



# **Sustaining Agrobiodiversity in Jharkhand:** Conservation and Commercialization of Native Rice & Millets for Resilient Farmer Livelihoods



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## Abstract

The conservation and commercial use of indigenous rice varieties, millets of Jharkhand as a means of preserving agrobiodiversity and enhancing farmer livelihoods are examined in this research. These crops, which are ideally suited to rainfed, marginal areas, are ingrained in the tribal farming traditions of the area. They include finger millet, small millet, and indigenous rice landraces. Because of market neglect, governmental focus on high-yield varieties, and loss of traditional knowledge, their production is dwindling despite their nutritional richness and climate resilience. In order to protect genetic diversity, the report suggests three strategies: (1) on-farm conservation and community seed banks; (2) value chain development through farmer collectives' aggregation, processing, and branding; and (3) enabling policy support through participation in public food programs and customized extension services. Encouraging these neglected crops can improve climate adaptation, diversify rural incomes, improve food and nutrition security, and revitalize Jharkhand's rich agroecological legacy.

Keywords: Agrobiodiversity, Native Millets, Legumes, Traditional Rice, Farmer Livelihoods, Climate-Resilient Agriculture.



## 1.0 Background

The eastern Indian state of Jharkhand is home to a sizable tribal population whose livelihoods are strongly correlated with traditional agriculture. The state is also rich in wildlife. Numerous native crops, such as millets (like finger millet, little millet, and kodo millet), and indigenous rice varieties, have historically been cultivated in the area due to its agroecological conditions, which are defined by undulating terrain, red and lateritic soils, and primarily rainfed farming (Mishra, 2017). These crops have cultural significance for the local populations in addition to being nutrient-dense and environmentally sustainable (Swaminathan & Kesavan, 2012). However, a number of issues, including the promotion of high-yielding cultivars, a lack of market incentives, the loss of traditional expertise, and climate unpredictability, have contributed to a notable drop in their production in recent decades (Padulosi et al., 2012; FAO, 2019). Agrobiodiversity has been eroded as a result of this change, and smallholder farmers are now more vulnerable (Smale & Bellon, 1999). In marginal regions like Jharkhand, climate-resilient agriculture depends on native millets and legumes because of their propensity to flourish in low-input, rainfed environments (Ministry of Agriculture & Farmers Welfare, 2021; National Rainfed Area Authority [NRAA], 2016). Similar to this, the region's native rice varieties have demonstrated robust resistance to biotic and abiotic stresses during millennia of evolution to fit a variety of micro-ecosystems (Adnan et al., 2020). It is crucial in this regard to preserve and revive indigenous legumes, millets, and traditional rice using both ecological and commercial methods. This study examines methods that combine commercial use and conservation to build a robust and inclusive agricultural system in Jharkhand that promotes farmer well-being and biodiversity.

## 2.0 Agrobiodiversity in Jharkhand

Jharkhand is endowed with a rich array of native crops, including millets (Table 2), and traditional rice varieties. Among legumes, indigenous pulses such as chakod, raksaag, kudrum, and sakhin remain part of traditional diets and cultivation systems (Ghosh-Jerath et al., 2015). A particularly important traditional millet is finger millet (*Eleusine coracana*, locally known as “Marua”), which serves as the second staple after rice in rainfed farming systems (Sinha and Sharma, 2022). Other minor millets—like kodo, little, proso, barnyard, and foxtail millet—also contribute vitally to both human nutrition and livestock fodder (Kumar et al., 2024).

