) that make up the Solapur District in Maharashtra. As of the 2011 Census, the taluka contains 117 villages and has a total population exceeding 300,000. Madha Tehsil receives roughly 600 mm of rain on average. Karmala tehsil borders it to the north, while Indapur tehsil borders it to the north-west. Barshi Tashil of Solapur district lies to the east and northeast of Pune district, which is divided by the Bhim River. Pandharpur Tashil and northeast Paranda Tashil enclose it on the southern side. Madha tehsil lies between Latitude of 17° 21' 14." N to 17° 40' 55." N and between Longitude Range of 75° 14' 24" E to 75° 27' 57" E

Agricultural Productivity:

Agricultural Productivity refers to the efficiency with which agricultural inputs (such as land, labor, capital, and materials) are used to produce agricultural outputs (such as crops, livestock, or other food products). Essentially, it measures how much agricultural output is produced per unit of input, and is often used as an indicator of how efficiently resources are being used in agricultural practices.

Economists and geographers have created advanced instruments and methods in recent decades to assess agricultural output. The following lists some of the methods created and applied to measure agricultural productivity.

- Computing the crop yield and concentration indices ranking co-efficient (Jasbir Singh 1976)
- Ranking co-efficient method (Kendal 1939, Stamp 1960, Shafi 1990)
- Input output ratio (Khusro 1964)
- Assessing the net income in Rs per hectors of cropped (Jasbir Singh 1985)
- To asses agriculture production as grain equivalent (Buch, 1956)
- Carrying capacity of land in term of production (Stamp 1958)

- A system of four co-efficient a) productivity of co-efficient, b) ranking co-efficient, c) money value co-efficient, d) energy co-efficient (Kendal 1939)
- Giving weight age to the ranking order of the output per unit area with the percentage share under each crop (Deshpande 1964, Bhatia 1967)
  (AWATE S.J. AND TODKARI G.U 2012)

Productivity of principal crops:

In study area among the cereal crops are maize, wheat, jowar, and barara. In Madha tehsil, 39.04% of the land was planted with crops. In the Madha tehsil area, maize crops predominated with 22159 hectares (17.77%) 17.77%), followed by Jowar with 21568 hectares (17 wheat 4532 hectares (3.63%), and Bajara with only 434 hectares (0.34%0.34%) of cereal crops. Pulses Crops covered only 13.15% area in Madha tehsil pulses crops included Gram (4.09%) 5108 hectors, Tur (5.03%) 6274 hectors, Mung (0.77%) 954 hectors, Udid (3.23%) 4029 hectors, Matki (0.03%) 43 hectors area covered. Pulses cropped area are not irrigation facilities development. These crops are totally depend on monsoon rainfall. Sugarcane is a main commercial cash crop covering 26.50% area. It can be seen that the total sugarcane area is 33036 hectare of Madha tehsil. Due to Canal irrigation, Backwater irrigation, Lift irrigation, Sina Madha link irrigation are main reason to increase the production of sugarcane in Madha tehsil. All oilseeds Crops only 0.03% area covered in Madha tehsil. Oilseeds include Groundnut 123 hectors (0.09%), Sunflower 7 hectare (0.005%), Soyabean 434 hector are in Madha tehsil Onion is also important crops in Madha tehsil. Onion is 9.91 Percent total area is cultivated. Onion crops has been cultivated on an area of 12364 hectors. Total fodder crops area in Madha Tahsil is 2.67% covered with 3332 hector area under fodder crops. In Madha tehsil orchards cultivation has been done on an area of 10251 hector, which 8.22% of total area under occupied by orchards Crops cultivation. Orchards Crops included like grapes banana pomegranate dragon fruit etc. (Bankar and Dalvi 2025)

Major crops:

Madha is known for **sugarcane** (important irrigated cash crop) and for rabi crops (wheat/gram) and kharif cereals in parts; jowar (sorghum), groundnut and oilseeds, and some horticultures (onion, orchards) are also present across Solapur talukas including Madha.

Irrigation & cropping system: Irrigation availability (canals, wells, and sugarcane irrigation) strongly shapes productivity — areas with canal/well irrigation produce sugarcane and higher-value crops, while rainfed areas rely on sorghum, bajra and pulses.

Recent shock: Heavy rains/flooding in 2025 caused significant crop damage in parts of Solapur including Madha, affecting soyabean, maize, onion and sugarcane in some pockets — this will depress yields in affected villages for that season.

Village Wise Area and Production 2024-25				
Village Name Name	**Crop Category**	**Major Crop**	**Area (Ha)**	**Production (Qt)**
Madha	Cereal Crops	Jowar	240	4800
Kurduwadi	Sugarcane	Sugarcane	150	10200
Bhorkawadi	Pulses	Gram	140	1550
Mahalung	Oilseed Crops	Groundnut	90	900
Wadala	Vegetable Crops	Onion	70	7000
Nimbodi	Fodder Crops	Maize (Fodder)	50	2300
Angar	Orchard Crops	Pomegranate	70	6000
Patkul	Cereal Crops	Wheat	160	4000
Bavi	Pulses	Tur (Pigeon Pea)	90	900
Gherdi	Sugarcane	Sugarcane	110	7600

Interpretation of Agricultural Productivity in Madha Tehsil

The agricultural data from various villages in Madha Tehsil (Solapur District, Maharashtra) shows a diverse cropping pattern influenced by soil type, irrigation availability, and local climatic conditions.

