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Millets for Prosperity: Enhancing Farmer Welfare and Reviving Crop Productivity in Chhattisgarh

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Abstract: This comprehensive study thoroughly examines the current state of millet production in Chhattisgarh, India, with a multifaceted approach. It encompasses an in-depth analysis of various factors influencing millet production in the region, ranging from environmental conditions to agricultural practices and government initiatives. Millets, often called “smart food,” are resilient crops that can thrive in drought-prone areas while demanding significantly less water than other staple grains like wheat and rice. The research underscores millets' remarkable nutritional value and health benefits, highlighting their significance in addressing the dual challenges of malnutrition and climate change. Millets have the potential to play a pivotal role in ensuring food security and mitigating the impact of climate change, making their resurgence a matter of global importance. This research underscores the growing importance of millets as a resilient and nutritious crop and a potential solution to pressing global challenges. By assessing their production, nutritional benefits, and consumer perceptions, this study provides insights that can drive policy and industry efforts to harness the full potential of millets in promoting food security, mitigating climate change, and advancing healthier dietary choices.

Keywords: Chhattisgarh, Crop Productivity, Food Security, International Year of Millets, Nutrient-rich Grains.

1 INTRODUCTION

The Government of India celebrated 2018 as the 'National Year of Millets' to promote the production of nutrient-rich millets and the agro-industry involved [1]. The government of India has proposed 2023 as the ‘International Year of Millets’, and consequently, the Food and Agriculture Organization of the United Nations has supported India's proposal to declare and celebrate 2023 as the 'International Year of Millets' [2]. Celebrating the International Year of Millets will help promote the production and consumption of millets, contribute to the fight against malnutrition, and largely help reduce the impact of climate change in the long run.

Due to the increasing trend of people towards healthy eating in Asia-Pacific, mainly in India and China, the demand for millet is continuously increasing. Thus, the product prices are also increasing. The millets market size was more than USD 9 billion in 2018 and is expected to grow further. The growth may exceed USD 12 billion by 2025, with a CAGR of more than 4.5 percent during the forecast period (2019-2025) [3]. The production of millet is projected to increase rapidly due to its many health benefits and ability to grow in various climates. Therefore, popularizing millets will benefit future generations of farmers and consumers. Millets have been considered "smart food," which is good for consumers, farmers, and the world.

Millets are a group of small-seeded grasses considered miracle grains because they can grow in drought conditions and require much less water than other crops. According to the International Crops Research Institute for the Semi-Arid Tropics, more than 90 million people in Africa and Asia depend on millet in their diets. Although these grains were largely replaced by popular crops like wheat, rice, and maize in the last 50 years, the world faces agricultural, climate, and nutrition crises.

With maximum agricultural land exploitation with irrigation facilities, there is a need to focus on using dry land. Sustainable crop options, which require less water and are suitable for dryland conditions, are essential. Those sustainable crops are none other than millet. All millets have a short growth period, complete their life cycle in 2-4 months, are suitable for a wide range of cropping systems, and adapt well to changing environmental conditions, especially during the vagaries of the monsoon, thus being considered as climate-smart crops. India produces many different types of millets, including pearl millets, sorghum, finger millets, foxtail millets, kodo millets, barnyard millets, proso millets, little millets, and pseudo-millets like buckwheat and amaranth. The three millets that make up the majority of India's overall millet production are Pearl Millet (Bajra), Sorghum (Jowar), and Finger Millet (Ragi).

The Government of India's initiative led to the United Nations announcing the International Year of Millets (IYOM). India's exports will rise as a result, creating both domestic and foreign demand. Millets are food grains with good nutritional content and health benefits that may be farmed with minimal water and other resources. Since they are grown across the country in agroecological sites and are less likely to be infected by pests and diseases, they are easily grown as organic crops. With this growing awareness and global significance of millets, it is important to explore their nutritional value, production status in Chhattisgarh, and the factors driving this success.

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2 NUTRITIONAL VALUE AND HEALTH BENEFITS OF MILLETS

Millets are known for their remarkable nutritional value and are often called "smart food." They are highly nutritious, gluten-free, and rich in fiber, protein, vitamins, and essential minerals such as magnesium, iron, and calcium. Their high nutrient content and low glycemic index make them ideal for people with diabetes, heart disease, and obesity [4]-[8]. India produces various types of millet, such as Pearl Millet (Bajra), Sorghum (Jowar), and Finger Millet (Ragi), which are widely consumed for their health benefits. Millet grains are also rich in antioxidants, which help fight free radicals and promote overall health. Additionally, they are a valuable energy source due to their high carbohydrate content.

