



International Journal of Research in Agronomy

E-ISSN: 2618-0618
P-ISSN: 2618-060X
© Agronomy
NAAS Rating (2026): 5.20
www.agronomyjournals.com
2026; SP-9(4): 19-29
Received: 26-01-2026
Accepted: 29-02-2026

Soumya Ranjan Behera
Ph.D. Research Scholar, Kerala
Agricultural University,
Department of Agricultural
Extension Education, College of
Agriculture Vellayani,
Thiruvananthapuram, Kerala,
India

Esakkimuthu M
Assistant Professor (Sr. Scale),
Department of Agricultural
Extension, ICAR-Krishi Vigyan
Kendra, Wayanad, Kerala
Agricultural University,
Ambalavayal, Kerala, India

Allan Thomas
Professor & Head, Kerala
Agricultural University,
Department of Agricultural
Extension Education, College of
Agriculture Vellayani,
Thiruvananthapuram, Kerala,
India

Rekha Sree Namburu
Ph.D. Scholar, Department of
Agricultural Extension Education,
College of Agriculture, Vellayani,
Kerala Agricultural University,
Thiruvananthapuram, Kerala,
India

Anitha G
Ph.D. Scholar, Department of Soil
Science and Agricultural
Chemistry, College of Agriculture,
Vellayani, Kerala Agricultural
University, Thiruvananthapuram,
Kerala, India

Corresponding Author:
Soumya Ranjan Behera
Ph.D. Research Scholar, Kerala
Agricultural University,
Department of Agricultural
Extension Education, College of
Agriculture Vellayani,
Thiruvananthapuram, Kerala,
India

Farming for the future: Community-led sustainable initiatives through millet bank

Soumya Ranjan Behera, Esakkimuthu M, Allan Thomas, Rekha Sree Namburu and Anitha G

DOI: <https://www.doi.org/10.33545/2618060X.2026.v9.i4Sa.5324>

Abstract

Farming for the Future emphasizes community-led sustainable initiatives through the establishment of millet banks as a strategy to enhance food security, climate resilience, and rural livelihoods. Millet banks function as decentralized systems for conserving traditional millet varieties, ensuring seed availability, and promoting agro biodiversity in vulnerable regions. These initiatives empower local communities, particularly smallholder farmers and women's groups, by facilitating participatory seed exchange, capacity building, and adoption of climate-resilient agricultural practices. Millets, being drought-tolerant and nutrient-rich crops, play a crucial role in addressing challenges related to climate variability, malnutrition, and declining soil health. The millet bank approach integrates conservation, cultivation, consumption, and commercialization, thereby strengthening local food systems and market linkages. Evidence suggests that such community-driven models enhance productivity, improve dietary diversity, and increase farmers' income while reducing dependence on external inputs. Furthermore, these initiatives contribute to achieving Sustainable Development Goals (SDGs), particularly zero hunger, good health, climate action, and sustainable agriculture. The study highlights that scaling up millet banks through policy support, institutional collaboration, and awareness programs can transform rural agriculture into a resilient and inclusive system. Thus, millet banks represent a sustainable pathway toward ecological balance and long-term food security.

Keywords: Millet bank, sustainable agriculture, climate resilience, food security, community-led development

Introduction

Millets are among the earliest domesticated cereal crops known to humankind, with archaeological evidence tracing their cultivation back to approximately 8000 B.C. These small-seeded grasses have historically played a crucial role in sustaining human populations, particularly in arid and semi-arid regions across Asia and Africa. Millets serve as an important source of dietary energy, protein, and essential micronutrients, especially for resource-poor communities. The major millets include sorghum (*Sorghum bicolor*), pearl millet (*Pennisetum glaucum*), and finger millet (*Eleusine coracana*), while minor millets comprise foxtail millet, proso millet, kodo millet, barnyard millet, and little millet (Kumari *et al.*, 2023)^[28].

In the Indian context, millets have been cultivated for centuries due to their nutritional richness, adaptability to marginal environments, and low input requirements. These crops are highly resilient to climatic variability, requiring significantly less water compared to major cereals such as rice and wheat, and are capable of thriving in degraded soils. Despite these advantages, millet cultivation has witnessed a substantial decline since the 1980s. This decline is largely attributed to the Green Revolution, which prioritized high-yielding varieties of rice and wheat supported by irrigation infrastructure, subsidies, and procurement policies. Consequently, farmers shifted toward these crops due to higher economic returns and assured market access, resulting in the marginalization of millets in both production and consumption systems (Government of India [GOI], 2025; FAO, 2024).

Recent data indicate a structural transformation in millet production systems in India. As per the third advance estimates for 2024-25, India achieved a total millet production of approximately 180.15 lakh tonnes (18.01 million tonnes), reflecting an increase compared to previous years.

At the global level, India continues to dominate millet production, contributing around 40% of global output, thereby maintaining its position as the largest producer worldwide. However, despite this leadership, fluctuations in yield and area persist. For instance, recent estimates suggest that millet production declined slightly to around 11.57 million tonnes in 2024-25 due to yield variations, even though the cultivated area remained relatively stable at around 9.2 million hectares. This indicates that productivity, rather than area expansion, is the key determinant of production trends.

In addition to production dynamics, millet exports have shown a steady upward trajectory in recent years. India exported approximately 146,300 metric tonnes of millets valued at USD 70.89 million in 2023-24, reflecting increasing global demand for nutritious and sustainable food products. Earlier data also indicate that exports reached about USD 75 million in 2022-23, demonstrating consistent growth in international markets. The global demand for millets is being driven by rising consumer awareness regarding gluten-free diets, functional foods, and plant-based nutrition. Furthermore, government initiatives aimed at expanding export markets, promoting value-added millet products, and enhancing branding have contributed to strengthening India's position in the global millet trade.

Recognizing the multifaceted importance of millets, the Government of India has undertaken several strategic initiatives to revive their cultivation and consumption. In 2018, millets were rebranded as “Nutri-cereals” to emphasize their nutritional superiority, and the year was declared the National Year of Millets. Building upon this initiative, India successfully proposed the designation of 2023 as the International Year of Millets (IYM), which was adopted by the United Nations General Assembly to promote global awareness and consumption. Continuing this momentum, the Union Budget 2024-25 recognized millets as “Shree Anna” (superfood), highlighting their importance in ensuring nutritional security, climate resilience, and sustainable agriculture (Ministry of Finance, 2024).

