

AGRICULTURE AND WATER DEMAND IN JHARKHAND

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Introduction



The state of Jharkhand is situated at latitudes 21°57' to 25°14' N and longitudes of 83°20' to 87°58' E. It is a prominent part of the vast Deccan plateau. The northern side of the state shares its boundary with Bihar, Uttar Pradesh, and Chhattisgarh on the west side, Odisha in the south, and West Bengal in the east. The total area of the state is 79.70 lakh hectares. Out of the total geographical area of 79.70 lakh ha, total fallow land was estimated at 25,58,957 ha (Yadav, 2023). As per the census data of 2011, the population of this state was 33 million.

As of 2023, the population density is reported to be 414 persons per square kilometer (Govt. Jharkhand, 2023). The state is the 13th most populated state in India, with 76% of the population living in rural areas and the remaining 24% residing in urban areas. In recent days, migration from rural areas is a prevalent occurrence in Jharkhand, ingrained as a customary aspect of life for the local population (Kumar,2023). There are 32615 villages, 4423 Gram Panchayats, 24 districts, and 259 blocks in the state. About 40% of India's mineral reserves are located in Jharkhand, making it a mineral-rich state (ICAR, 2014). Jharkhand is abundant in various mineral resources including, Copper, Uranium, Mica, Bauxite, Granite, Gold, Silver, Graphite, Magnetite, Dolomite, Fireclay, Quartz, Fieldspar, Coal (accounting for 32% of India's coal reserves), Iron, Copper (accounting for India's 25% of copper reserves), and other valuable mineral resources (Govt. Jharkhand, 2023). More than 29% of the state is covered with forests and woodlands, which is one of the highest percentages in India.

Geography, Switch Constants of the Constant of

Most part of the state comes under the Chotta Nagpur Plateau. The state has groundwater reserves and numerous surface water resources. The primary surface water sources are Damodar, Brahmani, and Subarnarekha rivers. Jharkhand is known for its diverse landscape unique and varied topography. The topography of Jharkhand represents hilly and undulating terrain, with altitudes varying from 40 m to 1366 m. The west central part of Jharkhand features a high mountainous area. It has extensive forest areas, rocks and stones are directly related to the soil formations. Jharkhand is endowed with a diverse range of natural resources, making it one of India's most resource-rich states. The state has subtropical climate with three distinct summer, winter and monsoon seasons.



Figure 1: Land use/land cover of Jharkhand

(Source: Nath et al., 2021)



In recent days, the increasing human population and economic growth have led to a higher demand for natural resources including water, energy and land.

Due to uneven rainfall and low water holding capacity in the soil, numerous districts of the states face major drought conditions. This significantly impacts the water requirement to meet irrigation needs. The land use map of the state is as given in Figure.1.



Agroclimatic Zones

The state is located in the Eastern Plateau and Hilly region of Agro-climatic Zone VII, which is further subdivided into three subzones, (IV)Central and North-Eastern Plateau, (V)Western Plateau, and (VI)South-Eastern Plateau (Figure.2). The state experiences yearly precipitation ranging from 1200–1600 mm, and its climate can range from dry to humid to semiarid (ICAR, 2014).

The characteristics of the subzone IV are as follows:



Low water retentive capacity of the soil particularly in uplands

Late arrival and early cessation of monsoon, along with erratic and uneven distribution of rainfall, and lack of safe disposal of runoff water during monsoon.



The need for water storage and moisture conservation practices to support the cultivation of rabi crops.





Figure 2: Agro climatic-zone wise Forest of Jharkhand (Source: Mishra, Kumar, & Tiwari, 2019)





Agriculture in Jharkhand

The state's population is largely dependent on agriculture, accounting for nearly 70% (ICAR 2014). The major crops cultivated in the state are paddy, wheat, pulses, oil seeds, and horticultural Crops(Table.1). Additionally some of the minor crops cultivated in the state are arhar, urad, moong, gram and mustard. During the Kharif season, around 70% of the state's area is under paddy cultivation (ICAR, 2014). Approximately 37.30% of the area belongs to cultivated land, amounting to 3.8 million hectares.

In recent decades, traditional diversified farming systems have been replaced by monoculture, with 90% of the area planted in maize and wheat, and 67% of the area planted in paddy being "High Yielding" Varieties (HYVs). These HYVs have a limited genetic base making them highly susceptible to pests, diseases, and abiotic stress (drought, flood, salinity, etc). Moreover they have poor adaptability in marginal soils and rainfed conditions (Molla *et al.* 2021).

Approximately 25.88 BCM of surface water and 4.29 BCM of groundwater are being used for agriculture in the state (Mali et al. 2020). A research conducted in Karkatta village, an agriculturally predominant village where paddy is the main crop cultivated, revealed severe water shortage in the 2021 summer, with all surface water sources and wells dried up, risking the livelihood of local farmers (Varma *et al.*, 2021).