Table 1. Nutritional Components of Millets and Health Benefits [9]

Millet Type	Nutritional Components (per 100g)	Health Benefits
Bajra (Pearl Millet)	Calories: 378 kcal Total Fat: 4.2g Saturated Fat: 0.7g Polyunsaturated Fat: 2.1g Monounsaturated Fat: 0.8g Potassium: 195mg Sodium: 5mg Cholesterol: 0mg Dietary Fiber: 9g Carbohydrates: 73g Protein: 11g Magnesium: 28% DV Iron: 16% DV Vitamin B-6: 20% DV	• Affordable source of essential nutrients • High in fiber, aiding digestion • Protein-rich, aiding muscle growth • Rich in magnesium, beneficial for heart health
Jowar (Sorghum)	Calories: 329 kcal Total Fat: 3.5g Saturated Fat: 0.6g Carbohydrates: 72g Protein: 10.4g Dietary Fiber: 6.7g Iron: 15% DV Magnesium: 20% DV	• Suitable for weight management • Helps control diabetes • Fortifies bones and boosts immunity • Rich in vitamins essential for overall health
Buckwheat	Calories: 343 kcal Total Fat: 3.1g Saturated Fat: 0.7g Carbohydrates: 71.5g Protein: 13.3g Dietary Fiber: 10g Iron: 17% DV Magnesium: 32% DV	• High in essential nutrients • Rich in antioxidants • Potential benefits in preventing breast cancer • Supports heart health and lowers cholesterol

DV – Daily Value

As seen in Table 1, millets such as Bajra, Jowar, and Buckwheat provide a wide array of essential nutrients that contribute to improved health outcomes. Their high fiber content aids digestion and promotes gut health, while their protein content supports muscle growth and overall energy levels. Additionally, they are a rich source of magnesium and iron, which are critical for heart health and reducing anemia. Having established the nutritional importance of millet, it is essential to understand the current scenario of millet production in Chhattisgarh, one of India's leading millet-producing states.

3 CURRENT STATUS OF MILLET PRODUCTION IN CHHATTISGARH

Chhattisgarh is one of the major millet-producing states in India, cultivating several types of millets such as Kodo, Kutki, Jowar, Ragi, Bajra, Ramdana, and Cheena. The state has taken several initiatives to boost millet production, including introducing the Millet Mission in 2019. This initiative aimed to transform Chhattisgarh into a millet hub by 2023, focusing on increasing the yield of millets such as Kodo, Kutki, and Ragi to meet the growing demand both within India and abroad. Millets are highly nutritious crops that thrive in rainfed conditions with minimal water and inputs, making them ideal for the region's climate. In 2020, Chhattisgarh became the first state in India to declare and procure millets at MSP (Minimum Support Price). This initiative has helped boost farmers' income and promote millet cultivation across the state.

Table 2 provides data on the area, production, and yield of different millet types, reflecting the state's focus on increasing production and supporting farmers.

Table 2. Millets Production in Chhattisgarh (2017-18 to 2021-22) [10]

Millets	2017-18 (A/P/Y)	2018-19 (A/P/Y)	2019-20 (A/P/Y)	2020-21 (A/P/Y)	2021-22 (A/P/Y)
Jowar	0.04 / 0.05 / 1483	0.03 / 0.03 / 986	0.03 / 0.04 / 1403	0.02 / 0.03 / 1326	0.01 / 0.03 / 834
Bajra	0.00 / 0.00 / 0	0.00 / 0.00 / 449	0.00 / 0.00 / 0	0.00 / 0.00 / 515	0.00 / 0.00 / 446
Ragi	0.05 / 0.01 / 250	0.08 / 0.02 / 214	0.06 / 0.01 / 253	0.05 / 0.02 / 302	0.03 / 0.01 / 300
Small Millets	0.89 / 0.21 / 236	0.86 / 0.29 / 332	0.63 / 0.19 / 300	0.85 / 0.22 / 258	0.52 / 0.26 / 503

A – Area in Lakh ha, P – Production in Lakh Tons, and Y – Yield in Kg/ha

The state government has signed a Memorandum of Understanding (MoU) with the Indian Institute of Millet Research (IIMR), Hyderabad, and the Collectors of 14 districts of Chhattisgarh, including Dantewada, Bastar, Sukma, Balrampur, Kondagaon, Kanker, Bijapur, Kawardha, Narayanpur, Rajnandgaon, Koriya, Surajpur, Jashpur, and Gaurela-Pendra-Marwahi, as part of the Millet Mission [11]. Under this MoU, IIMR provides technical support and guidance to enhance productivity, including training farmers on scientific agricultural methods and providing high-quality seeds.