From an environmental perspective, millets are increasingly being recognized as climate-smart crops. They are drought-resistant, require minimal external inputs, and have a lower carbon and water footprint compared to conventional cereals. Their ability to adapt to extreme climatic conditions makes them particularly relevant in the context of climate change and resource scarcity. As global agricultural systems face increasing pressure from environmental degradation and population growth, millets offer a viable pathway toward sustainable and resilient food systems (FAO, 2024).

Moreover, millets contribute significantly to achieving multiple Sustainable Development Goals (SDGs), including zero hunger (SDG 2), good health and well-being (SDG 3), climate action (SDG 13), and responsible consumption and production (SDG 12). Their integration into food systems can enhance nutritional outcomes, improve farmer livelihoods, and promote environmental sustainability.

In conclusion, the renewed emphasis on millets reflects a paradigm shift toward sustainable and nutrition-sensitive agriculture. The convergence of policy support, market demand, and technological advancements has created new opportunities for the millet sector. India, with its strong production base and policy backing, is well-positioned to lead the global millet movement and emerge as a hub for millet production, processing, and export in the coming decades.

Trade in millets: National and global scenario (2025 update)

The millet sector in 2025 reflects a significant transition from a traditionally neglected crop to a strategically important component of sustainable agriculture and global food systems. Historically, millets occupied a prominent position in the Indian food basket; however, the post-Green Revolution period led to a marked decline in their cultivation and consumption due to policy support favouring rice and wheat. This structural shift resulted in a substantial reduction in the area under millets, although recent years have witnessed a revival driven by increased awareness of their nutritional benefits, climate resilience, and policy interventions. In 2025, millets are increasingly recognized as “future smart foods,” aligning with global priorities of sustainability, food security, and nutrition (FAO, 2025).

India continues to maintain its position as the largest producer of millets globally, accounting for approximately 40-44% of total world production, followed by countries such as China and Niger (FAO, 2025; USDA, 2025). According to the Fourth Advance Estimates for 2024-25 released by the Ministry of Agriculture and Farmers Welfare, the total area under millet cultivation in India is estimated at around 9.5 million hectares, with production ranging between 18.2 and 18.8 million tonnes and an average yield of approximately 1200-1250 kg per hectare (Government of India [GOI], 2025). These figures indicate that although the area under millet cultivation has declined compared to earlier decades, production levels have remained relatively stable due to improvements in yield. This reflects a transition toward a productivity-driven production system supported by improved seed varieties, better agronomic practices, and targeted government interventions.

The spatial distribution of millet cultivation in India remains highly concentrated in dryland and semi-arid regions. Rajasthan continues to dominate both area and production, contributing nearly 35% of the total cultivated area and around 27% of national production. Maharashtra, Karnataka, and Uttar Pradesh also play significant roles, together accounting for a substantial share of millet output (GOI, 2025). Crop-wise analysis indicates that pearl millet (bajra) constitutes the largest share of production, contributing nearly 45-48%, followed by sorghum (jowar) at around 20-22%, finger millet (ragi) at 12-14%, and small millets contributing approximately 16-18% (GOI, 2025). The predominance of pearl millet is largely due to its adaptability to arid climatic conditions, while the increasing share of small millets reflects growing demand driven by health and nutrition awareness.

Despite the overall stability in production, millet cultivation in India continues to be largely dependent on rainfed agriculture. The irrigated area under major millets such as jowar and bajra remains limited to approximately 11-15%, indicating significant scope for productivity enhancement through improved irrigation infrastructure and water management practices (FAO, 2025; GOI, 2025). The limited irrigation coverage highlights the inherent resilience of millets, which can thrive under low-input conditions, but also points to untapped potential for yield improvement.

At the global level, millet production remains concentrated in Asia and Africa, with India holding a dominant position. China contributes approximately 9% of global production, while countries such as Niger and Nigeria play significant roles in African production systems (FAO, 2025; USDA, 2025). The global millet market has shown steady expansion, with its size estimated at around USD 14-15 billion in 2025. This growth is primarily driven by increasing demand for gluten-free, organic,

and nutrient-rich food products, as well as the rising popularity of plant-based diets and functional foods (FAO, 2025). Millets are increasingly being incorporated into value-added products such as ready-to-eat foods, breakfast cereals, and health snacks, thereby enhancing their commercial significance. India’s performance in the global millet trade has also improved in recent years, although it remains below its full potential. According to the Agricultural and Processed Food Products Export Development Authority (APEDA), India’s millet exports in 2024-25 are estimated at approximately 150,000 metric tonnes, with a total export value ranging between USD 75 and 80 million (APEDA, 2025). The major export destinations include the United Arab Emirates, Saudi Arabia, Nepal, and Japan, reflecting a growing international demand for Indian millets. The upward trend in exports is largely attributed to increased global awareness following the International Year of Millets and government efforts to promote millet-based products in international markets (APEDA, 2025; DGCIS, 2025). The expansion of millet trade in 2025 is influenced by multiple interconnected factors. Government initiatives such as the National Food Security Mission (NFSM) and various state-level millet missions have played a crucial role in enhancing production and promoting value addition. At the same time, rising health consciousness among consumers has significantly increased demand for millets due to their low glycaemic index, high fiber content, and rich micronutrient profile. Additionally, global recognition of millets as climate-resilient crops has strengthened their position in sustainable food systems, further driving demand in international markets (GOI, 2025; FAO, 2025). Overall, the 2025 scenario indicates a structural transformation in the millet sector characterized by production stability despite declining area, increasing domestic and global demand, and expanding trade opportunities. The shift from subsistence-oriented cultivation to market-driven production highlights the evolving role of millets in the agricultural economy. With continued policy support, technological innovation, and market development, millets are poised to emerge as a key component of sustainable agriculture and global food trade.

