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# Major Affecting Factor of Yield area in Jharkhand: A Geographical Analysis

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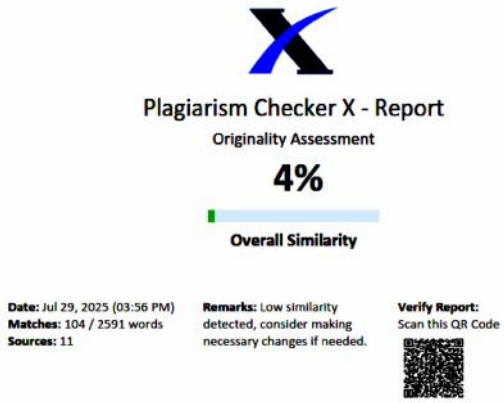


## ABSTRACT

*Agriculture is the indicator of human activities. Land is a priceless gift of nature. The impact of population growth completely visible on land. This research paper aims to know the affecting factors responsible for agricultural yield areas. This research paper question what are the affecting factors responsible for agricultural yield areas in Jharkhand? In order to complete this research paper, the use of primary and secondary data have been done. Major affecting factor Climate vulnerability, challenging soil conditions, the vulnerability of crops, management practices, socio - economic and institutional factors.*

## KEY WORDS

*Climate Vulnerability, Rising Temperatures, Challenging Soil, Crop Genetics and Variety.*

## INTRODUCTION

In agriculture, the term "yield area" refers to the specific unit of land area over which crop production is measured. It's a fundamental concept for understanding agricultural productivity.

- **Yield**: This is the amount of crop (or other agricultural product like wool, meat, or milk) harvested. It's typically expressed in units of weight or volume (e.g., kilograms, tons, bushels, pounds).
- **Area**: This refers to the land on which the crop is grown. It's typically expressed in units of land measurement (e.g., hectare, acre, square meter).

Therefore, "yield area" is the combination of the quantity of product per unit of land. It's the standard metric for assessing how efficiently a piece of land is producing food or other agricultural commodities.

Common ways yield area is expressed:

- **Kilograms per hectare (kg/ha):** This is a widely used metric, especially in metric-system countries like India.
- **Tons per hectare (t/ha):** Another common metric for larger yields.
- **Bushels per acre (Bu/ac):** Commonly used in countries like the United States.
- **Pounds per acre (lbs./ac):** Also used in the US for certain crops.
- **Measuring Productivity:** It's the primary indicator of how productive a farm or a specific plot of land is. A higher yield per unit area means more food is produced from the same amount of land.
- **Economic Viability:** Farmers use yield data to calculate their profitability. Higher yields generally lead to higher incomes.
- **Food Security:** At a national and global level, yield area data is crucial for assessing food supply, predicting potential shortages, and planning for food security.
- **Agronomic Research and Improvement:** Researchers use yield area measurements to evaluate the effectiveness of new crop varieties, fertilizers, irrigation methods, pest control strategies, and other farming practices.
- **Policy Decisions:** Governments use yield data to make policy decisions related to agriculture, such as subsidies, crop insurance, and resource allocation.
- **Sustainable Agriculture:** Increasing yield per unit area is vital for sustainable agriculture, as it reduces the need to convert more natural land into farmland to meet growing food demands.

In essence, "yield area" provides a standardized way to compare agricultural output across different farms, regions, and even countries, allowing for analysis and improvement in food production systems.

Jharkhand was formed in November 2000 by detaching 79 lakh hectares of geographical space from the state of Bihar. Agriculture is crucial for the Jharkhand economy since it has enormous potential for development in agriculture and associated areas. the majority of the population (59%) depends on agriculture for a living, yet it only contributes 15% to the Gross State domestic product. despite having a total cultivated area of 1735 thousand hectares, agricultural output is poor and static, and cultivation costs have been rising in recent years. (Kumar, D. 2021 and Kumar, D. 2021)

## Objective

The major objective to know the affecting factors responsible for agricultural yield areas.