TABLE 1. MAJOR CROPS GROWN IN JHARKHAND				
CROPS		PRODUCTION RATES (TONNES)	REFERENCE	
Millet	Server C	281 (Bajra) (2019-20) 2,752 (Jowar) (2019-20) 24,061 (Ragi) (2019-20)	Apeda, 2023	
Rice		5,123 (2020-21)		
Wheat		469 (2020-21)		
Maize		606.42 (2020-21)	Sameti, 2023	
Oil seeds 📣		393.54 (2020-21)		
Pulses	, ()	898.56 (2020-21)		

Millet cultivation is promising, and in Jharkhand, the cultivation of millets help to improve food security.

The Agricultural and Processed Food Products Export Development Authority of the Ministry of Commerce and Industry, Jharkhand's finger millet production increased from 16400 in 2020-2021 to 16700 tonnes in 2021-22, and it was actually estimated to produce 2022-23 9790 tonnes in (Greenpeace, 2023).



A recent study conducted by SwitchON in three districts of Dumka, Pakur and Sahibganj in the Santhal Pargana region revealed that, 66% of the farmers grow at least one of the prime millets and 34 % of the farmers do not cultivate any of the prime millets (Telegraph India, 2023). During 1950-51, almost a third of all major food grains in India constituted millets, but this proportion reduced to only around 15% by 2018-19 (Gupta, 2020).

Irrigation

The state's total cultivable land is 38 lakh HA, out of which only 22,38 lakh HA is net sown area (RKVY, 2023). In Ranchi, an area of 4000 hectares has been made suitable for cultivation through a canal system. Among the total cultivated area, about 9000 hectares of land is irrigated by canal water, and 2000 hectares are cultivated using water tanks (Agricoop, 2023 a). In all districts, paddy cultivation is common in lower altitudes as well as in high-altitude regions, where millets and vegetables are mainly cultivated (Sameti, 2023). The water requirement for different crops varies, and paddy crops require a large amount of water (Table .2). In the district, the water crisis affects crop cultivation for marginal farmers. Around 37% of the population lives below the poverty line (Columbia, 2017). Approximately three-quarters of the people belong to rural communities, and 26% belong to tribal communities.

Lack of rainfall causes low crop productivity in many districts. Additionally, low-income capacity and a lack of utilization of agricultural technology have negative impacts on their crop productivity. In this situation, the Pradhan Mantri Krishi Sinchayi Yojna aims to implement a program named "Har Khet Ko Pani". These government initiatives aim to improve agricultural infrastructure on croplands, thereby enhancing crop productivity (ICRISAT,2016).

In the regions of water scarcity, millets can be a better choice as they require less water compared to other crops. While growing 1 kg of rice requires around 5000 litres of water. millets require only between 650-1200 liters of water (Gupta, 2020).

Additionally, millets can thrive in poorly nourished soils and are less susceptible to pest attacks..

TABLE	2.M	AJOR CROPS GROWN IN	J H A R K H A N D	
CROPS		WATER CONSUMPTION (CM)	REFERENCE	
Rice		100 - 200		
Wheat		30 - 45	(Kumar, et al., 2018), (Sameti, 2023)	
Maize		25 - 40		
Oil seeds		5 - 10	(Sameti, 2023), (FAO, 2023)	



Challenges

Major challenges faced by the agricultural sector in this region include low investment, monocropping systems, and low productivity of lands, which have had impacts on overall crop production (Sameti, 2023). Most of the challenges faced by the sector are directly or indirectly connected to the availability of water. Some of the major challenges identified in this sector are given below.



- Poor soil fertility
- Mono cropping of paddy
- Runoff loss and soil erosion and deforestation
- Over abstraction and wastage of water during irrigation
- Landuse changes in the upper catchment reducing the rainwater recharges
- Disappearance and deterioration of traditional recharge structures in farm lands

Recommendations

- To encourage multi-cropping and adopt innovative systems of climate-resilient agriculture by choosing alternate crops and optimizing water usage is essential.
- To adopt DRE technology with micro irrigation techniques which not only save water but provide sustainable solutions for climate change.
- Promoting millet cultivation is easier as it was cultivated traditionally, and the nutrient poor soil and lesser water availability in the region favors it.
- Re-evaluating the schemes and policies in the agricultural sector is essential for sustainable development.
- · Conducting research on crop water requirements and implementing smart irrigation techniques
- Based on the recharge discharge profile of the area, design and implementation rainwater recharge structures like dykes, pits, contour check dams etc.
- Rejuvenation of traditional rainwater harvesting structures like pits, ponds and streams
- To follow better land-use management pattern in the catchment areas
- Encourage organic farming and natural farming to avoid pollution of soil and water due to pesticide and fertiliser residues
- Desilting and management of surface water bodies to promote better water percolation and to avoid flooding of farmlands during monsoons



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