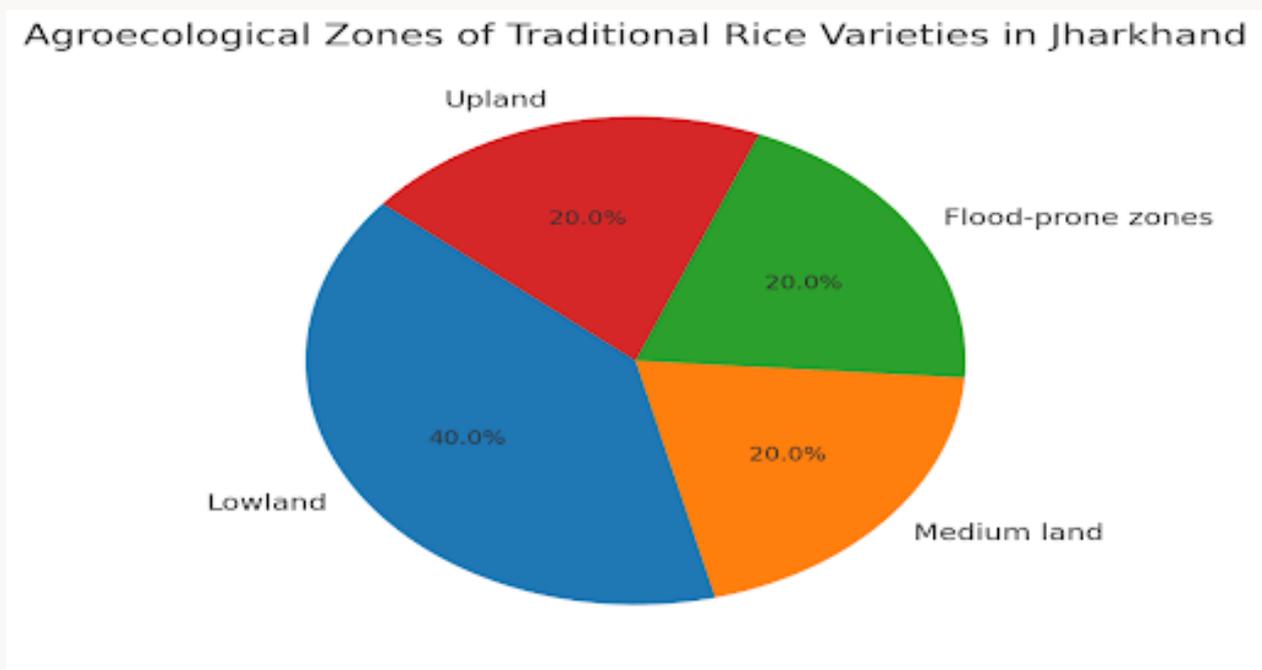
In terms of traditional rice, Jharkhand hosts an impressive diversity. Over 1,000 local paddy varieties were documented between 2006–07, with 600 identified by ICAR's Regional Station in Hazaribagh (Rajan et al., 2024). Many of these landraces possess desirable traits—short duration, drought tolerance, flood resistance, pest and disease resistance, aroma, and medicinal attributes (Table 1). Conservation efforts by Gene Campaign and others have established community-managed seed banks and have helped register a number of indigenous varieties under farmers' rights (Kumar et al., 2015).

### 3.0 Seed Collection and Conservation in Jharkhand

In Jharkhand, the ideal window for collecting seeds of indigenous rice and other traditional crops is November to January, when the harvest is fresh and varietal purity is easiest to maintain. Collecting seeds later can lead to mixtures, as farmers often follow mixed planting traditions and store seeds together after harvest. During this season, many rural communities are engaged in festivals and cultural observances, and certain days are considered inauspicious for sharing seeds. Rare or special varieties are sometimes kept within a small network of farmers, underscoring their cultural and agricultural value.

Accurate varietal identification is essential, as local names may vary or become altered over time. Cross-verifying names with multiple farmers helps ensure authenticity. Community-based seed banks, facilitated by organizations such as Gene Campaign, are playing a vital role in safeguarding these varieties. Involving elder women and experienced farmers in management has proven valuable, though systematic record-keeping and scientific seed multiplication require continued capacity building and technical oversight.

Jharkhand, together with Odisha and Chhattisgarh, lies within the center of origin of rice (Fig. 1), making it a region of exceptional genetic diversity. Preserving this wealth, while also adopting suitable modern practices, can strengthen agricultural resilience, food security, and cultural heritage. Collaborative efforts between farming communities, local organizations, and government institutions are key to ensuring that Jharkhand’s unique seed heritage is conserved for future generations.