## Research Questions

What are the affecting factors responsible for agricultural yield areas in Jharkhand?

## Methodology

The study consists of following methodology:

1. Source of primary data: Observational, interview
2. Source of Secondary data: district census handbook Ranchi, land resources department, ministry of rural development, economic survey of Jharkhand, book, journals, newspaper etc.
3. This research paper work have been completed through descriptive and analytical method.

## Result and Discussion

Jharkhand, often referred to as the "Land of Forests," presents a unique and challenging agricultural landscape. Despite being a predominantly agrarian state, its agricultural productivity remains significantly lower than the national average. This lower yield can be attributed to a confluence of deeply entrenched

environmental, biological, management, and socio-economic factors. Understanding these multifaceted challenges is crucial for devising effective strategies to enhance crop yield and improve the livelihoods of its farming communities, particularly the large tribal population.

## I. Environmental Factors: The Bedrock of Agricultural Challenges

Jharkhand's distinctive topography and climate lay the foundation for many of its agricultural limitations.

### A. Climate Vulnerability

- **Erratic Monsoon Dependence:** Agriculture in Jharkhand is overwhelmingly rainfed, with over 80% of its cultivated area relying on the monsoon. While the state receives an average annual rainfall of around 1200-1400 mm, about 80-85% of this precipitation occurs during the four monsoon months (June-September).
- **Delayed Onset and Early Withdrawal:** The uncertainty surrounding the precise onset and withdrawal dates of the monsoon poses a significant challenge. Delayed monsoons can disrupt planting schedules, leading to delayed sowing, which directly impacts crop growth duration and final yield. An early withdrawal can expose crops to moisture stress during critical reproductive stages.
- **Long Dry Spells:** Even during the monsoon, Jharkhand frequently experiences prolonged dry spells or "breaks" in rainfall. These intra-monsoon droughts are particularly devastating for rainfed paddy, the state's staple crop, as rice requires continuous water availability.
- **High Intensity Rainfall and Runoff:** When rainfall does occur, it is often characterized by high intensity, especially in the monsoon months. This leads to rapid runoff, preventing adequate water infiltration into the soil and increasing the risk of flash floods in low-lying areas.
- **Rising Temperatures and Heat Stress:** Over the decades, Jharkhand has witnessed a considerable rise in temperature. Extreme temperatures, especially heatwaves during pre-monsoon and early monsoon periods, can negatively affect crop germination, growth, and particularly, the sensitive flowering and grain-filling stages, leading to reduced productivity. Climate change projections indicate an increased frequency and severity of such extreme weather events.

### B. Challenging Soil Conditions

- **Undulating Terrain and Soil Erosion:** Jharkhand's undulating topography, characterized by hills and plateaus, makes it highly susceptible to soil erosion. High-intensity rainfall washes away the fertile topsoil, leading to a significant loss of nutrients and organic matter.
- **Shallow Soil Depth:** A large proportion of agricultural land in Jharkhand has shallow soil depth, limiting the rooting zone for crops. This shallow depth, coupled with the underlying hard rock strata, restricts water retention and nutrient availability, making crops more vulnerable to dry spells.
- **Low Water Retentive Capacity:** Many of Jharkhand's soils, particularly the red and lateritic soils common in the region, have low water retention capacity. This means they dry out quickly after rainfall, exacerbating moisture stress for crops in rainfed areas.
- **Poor Soil Fertility and Nutrient Deficiencies:** The soils in Jharkhand are generally poor in fertility, often deficient in essential macronutrients like Nitrogen (N), Phosphorus (P), and Potassium (K), as well as various micronutrients. This is further aggravated by continuous cropping without adequate replenishment and insufficient use of organic manures.
- **Acidic Soils:** A significant portion (around 40%) of agricultural soils in Jharkhand are highly acidic. Soil acidity reduces the availability of several essential nutrients (like P, Ca, Mg) to plants and increases the toxicity of others (like Al, Mn), severely impeding crop growth and nutrient uptake. Lime application is often necessary but not widely practiced.