Table 1: Area, Production and Yield of Millets in India (2024-25)

Indicator	Value
Area (Million hectares)	9.5
Production (Million tonnes)	18.2-18.8
Average Yield (kg/ha)	1200-1250

Source: Ministry of Agriculture & Farmers Welfare, Government of India (GOI, 2025)

Table 2: Global Millet Production Share by Country (2025)

Country	Share (%)
India	40-44
China	9
Niger	7
Nigeria	6
Others	34

Source: FAO (2025); USDA Foreign Agricultural Service (2025)

Table 3: India’s Millet Export Performance (2024-25)

Indicator	Value
Export Volume	~150,000 MT
Export Value	USD 75-80 million
Major Markets	UAE, Saudi Arabia, Nepal, Japan

Source: APEDA (2025); Directorate General of Commercial Intelligence and Statistics (DGCIS, 2025)

Millets to achieve SDGs on pathway

Millets are increasingly recognized as key crops for achieving multiple Sustainable Development Goals (SDGs) due to their nutritional, economic, and environmental benefits. In the context of SDG 2 (Zero Hunger), millets enhance food and nutritional security in rainfed and marginal regions by providing a resilient and nutrient-rich food source (Kumari *et al.*, 2023; FAO, 2025) [28, 16]. Their high fiber, mineral content, and low glycemic index contribute to SDG 3 (Good Health and Well-being) by supporting the prevention of non-communicable diseases (Anitha *et al.*, 2024). Furthermore, millets promote SDG 8 (Economic Growth) by generating income opportunities for smallholder farmers through value addition and market expansion. Their low input requirements and adaptability support SDG 12 (Responsible Consumption) and SDG 13 (Climate Action) by reducing environmental stress and enhancing resilience to climate variability. Overall, millets represent a sustainable pathway for achieving integrated development goals.

Importance Of Millets

Climate-Resilient and Sustainable Crop

Millets are widely recognized as climate-resilient crops capable of supporting sustainable agriculture under changing environmental conditions. Their ability to grow in arid and semi-arid regions with minimal water and input requirements makes them suitable for rainfed farming systems. Recent studies highlight that millets can tolerate extreme temperatures and poor soil conditions, making them a viable solution for climate adaptation and sustainable food production (Kumar *et al.*, 2025; FAO, 2025) [27, 16]. Their deep root systems and efficient water-use capacity enhance resilience against drought and environmental stress.

Nutritional Superiority and Health Benefits

Millets are considered “nutri-cereals” due to their high nutritional composition, including complex carbohydrates, dietary fiber, proteins, and essential micronutrients such as calcium, iron, and zinc. Recent research indicates that millets have a low glycaemic index and high antioxidant content, which contribute to improved glycaemic control, cardiovascular health, and weight management. Additionally, millets contain bioactive compounds such as polyphenols and flavonoids that exhibit anti-inflammatory and anti-diabetic properties, making them effective in preventing lifestyle diseases.

Role in Food and Nutritional Security

Millets play a crucial role in enhancing food and nutritional security, particularly in developing regions. Their ability to produce stable yields under adverse climatic conditions ensures food availability for vulnerable populations. Recent studies emphasize that millet-based diets improve dietary diversity and nutritional outcomes, especially in regions affected by climate variability and food insecurity (Gbegbelegbe *et al.*, 2025; FAO, 2025) [19, 16]. Their integration into food systems helps reduce dependency on major cereals such as rice and wheat.

Economic Importance and Livelihood Support

Millets provide significant economic benefits by supporting smallholder farmers and rural livelihoods. The increasing demand for millet-based products in global markets has enhanced their commercial potential. Research shows that value addition, processing, and marketing of millet-based foods contribute to income generation and rural employment (Rai *et*

al., 2025) [35]. Moreover, the expansion of millet value chains and agri-entrepreneurship has strengthened economic resilience in rural areas.

Environmental and Ecological Benefits

Millet contributes to environmental sustainability by reducing the ecological footprint of agriculture. Their low water requirement, minimal dependence on chemical inputs, and ability to grow in degraded soils help conserve natural resources and promote biodiversity. Studies indicate that millets also contribute to carbon sequestration and soil health improvement, thereby supporting climate change mitigation efforts. Their cultivation results in lower greenhouse gas emissions compared to conventional cereals.

Strategies for Millet Conservation

Selective utilization of specific crops and varieties in these modern days has threatened the agro-biodiversity leading to the loss of many potential landraces and subsequently affecting the nutritional security of the people. The only way to conserve the millet landraces is to bring them into use and build a viable ecosystem around them. Odisha Millets Mission is taking the lead in the conservation of millets by involving farmers.

The strategies to conserve the millet landraces are by following the 4 C's as follows:

- 1. Conservation:** The strategies for the conservation of millets involve seed collection, multiplication, seed distribution, farmer-to-farmer seed exchange, and conducting Participatory varietal trials (PVT) involving farmers, especially women farmers. The promising potential landraces are collected from the locality or nearby places. The seeds are properly cleaned, dried, and stored in the Community Seed Centres. On the arrival of the monsoon season, the seeds are distributed to the farmers in the community. The farmers are selected based on their interest to do seed multiplication. The farmers are properly made aware of the millet seeds in the community gathering. A proper register is maintained for the seed distribution.
- 2. Cultivation:** From the year 2017-18, farmers started

following the System of Millets Intensification (SMI), Line Transplanting/Line Sowing, where it was a marked significant increase in the yield of millets. Farmers reported getting yields of 8-12 quintals/acre. Happy moments were seen among the millet farmers when they received incentives for following the best agronomic practices. These initiatives of Odisha Millets Mission encouraged farmers to grow more millets in their fields.