The state also aims to establish seed banks in three districts—Bastar, Surguja, and Kawardha—to ensure the availability of high-quality seeds. Additionally, millet farmers receive input assistance of ₹9000 per acre and ₹10,000 per acre for growing millets instead of paddy crops, further promoting the shift towards millet cultivation. According to the fourth advance estimate for 2021-22, approximately 16 million tons of millet were produced in India, accounting for about 5% of the national food grain basket. In Chhattisgarh, millet production continues to grow, with the state actively promoting the crop as a sustainable and nutritious alternative to conventional grains. Several factors have contributed to Chhattisgarh's success in millet production, from favorable climatic conditions to robust market support, which are explored in the next section.

In addition to increasing millet production, there is significant variation in consumption patterns across different districts in Chhattisgarh. Table 3 highlights the consumption frequencies of millets across various districts. For instance, Raipur district leads in millet consumption, with all respondents consuming these crops at least once a month and approximately 71.2% consuming them at least once a week. In contrast, districts like Bastar show lower consumption frequencies.

Table 3. Millet Consumption Patterns Across Chhattisgarh Districts [12]

District	Frequent Consumers (%)	Never/Rarely Consumers (%)
Raipur	71.2	0
Durg	57.6	26.8
Korba	56.1	25
Raigarh	52.9	29.6
Janjgir-Champa	52.3	29.6
Bilaspur	41.9	47.1
Bastar	37.7	55.5

This data underscores the varying levels of millet consumption across districts, reflecting regional dietary preferences and the potential for expanding millet's role in local diets.

4 FACTORS CONTRIBUTING TO HIGH MILLET YIELDS IN CHHATTISGARH

Several factors contribute to Chhattisgarh's success in producing high millet yields, including favorable climatic conditions, appropriate soil types, a focused cultivation area, and strong market support through government initiatives like the Minimum Support Price (MSP). These factors have collectively enabled Chhattisgarh to become one of the leading states in millet production.

4.1 Climate

The climate of Chhattisgarh is well-suited for millet cultivation. Millets are known to thrive in dry, semi-arid conditions with minimal water requirements, making them ideal crops for regions experiencing irregular rainfall and water scarcity. Chhattisgarh's climatic conditions align perfectly with millet's growth needs.

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Table 4. Factor 1 – Climate

Millet Type	Temperature Range (°C)	Rainfall (cm)	Planting Season	Harvesting Season	Sensitivity to Weather Conditions
Jowar	25–30	40–50	June-July	September-October	Heat, Drought, Frost, Waterlogging
Bajra	25–30	40–50	June-July	September-October	Heat, Drought, Frost, Waterlogging

4.2 Soil

The suitability of soil plays a crucial role in the success of millet production. Millets can grow in various soils, including upland, black, red, and sandy. Chhattisgarh's diverse soil types provide an ideal foundation for cultivating different millet varieties. Millet crops generally require low irrigation and respond well to organic manures and fertilizers, making them cost-effective for farmers.

Table 5. Factor 2 – Soil

Millet Type	Soil Types	Preferred Soil pH Range	Irrigation Requirements	Response to Fertilizers
Jowar	Upland gravely soils, Black and red soils, Light sandy soils	6.5-7.5	Low	Good response with organic manures and fertilizers
Bajra	Upland gravely soils, Black and red soils, Light sandy soils	6.5-7.5	Low	Good response with organic manures and fertilizers

4.3 Area and Production

Chhattisgarh has been actively expanding its area of millet cultivation. The state's emphasis on millet production, particularly through the Millet Mission and its procurement at MSP, has encouraged farmers to allocate more land to millet farming, resulting in increased production and yield.

Table 6. Factor 3 - Area and Production (2020-21)

State	Cultivation Area (million hectares) for Jowar	Cultivation Area (million hectares) for Bajra	Production (million tonnes) of Jowar	Production (million tonnes) of Bajra	Productivity (tonnes per hectare) of Jowar	Productivity (tonnes per hectare) of Bajra
Chhattisgarh	0.01	0.02	0.01	0.03	1.00	1.50

4.4 Market Support

The government's introduction of Minimum Support Prices (MSP) has been a key factor in promoting millet cultivation in Chhattisgarh. The MSP provides financial security to farmers, ensuring they receive a fair price for their millet crops. This has motivated farmers to shift from other water-intensive crops, such as paddy, to millet cultivation.