**Fig. 1 Traditional rice growing agroecological regions**

## Table 1. Promising Traditional Rice Varieties

Variety Name	Key Traits	Agro-climatic Adaptation	Special Uses / Cultural Significance
<b>Lal Dhan</b>	Red pericarp, rich in iron & antioxidants; medium duration	Rainfed uplands, drought-tolerant	Traditional festivals, health foods
<b>Katarni</b>	Aromatic, fine grain, soft texture after cooking	Lowland & medium land, requires good water retention	Used in festive meals & gifting
<b>Bihari Dhan</b>	High tillering, pest tolerant, good straw yield	Rainfed uplands, adaptable to poor soils	Dual purpose – grain & fodder
<b>Danwar</b>	Tall, lodging-tolerant, long duration	Flood-prone lowlands	Popular in traditional brewing
<b>Tulsimanjari</b>	Aromatic, long slender grain, good cooking quality	Medium lands with moderate irrigation	Used in puja & ceremonial cooking
<b>Jhumri</b>	Quick maturing, resistant to common rice pests	Upland, short growing season	Early food security crop
<b>Hansraj</b>	Medium slender grain, soft cooking quality	Medium lands	General household consumption
<b>Jhilli</b>	Sticky texture, high amylopectin content	Lowlands with standing water	Preparation of traditional sweets & pitha
<b>Sada Dhan</b>	White grain, hardy, low input requirement	Rainfed uplands	Staple for marginal farmers
<b>Bhutmuri</b>	Distinct aroma, blackish husk, medium grain	Medium to lowlands	Ritual significance & specialty dishes
<b>Ranga Dhan</b>	Red kernel, drought & pest resistant	Uplands	Nutritious food for lean seasons
<b>Bhalum</b>	Short duration, drought tolerant	Upland, shifting cultivation	Famine reserve variety

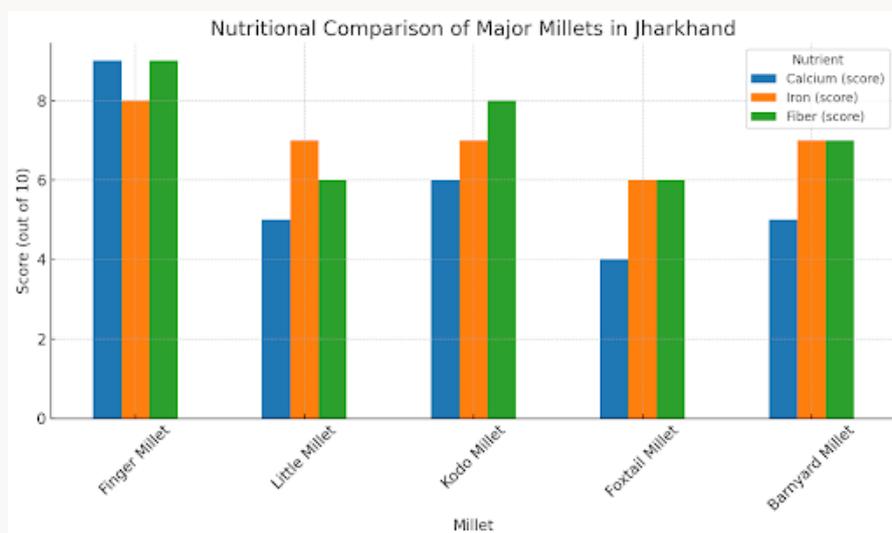


**Table 2. Promising Millets cultivars in Jharkhand**

Local Name	Scientific/Common Name	Notable Features
<b>Marua</b>	Finger Millet ( <i>Eleusine coracana</i> )	Drought-resistant, high calcium and iron
<b>Kutki</b>	Little Millet ( <i>Panicum sumatrense</i> )	Hardy, short-duration, nutritious
<b>Kodo</b>	Kodo Millet ( <i>Paspalum scrobiculatum</i> )	Rich in fiber, good for diabetics
<b>Kakun</b>	Foxtail Millet ( <i>Setaria italica</i> )	Pest-resistant, fast-growing
<b>Sanwa</b>	Barnyard Millet ( <i>Echinochloa frumentacea</i> )	Grows in marginal soils, quick maturity