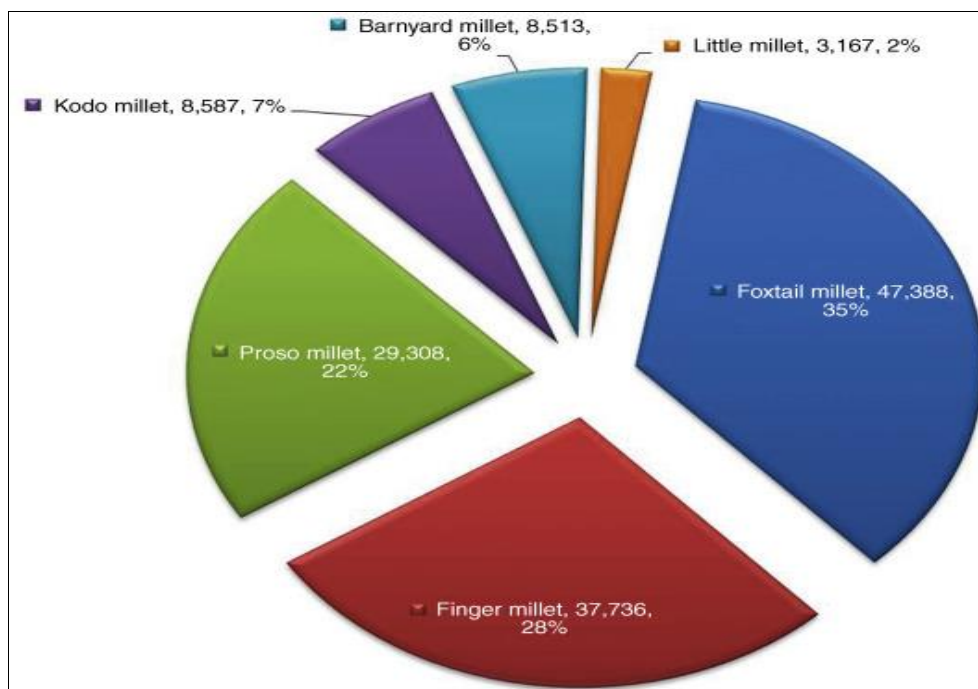
- 3. Consumption:** To address the issue of reduced millet consumption due to the labour-intensive processing methods, the Odisha Millets Mission has undertaken several proactive initiatives. They have provided OUAT Ragi Threshers to Women Self-Help Groups (WSHGs), which streamlines the millet threshing process, reducing the time and effort required. Additionally, the distribution of pulverizers to produce millet flour efficiently has further eased the accessibility and use of millets in various recipes.
- 4. Commercialisation:** The millet ecosystem cannot sustain for a long time until a business is created. In view of this, the WSHGs are trained in processing millets and making value-added products. On convergence, Odisha Millets Mission is associated with Mission Shakti Department. The value-added products are branded in the name of "Millet Shakti". The millet products are in much demand in the state as well as in other states. Now, the Women's Self-help Groups are making a good business out of millet products (Roy, 2022) [37].

Ex-situ conservation

The ex-situ conservation widely used method to conserve millet genetic resources. Globally >29,000 accessions of proso millet, >8,000 accessions each of barnyard and kodo millets, and >3,000 accessions of little millet have been assembled and conserved. The major gene banks conserving proso, barnyard, kodo, and little millets. The major collections of proso millet germplasm accessions are assembled in the Russian Federation, China, Ukraine and India; barnyard millet in Japan and India; kodo millet in India and USA; and little millet in India. (Upadhyaya *et al.*, 2016).

Table 4: Genebanks conserving germplasms of Proso, Barnyard, Kodo and Little millets

Millets	Institute	Germplasm accessions		
		Cultivated	Wild	Total
Proso millet	AICRP on Small Millets (AICRP-Small Millets)	920		920
	International Crop Research Institute for the Semi-Arid Tropics (ICRISAT)	849		849
	National Bureau of Plant Genetic Resources (NBPGR)	994	4	998
Barnyard millet	National Bureau of Plant Genetic Resources	1668	9	1677
	AICRP on Small Millets	868		868
	International Crop Research Institute for the Semi-Arid Tropics	749		749
Kodo millet	The Ramiah Gene Bank, Tamil Nadu Agricultural University, India	232		232
	AICRP on Small Millets, Bangalore	1111		1111
	International Crop Research Institute for the Semi-Arid Tropics (ICRISAT)	665		665
Little millet	National Bureau of Plant Genetic Resources (NBPGR), New Delhi	2170	10	2180
	AICRP on Small Millets (AICRP-Small Millets)	928		928
	International Crop Research Institute for the Semi-Arid Tropics (ICRISAT)	473		473
	National Bureau of Plant Genetic Resources (NBPGR)	1253		1253
	Regional Station Akola, NBPGR (NBPGR)	165		165



Source: Upadhyaya *et al.*, 2016

Fig 1: Global status of small millet germplasm maintained in different gene banks

In-situ Conservation (On farm conservation practice)

The in-situ conservation practice followed by farmers and among the best method is System of Millets Intensification (SMI) in finger millets enhanced productivity.

SMI in Finger Millet

SMI stands for System of Millets Intensification. This method of agronomic practice is to enhance productivity and to increase the production in millets. Now, SMI in Finger Millet is practiced by most of the farmers in Odisha under the Odisha Millet Mission. This practice is getting popular in the farmer field because it is giving promising yield as compared to the traditional method.

Package of practices in SMI

- 1. Land Preparation:** The land should be well ploughed in the month of June after the first shower of rain. This method is suitable for cultivation in medium land. It must be ensured that no water remain stagnant in the field for long period.
- 2. Selection of seed:** It is always recommended to select a variety which is more suitable for that particular area. There are some promising local varieties that farmers are still cultivating. In the era of Research and Development, there

are many high yielding which is accepted by the farming community. popular Finger Millet cultivars giving excellent yield like GPU-28, GPU-48, GPU-66, GPU-67, and KMR-204.

- 3. Seed Rate for SMI:** In Traditional/Conventional method we generally require 4 kg of seeds per acre but in SMI method we need only 300-400 gm per acre. Farmers can definitely save seeds by this method.
- 4. Seed Treatment:** It can be done in a chemical or organic way. organic way as it costs lesser and resources easily available with the farmers. Treating with *Bijamrita* is well accepted by the farmers.
- 5. Raising of Seed Bed:** Generally, fourty square meters of the area is required for transplanting a one-acre area. The bed should be raised up to a height of 6 inches. In the rope, marker lines are marked with a *Khurpi* or a stick. After the treated seeds are completely dried it is mixed with sand and spread in the grove of the marked lines. The fine-tuned powder form of FYM or Vermi-compost is used to cover the sown seeds in the bed.

6. Preparation of Main Field



The main field is well ploughed with tractor and 30 quintals of FYM is spread over 1 acre of land. Plough at least 2 times before transplanting of finger millet.

Fig 2: SMI practices (OMM, 2023)

Transplanting

The duration of 15-20 day seedlings are best for transplanting. The seedlings should not be uprooted as we do in rice rather use a spade. Take out the seedlings along with the soil and ensure that roots are not broken. Line marking is made at 10 inches from line to line and plant to plant with an iron or wooden marker. Making lines with a marker will create a ridge and furrow. A rope is used for marking the distance of plant to plant. Compost or ash is put 10 inches apart and seedlings are placed on this mark. Seedlings are planted slightly covering it with the soil.