**II. Biological Factors: The Vulnerability of Crops**

Even with optimal environmental conditions, inherent biological characteristics and external biological threats can limit crop yield.

**A. Crop Genetics and Variety Selection:**

- **Low Adoption of High-Yielding Varieties (HYVs):** While HYVs of major crops like paddy and wheat are available, their adoption rate among Jharkhand's farmers, especially in upland and rainfed areas, remains suboptimal. This is often due to a lack of awareness, limited access to quality seeds, and perceived risks associated with new varieties.
- **Lack of Stress-Tolerant Varieties:** Given Jharkhand's susceptibility to drought, heat stress, and acidic soils, the widespread adoption of varieties specifically bred for tolerance to these abiotic stresses is crucial. However, their availability and adoption are still limited.
- **Preference for Traditional Varieties:** Many farmers continue to cultivate traditional, local varieties that, while resilient to local conditions, often have lower inherent yield potential compared to improved varieties. This is sometimes due to cultural preferences, seed saving practices, or simply a lack of access to better alternatives.

**B. Pests, Diseases, and Weeds**

- **High Incidence of Pests and Diseases:** Climatic conditions, especially high humidity during monsoon, create a conducive environment for the proliferation of various pests and diseases in crops like paddy (e.g., blast, brown spot, stem borer). These outbreaks can lead to substantial yield losses if not managed effectively.
- **Weed Infestation:** Weeds compete fiercely with crops for light, water, and nutrients, especially in rainfed lowland and upland rice systems. Inadequate or untimely weed control is a major factor contributing to yield reduction. The labor-intensive nature of manual weeding can also be a constraint for many small and marginal farmers.

**III. Management Practices: The Human Element in Productivity**

The way farmers manage their land and crops profoundly impacts yield. In Jharkhand, traditional practices often fall short of modern agricultural requirements.

**A. Suboptimal Agronomic Practices**

- **Delayed Sowing/Planting:** Due to monsoon uncertainty, farmers often face delays in sowing or transplanting, particularly for paddy. This pushes the crop into suboptimal growth windows, affecting maturity and yield.

**Improper Nutrient Management**

- **Inadequate Fertilizer Use:** Farmers often apply insufficient quantities of fertilizers due to high costs, lack of awareness about balanced nutrition, or non-availability.
- **Unbalanced Fertilization:** Even when fertilizers are used, there's often an imbalance in the application of macro and micronutrients, leading to hidden hunger in plants. Soil testing facilities are not widely utilized, leading to blanket recommendations rather than need-based application.
- **Limited Organic Manure Application:** The decline in livestock population and traditional practices means less availability and use of farmyard manure, which is crucial for improving soil organic matter and overall soil health.

**Inefficient Water Management**

- **Low Irrigation Coverage:** Jharkhand has one of the lowest irrigation coverages in India, with only about 12-13% of the net sown area under irrigation. This makes the vast majority of agriculture vulnerable to monsoon vagaries.

- **Lack of Water Harvesting Structures:** Despite receiving significant rainfall, there is a severe dearth of effective rainwater harvesting structures (e.g., farm ponds, check dams) to conserve water for dry spells or supplementary irrigation.
- **Poor Drainage:** In some low-lying areas, poor drainage can lead to waterlogging, particularly detrimental to crops like pulses and oilseeds.
- **Suboptimal Plant Population/Spacing:** Improper planting density and spacing can lead to either overcrowding (competition for resources) or underutilization of land area, both reducing yield.
- **Lack of Integrated Pest and Disease Management (IPM):** Farmers often lack the knowledge and resources for adopting integrated pest and disease management strategies, relying instead on reactive chemical interventions that may be ineffective or harmful.
- **Limited Crop Diversification:** While paddy dominates the Kharif season, there's limited diversification into other drought-tolerant or high-value crops suitable for the region. This monoculture further increases vulnerability to climatic shocks and market fluctuations.
- **Poor Post-Harvest Management:** Significant post-harvest losses occur due to inadequate storage facilities, inefficient transportation, and lack of proper cleaning, grading, and packaging infrastructure at the village level.