## 4.0 Ecological and Nutritional Value

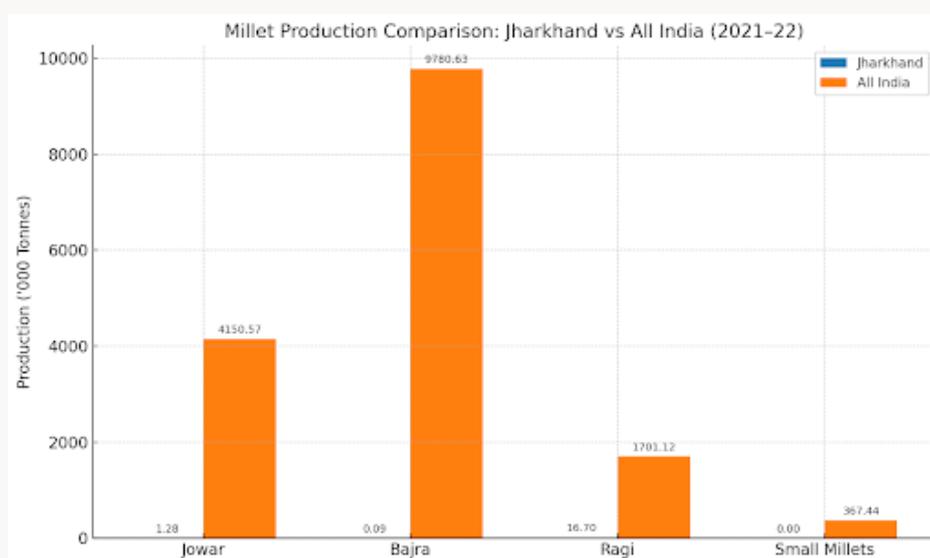
The indigenous crops of Jharkhand offer multiple ecological and nutritional benefits. Millets are inherently climate-resilient, requiring minimal water, adapting to poor soils, and having a low environmental footprint compared to rice or wheat (Agarwal, 2024). Nutritionally, they are "nutri-cereals"—rich in iron, fiber, minerals, with slow-release carbohydrates and immune-supporting antioxidants (Kumar, 2024). Finger millet specifically is a robust source of dietary fiber and iron (Wikipedia, 2025) (Fig.2.0). Traditional rice landraces also often exhibit higher nutritional and medicinal properties, while being resilient to local stresses (Rajan et al., 2022).



**Fig. 2.0 Nutritional contents of different Millets**

## 5.0 Status and Trends in Biodiversity Loss

Despite their inherent value, these native crops face accelerating decline. The Green Revolution prioritized high-yielding and hybrid rice (Fig.4.0) and wheat, leading to a sharp fall in millet (Fig. 3.0) and indigenous rice cultivation and resulting in significant loss of agrobiodiversity nationwide (Eliazer Nelson et al., 2019). In Jharkhand, although traditional varieties once abundant, they now cover less than 20% of rice area. Similarly, millets, which once contributed up to 40% of grain production in India, have seen their share nearly halved (SwitchON Foundation, 2023). Loss of cultivation, poor marketability, and lack of policy attention have further threatened these invaluable germplasm resources.



**Fig. 3.0 Millets productions in Jharkhand Vs India (2021-22) (Source: PIB, 2023)**



**Fig. 4.0 YOY (%) change on Rice Area and Production**

## 6.0. Challenges to Conservation and Cultivation

Despite their ecological suitability and nutritional importance, native legumes, millets, and traditional rice varieties in Jharkhand face multiple challenges that threaten their continued cultivation and survival.

### 6.1. Market Neglect and Economic Disincentives

Most indigenous crops suffer from poor market visibility and low price realization, making them less attractive to farmers compared to high-yielding varieties (HYVs) of rice or vegetables. Absence of robust value chains, price assurance mechanisms, and limited demand in urban markets have further marginalized their cultivation (SwitchON Foundation, 2023).

### 6.2. Policy Bias Toward HYVs and Cash Crops

Government schemes and procurement policies have historically prioritized rice and wheat, often at the cost of millet and pulse promotion. Even though millets have recently gained national attention through the "International Year of Millets 2023", ground-level implementation and support in Jharkhand remain limited and fragmented.

### 6.3. Loss of Traditional Knowledge

As farming communities shift toward input-intensive farming and migration increases among the youth, traditional agricultural knowledge related to seed saving, crop rotation, and mixed cropping is rapidly eroding. This is particularly critical for community-based seed systems that historically preserved varietal diversity.