Weeding

Weeding is an important intercultural operation to be carried out in SMI. It is done after 15 days of transplanting by a cycle weeder. Totally, three time of weeding is recommended at 15 day frequent intervals.

Log Rolling

A log of 8-10 feet long is tied with a rope on both ends and it is pulled over the finger millet plants on 25-30 after planting. It is pulled only in one direction. This operation bends the plant and gives a shock so that more tillering occurs (OMM, 2023).

Millet promotional activity

The Department of Agriculture and Farmers Welfare (DA&FW), Government of India is implementing a Sub-Mission on Nutri-Cereals (Millets) under National Food Security Mission (NFSM) to enhance area, production and productivity of millets including bajra. Under this Sub-Mission, bajra is being promoted in 89 districts of 9 states including 14 districts of Gujarat. Northeastern States, Himachal Pradesh and UTs of Jammu & Kashmir and Ladakh have been given flexibility to include these districts under programme. Through the efforts made by the Government, the production of millets has increased from 14.52 million tonnes in 2015-16 to 17.96 million tonnes in 2020-21. The production of bajra has also increased from 8.07 million tonnes to 10.86 million tonnes during the same period. The state governments can also promote cultivation of millets and bajra under *Rashtriya Krishi Vikas Yojana* - Remunerative Approaches for Agriculture & Allied sector Rejuvenation (RKVY- RAFTAAR) with the approval of the State Level Sanctioning Committee (SLSC) constituted under the chairmanship of the chief secretary of the State.

Government Initiative for Millet Promotion

Table 4: Different Millets Mission Schemes in Various States

State Missions	States	Description
Bhavantar Bharpayee Yojana	Haryana	It is a one-of-a-kind Haryana Government Scheme designed to compensate horticulture farmers for the low price of their produce. The Scheme has been expanded to the Bajra crop beginning with the Kharif season of 2021 in order to help millet producers in the state.
Millet Mission	Chhattisgarh	In September 2021, the Chhattisgarh government announced Mission Millet Chhattisgarh in an effort to establish the state as India's millet hub. With a total budgetary allocation of US\$ 20.71 million (Rs. 170 crore) and an input grant of US\$ 109.65 (Rs. 9000) per hectare, its main goal is to promote the growth of Kodo millet, small millet, and finger millet in the State.
Drought Mitigation Project (APDMP)	Andhra Pradesh	This programme is supported by IFAD and GoAP, a systematic and coordinated effort to address the general issue of persistent drought, enhance the incomes of 95,000 agricultural households, and strengthen their drought resistance. The project aims to improve agricultural productivity and adaptability in the 315 drought-prone gramme panchayats in the worst-affected 105 blocks of the southern AP districts of Ananthapuramu, Chittoor, Kadapa, Kurnool (the Rayalaseema region), and Prakasam.
Procurement and Processing for Value Addition of Millets	Uttarakhand	Under the State Millet Mission and in accordance with the State Department of Agriculture, Uttarakhand State Co-operative Federation Ltd. (UCF) has set a goal of acquiring Finger Millet (Mandua) and Barnyard Millet (Jhingora), in addition to establishing and constructing a Multi-Grain Processing Facility for primary and secondary processing of traditional small millet varieties.
Organic Production and Certification of Millets	Uttarakhand	Farmers in the state's hilly regions primarily cultivate native crops such as finger millet, barnyard millet, amaranthus, and so on. According to the State Government, organic cultivation and certification of millets are done through centrally sponsored programmes like the Paramparagat Krishi Vikas Yojana (PKVY) in 1,657 clusters (33,140 hectare), Rashtriya Krishi Vikas Yojana (RKVY)-Organic Programme in 70,240 hectares, and Namami Gange Programme in 620 cluster (12,400 hectare).
Promoting Kodo and Little Millets	Madhya Pradesh	Under the Centre's Nutri Cereal Sponsored Scheme, Madhya Pradesh is promoting millets, especially Kodo and Little millet. A non-profit organisation called Action for Social Advancement (ASA) has identified 30-40 villages in the tribal districts of Mandla and Dindori for millet promotion.
Millets Mission	Tamil Nadu	The National Agriculture Development Programme (NADP)'s Tamil Nadu Millet Mission was established in 2014-15 with the goal of reviving the cultivation of forgotten millets by providing incentives for their production and distribution, setting up frontline demonstrations, and training farmers in farming millets and its value-added products.
Millets Mission and SHG Mission Shakti	Odisha	Odisha Millet Mission (OMM), a special programme the state government of Odisha launched in 2017 with the goal of promoting millets in tribal areas that aims to revive millets on farms and plates while simultaneously foccon production, processing, consumption, marketing, and inclusion of millets in government initiatives. One of the primary initiatives to encourage millet consumption has been the convergence of Odisha Millets Mission and SHG Mission Shakti, in order to produce creative recipes, as well as train SHG women.
Promotion of Millets through NFSM-Nutri Cereals Mission	Nagaland	Millet (Foxtail) is an important crop farmed in Nagaland for not only food but also medicine and animal feed. It can be grown in all the districts of Nagaland during the kharif season. Foxtail has been included in NFSM-Nutri-Cereals to stimulate and improve area, production, and productivity. Front-line demonstration, seed distribution, seed production, integrated nutrient management, integrated pest control, and training are all part of the NFSM-Nutri Cereals interventions.

Inclusion of millets in ICDS

Inclusion of Millets in take Home Ration in Chandigarh

Millets (Bajra and Jowar) are an excellent source of iron, protein and carbohydrates, are rich in fiber and also constitute part of the daily intake for phosphorus and magnesium. Keeping this in mind, to improve the health of Anganwadi children, pregnant women, lactating mothers, and adolescent girls, the Women and Child Development Department has taken an initiative to promote millet (bajra and jowar) consumption by introducing them in the Take Home Ration to the beneficiaries of all 450 Anganwadi Centres under the Integrated Child Development Scheme. The Anganwadi workers are made aware of the benefits of this superfood so that they can spread the message to the beneficiaries.

Introduction of Finger Millets (Ragi) In Supplementary Nutrition Programme in Chhattisgarh:

In year 2018, State Government of Chhattisgarh, under *Mukhyamantri Suposhan Yojna*, introduced Finger millets (ragi) in Supplementary Nutrition Program (SNP). Under Take Home Ration, ready-to-eat food packet comprising ragi, wheat, soyabean, bengal gram, sugar, groundnut and fortified soya bean oil is distributed to 6months to 6 years' children, pregnant and lactating women, severely malnourished children and 11 to 14 years' adolescent girls.