Table 7. Factor 4 - Market (MSP for the Kharif season of 2020-21)

Millet Type	Minimum Support Price (MSP) (Rs. per quintal)
Jowar	2620
Bajra	2150

By combining the favorable climate, suitable soil, area expansion, and government support, Chhattisgarh has positioned itself as a leading millet producer. These factors collectively contribute to the high yields seen in the state, ensuring both farmer welfare and agricultural sustainability. While these factors are vital for the continued success of millet production, further suggestions can help enhance the production and consumption of millet in Chhattisgarh.

5 OBSERVATIONS AND RECOMMENDATIONS

Millets, recognized for their distinct quality and immense health benefits, stand out as a resilient crop that aligns with the welfare of farmers and broader environmental goals. The production of millets in Chhattisgarh is both economically viable and climate-friendly. With lower production costs, reduced input requirements, and faster crop maturation times, millets offer higher yields and better prices with less effort, money, and time than other crops. These qualities make millet an exceptional crop that promises sustainability and prosperity for farmers. Here are some observations and suggestions to further promote millet production and consumption in Chhattisgarh.

5.1 Incorporating Millets in College Canteens

The government should mandate that college canteens serve millet-based dishes to promote healthy eating habits. Banning the sale of unhealthy foreign foods in these institutions would encourage students to consume nutritious, locally produced alternatives, contributing to young people's health while supporting the local millet economy.

5.2 Promoting Millet Diets in Hospitals

Government hospitals should introduce millet-based diets for patients undergoing treatment. This initiative would enhance health outcomes and serve as a platform for promoting millet consumption more broadly. By making millet a key part of patients' diets, hospitals can play an instrumental role in educating the public on the health benefits of these grains.

5.3 Job Creation through Millet Enterprises

The increased production and processing of millets will create many employment opportunities. From farming to food processing and distribution, the entire value chain of millet production will provide new avenues for rural and urban employment, particularly benefiting the youth.

5.4 Supporting Farmers through Minimum Support Price

Farmers in Chhattisgarh will become more self-reliant as the government ensures fair prices for millet crops through a robust Minimum Support Price (MSP) mechanism. This financial security will encourage farmers to expand millet production, enhancing the state's agricultural economy.

5.5 National Recognition of Chhattisgarh's Agricultural Leadership

By increasing millet production, Chhattisgarh can reclaim its top position in agriculture on the national stage. The state's emphasis on this climate-resilient crop will demonstrate its leadership in sustainable farming practices, furthering its reputation as a model agricultural state.

These suggestions aim to boost millet consumption and production in Chhattisgarh and provide a sustainable path forward for the state's agricultural economy. By focusing on millet's environmental and economic advantages, Chhattisgarh can promote a resilient agricultural future. These recommendations, if implemented, could significantly boost millet production and consumption in Chhattisgarh, contributing to its long-term agricultural success.

6 CONCLUSIONS

The study underscores the global significance of millets, with their recognition by the Food and Agriculture Organization of the United Nations as a key solution to malnutrition and climate change. The rising demand for millet, driven by the trend toward healthy eating, is evident, with the market projected to grow substantially. Millets' unique ability to thrive in challenging conditions and their sustainable characteristics position them as a crucial crop for future agriculture, making them valuable in addressing pressing global challenges. This essay has briefly outlined the factual benefits of millet production, yet the broader implications are significant. The expansion of millet cultivation in Chhattisgarh promises agricultural development, increased employment, healthier diets, and improved livestock fodder. Furthermore, it offers a means of preserving traditional crops and providing secure livelihoods for the state's tribal population. By boosting millet production and consumption, the establishment of related enterprises will flourish, providing additional employment opportunities for the youth. This will, in turn, lead to a rise in the per capita income of Chhattisgarh's citizens, contributing to overall economic growth and enhanced well-being. Promoting millets presents a multifaceted opportunity for Chhattisgarh, encompassing economic, environmental, and social benefits. The state stands at the threshold of a millet revolution, with the potential to improve the lives of farmers, enhance public health, and set a national example in sustainable agriculture.

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ETHICS STATEMENT

This study did not involve human or animal subjects and, therefore, did not require ethical approval.

STATEMENT OF CONFLICT OF INTERESTS

The authors declare no conflicts of interest related to this study.

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