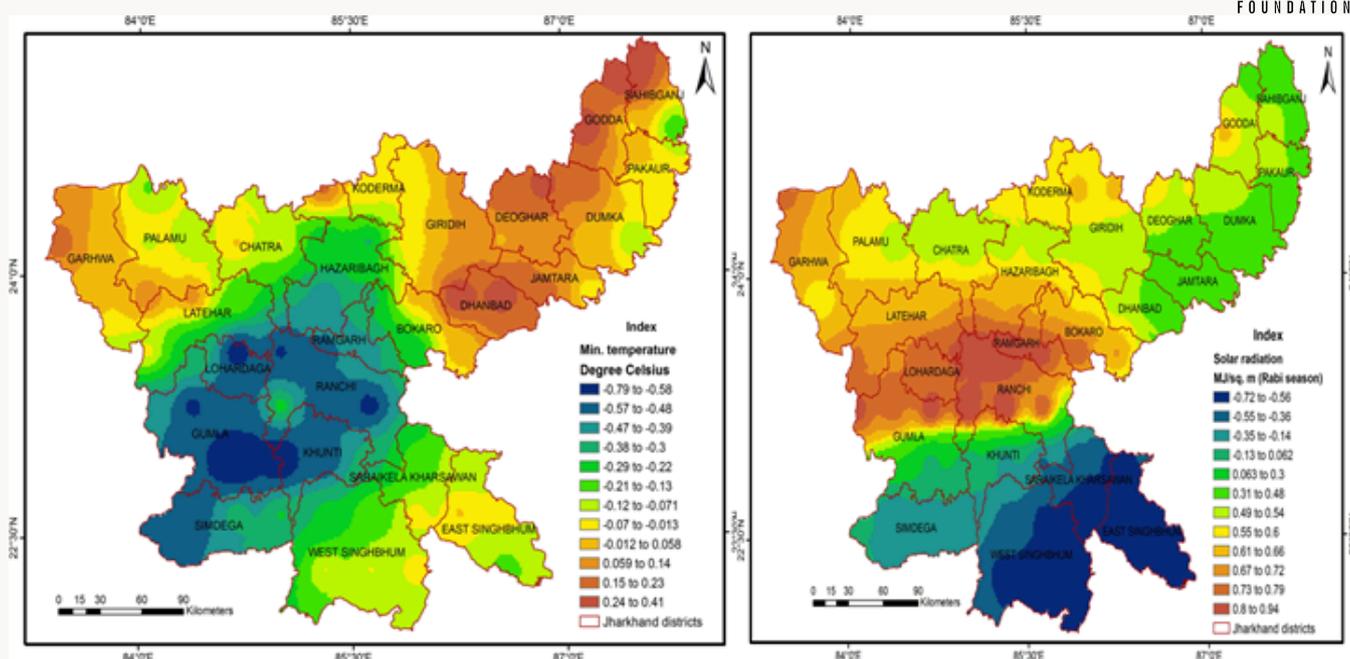
### 6.4. Climate Variability and Soil Degradation

The wide variety of indigenous rice, beans, and millets found in Dumka, Jharkhand's Santhal Pargana district, has been conserved over many generations by the area's primarily tribal farming communities. Due to their strong tolerance to drought, poor soils, and climatic stress (Fig. 5.0), these crops are ingrained in the local food traditions, culture, and ecological balance (Mishra, 2017; Swaminathan & Kesavan, 2012).

However, soil fertility and agricultural performance are progressively being impacted by climatic variability, which is characterized by unpredictable rainfall, protracted dry spells, and rising temperatures (Singh et al., 2020). Although local varieties are more adaptable, many farmers have been forced to grow high-input, water-dependent commercial crops, frequently at the expense of long-term sustainability, due to a lack of proper institutional support, access to high-quality seed, and technical know-how (FAO, 2019; Sahai, 2003).

In addition to conserving Dumka's agrobiodiversity, strengthening community seed banks (Padulosi, Bergamini, & Lawrence, 2012), encouraging agroecological farming (Altieri & Nicholls, 2017), and creating value chains through FPOs and SHGs (NRAA, 2016) can also improve soil health, guarantee climate-smart production, and raise farmer incomes.





**Fig. 5.0 District Wise Temperature and Solar Radiation (Source: Tirkey et al., 2018)**

### 6.5. Limited Extension and Research Support

Agricultural extension in tribal and rainfed regions of Jharkhand is often weak. There is a lack of local research on varietal improvement, pest management, and post-harvest practices for indigenous crops. As a result, farmers are left without access to improved seeds, agronomic knowledge, or technical advice tailored to their local needs.

### 7.0. Opportunities for Conservation and Commercial Use

Despite the decline in cultivation of native legumes, millets, and traditional rice varieties in Jharkhand, there are emerging opportunities to revive and integrate these crops into sustainable food systems while improving rural livelihoods.