Cereal Crops : Madha (Jowar) and Patkul (Wheat) are the major cereal-growing villages. Madha has the highest area under Jowar (240 ha) with a production of 4800 quintals, giving a yield of 20 qt/ha, which is moderate for dryland conditions. Patkul has 160 ha under Wheat with a production of 4000 qt, yielding 25 qt/ha, showing relatively better productivity—likely due to irrigation support.

Sugarcane : Kurduwadi (150 ha, 10,200 qt) and Gherdi (110 ha, 7,600 qt) are major sugarcane-producing villages. Sugarcane has the highest production per hectare (approx. 68–70 qt/ha), indicating the presence of canal or well irrigation. These areas may have better access to water resources and fertile alluvial soils.

Pulses : Bhorkawadi (Gram) and Bavi (Tur) show cultivation on 140 ha and 90 ha, producing 1550 qt and 900 qt, respectively Productivity of pulses ranges from 10–11 qt/ha, which is average for rainfed conditions in Solapur district.

These crops are typically grown in medium to light black soils with limited irrigation.

Oilseed Crops: Mahalung (Groundnut) has 90 ha area with 900 qt production, giving a yield of 10 qt/ha, indicating moderate productivity.

Groundnut is usually grown under semi-arid conditions, suggesting reliance on monsoon rainfall.

Vegetable Crops: Wadala (Onion) shows very high productivity, with 70 ha producing 7000 qt, i.e., 100 qt/ha. This indicates intensive irrigation practices, use of fertilizers, and high commercial orientation.

Fodder Crops: Nimbodi (Maize-Fodder) has 50 ha under cultivation with 2300 qt production (46 qt/ha), indicating good support for livestock and dairy farming.

Orchard Crops Angar (Pomegranate) : stands out among orchard crops, with 70 ha yielding 6000 qt (≈85.7 qt/ha). This highlights the shift toward high-value horticulture, supported by drip irrigation and better market linkages.

Village wise Yield Productivity 2024-25				
Village Name	**Major Crop Name**	**Yield Productivity (Kg/Ha)**	**Irrigated Area (%)**	**Productivity Level (High/Medium/Low)**
Madha	Jowar	79000	42	Medium
Kurduwadi	Sugarcane	100	95	High
Bhorkawadi	Gram	850	25	Medium
Mahalung	Groundnut	9000	18	Low
Wadala	Onion	3200	70	High
Nimbodi	Maize (Fodder)	9500	80	High
Angar	Pomegranate	3000	70	High
Patkul	Wheat	750	40	Medium
Bavi	Tur (Pigeon Pea)	6000	20	low

Interpretation of Agricultural Productivity in Madha Tehsil

The agricultural productivity data of different villages in Madha Tehsil, Solapur District (Maharashtra) reveals significant variations in yield and productivity levels, primarily influenced by irrigation availability, crop type, and agro-climatic conditions.

Cereal Crops : Madha (Jowar) – With a yield of 79,000 kg/ha and 42% irrigated area, Jowar shows medium productivity. This suggests partial irrigation support and dependence on monsoon rainfall. Jowar being a staple dryland crop performs moderately well in the black soil conditions of Madha.

Patkul (Wheat) – Yield of 750 kg/ha with 40% irrigation indicates medium productivity. Wheat cultivation depends largely on winter irrigation from wells or canals. The moderate yield shows scope for improvement through enhanced irrigation and fertilizer use.

Sugarcane (Commercial Crop): Kurduwadi (Sugarcane) – Yield of 100 kg/ha (interpreted as 100 tons/ha likely due to unit notation) and 95% irrigation marks very high productivity Sugarcane is a high water-demanding cash crop, and the high irrigation percentage ensures optimum yield. Kurduwadi thus stands out as an intensively irrigated and commercially productive area.

Pulse Crops: Bhorkawadi (Gram) – Yield of 850 kg/ha with 25% irrigation gives medium productivity. Pulses are largely grown under rainfed conditions; hence, the yield is satisfactory for a semi-arid region. The limited irrigation restricts further yield improvement. Bavi (Tur / Pigeon Pea) – Yield of 6000 kg/ha (interpreted as 6 qt/ha or similar relative value) with only 20% irrigation indicates low productivity. The crop is drought-tolerant but suffers under

prolonged dry spells and poor soil moisture.

Oilseed Crops: Mahalung (Groundnut) – Yield of 9000 kg/ha with 18% irrigation corresponds to low productivity. Groundnut, being sensitive to rainfall fluctuations, shows reduced output under limited irrigation conditions. Soil moisture and timely rain are critical to its productivity.

Vegetable and Fodder Crops: Wadala (Onion) – Yield of 3200 kg/ha with 70% irrigation shows high productivity. Onion is a high-value commercial crop, dependent on irrigation and fertilizer input. The substantial irrigated area supports intensive cultivation. Nimbodi (Maize – Fodder) – Yield of 9500 kg/ha and 80% irrigation also denotes high productivity. Adequate irrigation ensures healthy biomass production, supporting dairy and livestock sectors.

Orchard Crops: Angar (Pomegranate) – Yield of 3000 kg/ha and 70% irrigated area indicate high productivity. The region has adopted drip irrigation systems, contributing to consistent yield and quality fruit production. Pomegranate represents a shift toward horticultural diversification.

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