## IV. Socio-Economic and Institutional Factors: The Overarching Constraints

Beyond the field-level issues, broader socio-economic and institutional challenges significantly impede agricultural productivity in Jharkhand.

### A. Small and Fragmented Landholdings

- **Marginal Farmers:** A large proportion of farmers in Jharkhand are small and marginal farmers with landholdings often less than one hectare. These small holdings limit the scope for mechanization, large-scale investment, and adoption of modern technologies.
- **Land Fragmentation:** Successive generations lead to further subdivision and fragmentation of landholdings, making cultivation inefficient and increasing the cost of operations.

### B. Limited Access to Resources and Credit

- **Capital Constraints:** Many small and marginal farmers lack the financial capital to purchase quality seeds, fertilizers, pesticides, and other essential inputs.
- **Inadequate Credit Facilities:** Despite Government efforts, access to formal credit from banks and financial institutions remains a challenge for many, forcing them to rely on informal moneylenders with high-interest rates.
- **Low Mechanization:** The low level of mechanization in Jharkhand means much of the farming is still done manually or with traditional tools, leading to lower efficiency and higher labor costs.

### C. Knowledge Gap and Extension Services

- **Limited Agricultural Extension:** The reach and effectiveness of agricultural extension services are often inadequate. Farmers may not have access to timely information on improved varieties, modern cultivation techniques, pest and disease management, and market prices.
- **Low Literacy Levels:** Lower literacy rates among farmers can hinder their ability to understand and adopt new technologies and practices.
- **Resistance to Change:** Traditional farming practices and cultural beliefs sometimes lead to a resistance to adopting new, more productive methods, even when demonstrated.

### D. Weak Market Linkages and Infrastructure

- **Poor Market Access:** Many rural areas in Jharkhand suffer from poor road connectivity, making it difficult for farmers to transport their produce to markets efficiently.

- **Lack of Storage Facilities:** The absence of adequate cold storage and warehousing facilities leads to significant post-harvest losses, particularly for perishable commodities.
- **Exploitative Middlemen:** Farmers often have to sell their produce to local middlemen at unremunerative prices due to a lack of direct market access and organized marketing channels.
- **Price Volatility:** Fluctuations in market prices can discourage farmers from investing in agriculture and limit their income, affecting their capacity to re-invest in farm improvements.

**E. Policy and Governance Challenges:**

- **Inadequate Investment in Agriculture:** Historically, public and private investment in agriculture in Jharkhand has been insufficient, particularly in critical areas like irrigation infrastructure, research, and extension.
- **Implementation Gaps in Schemes:** While various Government schemes exist (e.g., Rastriya Krishi Vikas Yojana, Kisan Samriddhi Yojana for solar irrigation), their effective implementation and reach to the last mile remain challenges due to bureaucratic hurdles, lack of awareness, and corruption.
- **Land-Related Issues:** Land disputes, unclear land records, and issues related to land acquisition can also impede agricultural development and investment.

## CONCLUSION

In conclusion, boosting crop yield in Jharkhand is a complex task that requires a holistic approach addressing each of these interconnected factors. It necessitates robust investment in irrigation infrastructure, aggressive promotion of stress-tolerant and high-yielding varieties, widespread adoption of scientific nutrient and pest management practices, improvement in soil health through organic matter addition and lime application, and strengthening of agricultural extension services. Furthermore, addressing socio-economic challenges through improved credit access, market linkages, and land reforms will empower farmers to adopt sustainable and productive farming practices, ultimately transforming Jharkhand's agricultural landscape and enhancing food security for its populace.

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