#### 7.1. Rising Demand for Nutri-Cereals and Climate-Resilient Crops

With growing health awareness and a shift toward sustainable diets, there is increasing national and global demand for millets and traditional pulses. These crops are rich in fiber, protein, and micronutrients and are gaining recognition as “smart foods” that are good for people, the planet, and farmers. Jharkhand’s indigenous varieties have unique traits that can be leveraged to tap into health-conscious and specialty markets.

#### 7.2. Government Initiatives and Policy Momentum

The declaration of 2023 as the International Year of Millets by the UN has created momentum for millet promotion. Government schemes such as the National Food Security Mission (NFSM), Millets Mission, and Paramparagat Krishi Vikas Yojana (PKVY) provide financial and technical support for the revival of these crops. Jharkhand’s inclusion in millet promotion programs opens new opportunities for scaling conservation efforts with institutional backing.

### **7.3. Integration into Public Food Programs**

There is significant potential to integrate indigenous crops into existing schemes such as the Public Distribution System (PDS), Mid-Day Meal (MDM) scheme, and Integrated Child Development Services (ICDS). Including millets and pulses in these programs can create a stable market, improve nutrition, and support local producers.

### **7.4. Farmer Producer Organizations (FPOs) and Collective Enterprises**

The formation of tribal FPOs and women-led SHGs in Jharkhand creates a foundation for collective action. These platforms can be leveraged for seed conservation, collective marketing, and processing enterprises that add value to raw produce. Branding, packaging, and digital platforms can help reach wider markets.

### **7.5. Support from NGOs and Research Institutions**

Organizations like Gene Campaign, SwitchON Foundation, and ICAR are actively working to revive indigenous crop systems in Jharkhand through seed conservation, agroecological practices, and participatory breeding. Collaborations with these actors can provide technical support, funding, and market access to farming communities.

### **7.6. Ecotourism and Cultural Revival**

There is growing interest in linking indigenous food systems with ecotourism, slow food movements, and cultural preservation. Promoting native millets and rice in local festivals, organic food cafes, and tribal tourism circuits can enhance community pride and generate alternative livelihoods.



## 8.0 Proposed Strategies and Interventions

To preserve agrobiodiversity and enhance farmer livelihoods in Jharkhand, an integrated strategy is needed—one that blends conservation with commercialization, traditional knowledge with modern innovation, and community action with institutional support.

**The following interventions are proposed:**

### 8.1. Conservation of Native Crops

Climate change, market forces, and the loss of traditional knowledge are all posing a growing threat to Jharkhand's rich agrobiodiversity, which has been fostered for generations by the state's primarily tribal farming people. In addition to being essential to regional diets and cultural legacy, native crops including traditional rice types, beans, and millets also hold the key to nutritional security and climate resilience. By preserving and advancing these crops via value chain development, agroecological farming, and community-led conservation, it is possible to protect biodiversity, improve soil and water quality, and raise farmer incomes all at once.

#### 8.1.1. Community Seed Banks and In-situ Conservation

Community seed banks have been shown to be highly effective in conserving local germplasm and empowering farmers to maintain their agricultural heritage (Padulosi, Bergamini, & Lawrence, 2012; Sahai, 2003). In Jharkhand, Gene Campaign has demonstrated successful models of decentralized seed conservation and exchange.

#### 8.1.2. Agroecological Farming Practices

Agroecological approaches such as intercropping and organic soil management are crucial for sustaining yields under climate stress, particularly in rainfed areas (Swaminathan & Kesavan, 2012). Traditional knowledge systems in tribal Jharkhand support natural resource conservation and soil regeneration (Mishra, 2017).

#### 8.1.3. Research and Local Germplasm Characterization

Partnerships with ICAR, SAUs, and NGOs can strengthen efforts to document and evaluate native varieties for traits like drought tolerance and nutritional quality (FAO, 2019). This is critical for developing location-specific, climate-smart crop strategies.



## **8.2. Commercialization and Value Chain Development**

### **8.2.1 Farmer Producer Organizations and SHGs**

FPOs and SHGs offer platforms for collective production, value addition, and marketing of indigenous crops. They are central to strengthening bargaining power and improving access to credit and infrastructure (NRAA, 2016).