Inclusion of Kodo-Kutki Millets through Tejaswini Rural Women Empowerment Programme in ICDS, Madhya Pradesh:

In order to enrich the diet of children and mothers, Madhya Pradesh has taken initiatives to promote millets-based recipes in Anganwadi Services and *poshan abhiyaan*. Two Districts of Dindori and Mandla are serving millets based recipes in Dindori and Mandla to 3-6 year children.

Ragi Laddu in ICDS, Sundargarh and Keonjhar, Odisha:

The Odisha Government's project, "Special program for promotion of millets in tribal areas" aims to revive millets in farms and on plates considering the climate resilience of the crops and its high nutritional value. Ragi or finger millets has better calcium, iron, and protein than polished rice, is grown enormously in the tribal districts of Odisha. With a little innovation and some value addition, it has turned out to be a benchmark in nutrition promotion by ICDS among pre-school children.

Local Traditional Recipes as Hot Cooked Meals and Millet in Complementary Weaning Food in ICDS, Tamil Nadu:

State of Tamil Nadu introduced the revolutionary nutritious meal programme to encourage children to take up education and at the same time compensate the lack of resources caused by poverty. Ragi millet is one of the main composition of its weaning food which is provided to 6 months-2 year children, pregnant women & lactating mothers.

Giri Poshana / Nutri-Food Basket (NFB): Nutritional Interventions to Improve Dietary Diversification in the Tribal Households of Telangana:

Giri Poshana (scale up of Nutri-Food basket project) is an innovative approach to improve nutrition among tribal population in the Integrated Tribal Development Agency (ITDA) areas of Utnoor, Bhadrachalam and Eturnagaram, Telangana. Under this initiative, food products that supplement existing diets are provided to improve the dietary diversity and nutritional outcomes (stunting, wasting, underweight & anemia).

Research & Development and Use of Technology for Innovative Practices

Case Study on Sorghum in Rice Fallows by ICAR-IIMR, Hyderabad: The ICAR-IIMR has developed a standardised package of practice for sorghum cultivation in rice fallow under zero tillage by repeated field trials, creating awareness among the farmers, conducting field day and large-scale demonstration.

Nutrihub-Technology Business Incubator (TBI) Hosted by the ICAR-IIMR, Hyderabad: The 'Nutrihub' is the Department of Science & Technology (DST), Government of India supported Technology Business Incubator hosted by the Indian Institute of Millet Research, Hyderabad. It is a unique and first of its kind initiative to cater start-ups in the Nutri-Cereals sector in the country. An encouraging the budding entrepreneurs to promote the growth of Nutri Cereals (Millets), the Climate Resilient Future Crops.

Innovative Approach to Mainstream Sweet Sorghum as a Source of Ethanol Production By ICRISAT- IIMR: An innovative project to mainstream sweet sorghum as a source of ethanol production by ICRISAT and ICAR-IIMR, and the results paving the way to create an alternative eco-friendly fuel source from 2014.

Indian Institute of Food Processing Technology (IIFPT)

Millet Mission: The IIFPT is conducting research and development, capacity building skill development programmes, technology transfer and consultancy services for budding entrepreneurs, existing industrialists, farmers, SHGs, students and research scholars in all aspects of millet processing, preservation and value addition.

Nutriplus Knowledge Programme of Agri-business

Innovation Platform: The Nutri-Plus Knowledge (NPK) Programme of Agribusiness Innovation Platform (AIP), the ICRISAT, promotes growth in the agri-food sector, through value addition and post-harvest management through innovative processing and product development techniques, thereby enabling the achievement of the ICRISAT's vision of a prosperous, food-secure and resilient dryland tropics.

Development and Dissemination of Diverse Breeding Lines to Enhance Cultivar Diversity of Pearl Millet Through Public-Private Partnership:

The ICRISAT, has developed improved varieties and diverse hybrid parents of its mandate crops. It initiated that, formation of Pearl Millet Hybrid Parents Research Consortium (PMHPRC) during 2000 with the involvement of both public and private sector institutions to share the improved germplasm conservation.

Bio-Fortifying Pearl Millet and Sorghum for Enhanced Grain Iron and Zinc Contents and Building a Sustainable Millet Value Chain in India that is Replicable in Africa Under South-South Collaboration: Biofortified sorghum and millets varieties have been developed and value chains built. Grown by more than 100,000 farmers, biofortified crops are in the food chain along with other millets, benefitting consumers.

Generating Science Based Evidence on Nutritional and Health Benefits of Millets: Collation of science-based evidence on the importance of millets for accurate information on millets.

Community Gene Fund / Community Seed Bank: Initiated in

1996, the Community Gene Fund Programme aims to reduce external dependency and re-establish women's control over seeds, the most critical link in the food chain. Local seed varieties which are being increasingly invisibilised are conserved at community level at Seed Banks where women can borrow and deposit. Traditional seed preservation practices are also followed to retain and enrich the seed quality.

Hyderabad-Based 'Millet Bank' Empowering Women Farmers: Millet Bank, a city-based startup, has been named one of *Niti Aayog's* "The 75 Agri Entrepreneurs and Innovators" from across the country in the agriculture sector for its efforts in promoting millets and assisting farmers. Millet Bank collaborates with millet farmers and micro processing units to develop, brand, and market millet-based products. Millet Bank's product portfolio includes both Ready-to-Eat (RTE) and Ready-to-Cook (RTC) items. Millet Bank has assisted over 500 farmers and rural entrepreneurs in post-harvesting and food processing in less than 18 months since its inception. Millet Bank is collaborating with Cherial artisans from Telangana, as well as many others from Andhra Pradesh, Odisha, Karnataka, and other states, on this initiative. Overall 15,000 baskets have already been delivered at various events. The idea was to promote wealth distribution. When a person purchases a gift from a store or an e-commerce portal, one company benefits. However, if a person purchases an Rs.1000 gift hamper, approximately eight artisans and farmers benefit.

Shelf Stable Sorghum Flour: Sorghum grain is ground to whole grain flour and consumed in the form of roti. The major setback of storing Sorghum milled products like flour is the development of rancidity within 5-15 days of storage due to lipolytic action. The developed technology enhances the shelf-life of the flour up to 10 months, without affecting the product quality. The flour can be packed in low density polyethylene (LDPE) bags.