### **8.2.2. Value Addition and Processing Infrastructure**

Investment in decentralized primary processing units (e.g., millet dehullers, rice mills) can reduce post-harvest losses and improve profitability, especially when linked to local consumption or institutional markets (SwitchON Foundation, 2023).

### **8.2.3. Branding, Certification, and Market Linkages**

Branding and certification of native crops can enhance their market appeal and create niche consumer demand. GI tagging and organic certification have proven effective in Odisha and Karnataka for minor millets (FAO, 2019).

## **8.3. Policy and Institutional Support**

### **8.3.1. Inclusion in Government Schemes and Procurement**

The integration of millets and traditional biofortified into MDM, ICDS, and PDS systems can stabilize demand while addressing malnutrition (Swaminathan & Kesavan, 2012; MoAFW, 2021). Jharkhand has begun piloting this model in select districts with positive outcomes.

### **8.3.2. Financial and Technical Support**

Schemes like PKVY, Millets Mission, and NFSM offer subsidies and training, but uptake remains low in tribal belts. Dedicated resource persons and cluster-based models are needed to improve outreach and impact (MoAFW, 2021).

### **8.3.3. Awareness and Nutrition Campaigns**

Behaviour change communication is essential for increasing both production and consumption of native crops. Nutrition campaigns led by Anganwadi workers and school-based education can support dietary diversification (FAO, 2019).



## 9.0. Conclusion and Recommendations

The conservation and commercial use of native legumes, millets, and traditional rice varieties in Jharkhand offer a powerful opportunity to align biodiversity preservation with improved farmer livelihoods. These crops—resilient to climate stress, rich in nutrition, and rooted in tribal agricultural heritage—hold the key to building a more sustainable, inclusive, and food-secure rural economy. However, reversing the decline of these crops requires a strategic, multi-dimensional approach that addresses the structural, economic, and knowledge-based barriers facing farmers.

The report highlights the urgent need to integrate conservation efforts with market-based interventions, build institutional support around traditional food systems, and recognize the value of indigenous knowledge in agroecological transitions. Tribal communities in Jharkhand are not just cultivators but custodians of unique genetic resources; empowering them with appropriate tools, incentives, and recognition will be crucial for long-term success. Climate change, market forces, and the loss of traditional knowledge are all posing a growing threat to Jharkhand's rich agrobiodiversity, which has been fostered for generations by the state's primarily tribal farming people. In addition to being essential to regional diets and cultural legacy, native crops including traditional rice types, beans, and millets also hold the key to nutritional security and climate resilience. By preserving and advancing these crops via value chain development, agroecological farming, and community-led conservation, it is possible to protect biodiversity, improve soil and water quality, and raise farmer incomes all at once.



## 10.0. Key Recommendations

### 1. Strengthen Community-Based Conservation

- Establish and fund seed banks, heritage rice and millet repositories, and community biodiversity registers.
- Support farmer-led trials and participatory breeding to maintain and improve local varieties.

### 2. Enhance Market Access and Value Chains

- Build decentralized infrastructure for primary processing, storage, and packaging of millets and pulses.
- Promote branding, certification (organic, GI), and e-commerce access for native produce.
- Facilitate linkages between FPOs and institutional buyers such as schools, hospitals, and restaurants.

### 3. Integrate into Public Food and Nutrition Programs

- Include millets, pulses, and local rice varieties in the Public Distribution System (PDS), Mid-Day Meals (MDM), and ICDS schemes to drive demand and improve community nutrition.

### 4. Provide Financial and Technical Incentives

- Offer crop-specific incentives and subsidies under Millets Mission, PKVY, and NFSM tailored to the needs of tribal farmers.
- Deploy trained extension agents focused on agroecological and traditional farming practices.

### 5. Raise Awareness and Promote Dietary Change

- Run mass campaigns on the health and ecological benefits of native crops.
- Involve youth, women's groups, and schools in cultural revival and nutritional literacy programs.

### 6. Foster Collaborative Research and Policy Alignment

- Partner with ICAR, SAUs, and NGOs to document, characterize, and promote underutilized crops.
- Align state agriculture policies with biodiversity conservation goals and tribal development plans.

Reviving and revaluing Jharkhand's agrobiodiversity is not only essential for ecological resilience and nutritional security but also represents a step toward restoring dignity, autonomy, and prosperity to its farming communities. With the right blend of traditional knowledge and modern innovation, the state can become a national leader in sustainable, indigenous agriculture.



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