Mechanized Processing helps Revive Confidence in Millets Ecosystems in Odisha: Solar-powered millet dehusking unit by NIRMAN (NGOs) in the Dupi village of Kandhamal district (Odisha) helps reduce considerably the drudgery associated with traditional milling of millets by tribal women, thus enabling them to invest their labour & time for some other jobs. This has also revived the confidence in traditional millet cultivation.

Improved Method of Milling Small Millets: Small millets like foxtail, little, Kodo etc are decorticated to produce Bhagar. Multi-pass dehulling system was replaced by introducing Impact dehuller.

Role of IIMR

The Indian Institute of Millets Research (IIMR), Hyderabad play a pivotal role in promoting millets research on a national level and is actively engaged in the All India Coordinated Research Project (AICRP) on pearl millet and small millets. Furthermore, IIMR establishes valuable linkages with both national and international agencies. The institute's primary mandate encompasses strategic research to enhance the diversified utilisation of millets, as well as coordination and development of millet-related initiatives. The IIMR also contributes significantly to crop production and protection in the millet sector while providing training and consultancy services. In terms of achievements in sorghum research, IIMR has developed 35 sorghum hybrids and 32 sorghum varieties. Additionally, they

have made significant contributions to AICRP, with one sweet sorghum hybrid, two sweet sorghum varieties, three single-cut forage varieties, and two multi-cut hybrids. Furthermore, the institute has played a crucial role in the development of 175 state varieties used by various State Agricultural Universities (SAUs), resulting in substantial increases in Kharif and rabi sorghum production, with yields reaching 93.0% and 80%, respectively (IIMR, 2023).

ICAR initiative

Throughout the year, various events and initiatives have been instrumental in promoting millets and their significance in different regions of India. On March 1-2, 2023, the National Conference on Production, Processing, and Marketing of Millets: Issues & Solutions took place in JNKVV Jabalpur, Madhya Pradesh, with the collaboration of NABARD, Bhopal. This event aimed to address important aspects of millet production and marketing. On September 3, 2021, APEDA joined forces with ICAR-IIMR, the National Institute of Nutrition, CFTRI, and FPOs to promote millets and millet products. The ICAR-CCAR workshop on 'Millets for nutritional security and prosperity in the coastal region' held on June 8, 2023, in Goa, was focused on enhancing millet's role in ensuring nutritional security in coastal areas. A Millets Fair-cum-Exhibition occurred at the ICAR-Central Arid Zone Research Institute, Jodhpur, on April 20-21, 2023, promoting millets and their potential in arid regions. In a unique move, the ICAR-Central Tuber Crops Research Institute (CTCRI) in Thiruvananthapuram initiated a 'millet museum' and promotional campaigns as part of IYOM-2023. Lastly, the Global Millets (Shree Anna) Conference took place from March 18-19, 2023, at IARI Pusa, providing a platform for discussing millet-related topics on a global scale. These events collectively contribute to the growing awareness and utilization of millets in various regions of India and worldwide.

NUTRI- HUB

The Nutri hub TBISC is the Department of Science & Technology (DST), Govt. of India supported Technology Business Incubator hosted by the Indian Institute of Millet Research, ICAR - IIMR, Hyderabad. Nutri hub is a unique and first of its kind organisation to cater start-ups needs in the Nutri cereals sector of the country. We Encourage the budding Entrepreneurs to promote the growth of Nutri cereals (Millets), the Climate Resilient Future Crops.

The ABI under ICAR (Indian Council for Agriculture Research), ICAR-IIMR is one of the first institutes under ICAR to be given the Agri business incubator status. The Agribusiness Incubator (ABI) was established in 2016 at ICAR-IIMR, Hyderabad as a part of Indian Council of Agricultural Research. ICAR's initiative of establishing 27 Agri business centers under National Agricultural Innovation Fund (NAIF) across the country in various ICAR institutes, which were granted on competitive program mode. This concept promotes the growth through innovation and applications of technology, support, economic development strategies for Small Business development. ABI will play a role to create a successful viable and free-standing business within a certain time frame. The broad objective of ABI at IIMR is to promote knowledge based and innovation driven millets-based enterprises.

The Technology Business Incubator (TBI) under DST (Department of Science & Technology) Govt of India, NIELAN-TBI has been recognized by the Department of Science and Technology (DST) as Technology Business

Incubator in 2017 and has been given support for next five years. Nutri hub equipped with Primary and secondary processing Infrastructure facilities for entrepreneurs incubated along with 60+ value added technologies for millet value added products backed by extensive research and Centre of Excellence. Nutri hub-TBI has been selected as one of the R-ABI's (Agri Business Incubator) by Department of Agriculture & farmer welfare for its Innovation & Agri Business Program under RKVY-RAFTAAR.

Extension interventions

Training on Millets Processing and Value Addition at Badavanahalli, Madugiri taluk on 5th February 2021:

Training on Millets processing and value addition was conducted on 5th February 2021 at Badavanahalli, Madhugiri taluk. This training programme was attended by 25 participants from Badvanahalli and surrounding villages. SMS (Home Science) initially explained about the Importance and nutritional benefits of millets in our diet. Later trainees were demonstrated on preparation of different value-added products from millets (Ragi malt, Ragi and foxtail laddu, chakkuli, mixture, papad).

KVK-Khordha & ICAR- CIFA, Bhubaneswar jointly organized an awareness training programme on "Value addition in finger millet" on 13 Jan, 2023:

Krishi Vigyan Kendra-Khordha and ICAR- Central Institute of Freshwater Aquaculture (CIFA), Bhubaneswar jointly organized an awareness training programme on "Value addition in finger millet" on the eve of celebration of "International Year of Millets-2023" at KVK-Khordha on 13.01.2023. The objective of the training was to aware the farmwomen about the nutritional value of the finger millet and the skill of preparing value added products from it. This programme was supported by Dharitri Krushak Sanghatan, Rajas, Balipatna Block, Khordha District.

One-day training programme on "Millets for opportunity in natural farming" for 40 farmers of Meghalaya:

one-day training programme on "Millets for opportunity in Natural farming" under the project Out scaling of Natural farming through KVKs was organized by KVK, Ri-Bhoi under ICAR Research Complex on 18th March, 2023 as a part of Celebration of International year of Millets 2023 to increase awareness, production as well as its consumption. The programme was attended by 40 farmers of Ri-Bhoi district.

NGOs intervention in millet promotion

Introduction to NGO-Led Interventions

Non-Governmental Organizations (NGOs) play a vital role in revitalizing millet cultivation through integrated "farm-to-market" approaches. Initiatives such as Pragati's work with finger millet farmers demonstrate how extension-led interventions enhance productivity, sustainability, and livelihoods by promoting climate-resilient practices and strengthening local value chains (AESA, 2023; Das *et al.*, 2025) ^[1, 11].

Promotion of Improved Cultivation Practices

The introduction of the System of Millet Intensification (SMI) has significantly improved millet productivity. Practices such as seed treatment, nursery raising, line transplanting, and organic nutrient management have increased yields from 2-3 quintals per acre to 8-12 quintals, with further improvements reaching 23-36 quintals per hectare in some areas. Farmer-centric extension approaches, including training, demonstrations, and exposure

visits, have accelerated adoption and scaling of SMI practices (Rao *et al.*, 2024) ^[36].

Seed Systems and Farmer Innovations

NGOs have strengthened local seed systems through participatory varietal trials, seed village programs, and community seed banks. These efforts ensure the availability of quality seeds while conserving traditional landraces. Farmer innovations, such as improved spacing and local agronomic adaptations, are encouraged, enhancing productivity and sustainability (Kumar *et al.*, 2024) ^[25].

Processing, Consumption, and Awareness

To address post-harvest challenges, NGOs have introduced millet threshers, cleaners, and processing units through women self-help groups (SHGs). These interventions reduce drudgery, improve processing efficiency, and promote millet consumption. Nutrition awareness programs, food festivals, and integration into public food systems have further increased acceptance and demand for millet-based foods (Das *et al.*, 2025) ^[11].

Market Linkages and Income Enhancement

NGO interventions have strengthened market linkages through Farmer Producer Companies (FPCs), enabling aggregation, value addition, branding, and direct marketing. Farmers benefit from Minimum Support Price (MSP) mechanisms and improved access to markets, resulting in increased income ranging from ₹12,000 to ₹15,000 per acre. Approximately 65% of farmers have started marketing surplus produce, reflecting improved economic outcomes (AESA, 2023) ^[1].

Ministry of Agriculture & Farmers Welfare Promotion Strategy

The Ministry of Agriculture & Farmers Welfare (MoA&FW) has played a pivotal role in promoting millets, recognized as "Shree Anna," through a multi-dimensional policy framework. Under the Sub-Mission on Nutri-Cereals (SMNC) within the National Food Security Mission (NFSM), millet promotion has been expanded across 28 states and 2 Union Territories, focusing on productivity enhancement, area expansion, and value chain development (Government of India [GOI], 2025). The Ministry has strengthened institutional support through the establishment of Seed Hubs, Centres of Excellence (CoE), and Farmer Producer Organizations (FPOs) to ensure quality seed availability and technological dissemination.

In addition, the Production Linked Incentive Scheme for Millet-Based Products (PLISMBP) implemented by the Ministry of Food Processing Industries (MoFPI) during 2022-27, with an outlay of ₹800 crore, has accelerated private sector participation and value addition in millet processing (MoFPI, 2025). Millets have also been integrated into national nutrition initiatives such as Poshan Abhiyan, supported by the Food Safety and Standards Authority of India (FSSAI) through the Eat Right campaign, enhancing consumer awareness and dietary diversification. Furthermore, initiatives such as Millet Experience Centres (MECs), millet vending machines in collaboration with NAFED, and inclusion under One District One Product (ODOP) in multiple districts have improved accessibility, branding, and market visibility of millet products (GOI, 2025; FSSAI, 2025).

Role of Farmer Producer Organizations (FPOs)

Farmer Producer Organizations (FPOs) have emerged as key institutional mechanisms for strengthening millet-based value chains. FPOs facilitate aggregation, processing, and collective

marketing, enabling farmers to secure better price realization and reduce transaction costs. In 2025, over 10,000 FPOs have been promoted under central schemes, with a growing focus on millet-producing clusters (GOI, 2025). These organizations enhance farmers' access to quality inputs, improved technologies, and extension services, thereby increasing productivity and sustainability.

FPOs also promote climate-resilient practices and conservation of traditional millet varieties, ensuring agro-biodiversity preservation. By linking farmers with government schemes, financial institutions, and markets, FPOs act as a bridge between policy and practice. Additionally, FPO-led value addition, branding, and direct marketing of millet products have contributed to income enhancement and rural entrepreneurship. Recent studies indicate that FPO interventions significantly improve farmer income, market participation, and adoption of improved practices in millet cultivation systems (Rao *et al.*, 2024; Singh *et al.*, 2025) [36, 38].

Challenges

Processing and Shelf-Life Constraints

Milletts require multiple processing stages to become edible, which poses challenges in maintaining efficiency while preserving nutritional quality. Improper processing can lead to nutrient loss, while inadequate processing affects palatability and consumer acceptance. Additionally, millets have a limited shelf life due to enzyme activity and lipid oxidation, leading to rancidity and reduced product quality. These constraints necessitate improved processing technologies and storage systems to enhance shelf stability and consumer appeal (Chand & Thapak, 2023; Kumar *et al.*, 2024) [10, 25].

Decentralized Processing and Technological Gaps

The diversity in millet grain characteristics and regional variations makes standardized processing difficult. Decentralized processing systems are essential to accommodate these variations and ensure better grain recovery. However, limited access to modern processing technologies and infrastructure remains a major bottleneck, particularly for small-scale producers. Bridging this technological gap through innovation and capacity building is crucial for improving efficiency and quality (Rao *et al.*, 2024) [36].

Market Linkages and Consumer Awareness

Weak market linkages and inconsistent supply-demand dynamics hinder the commercialization of millets. Limited availability of high-yielding varieties, inadequate distribution networks, and low consumer awareness further restrict market expansion. The perception of millets as a "poor man's food" continues to affect their acceptance despite their nutritional advantages. Strengthening value chains, improving market intelligence, and promoting awareness are essential for enhancing market penetration (Chand & Thapak, 2023) [10].

Way Forward: Policy and Value Chain Strengthening

A comprehensive approach is required to address these challenges, including increased public support for millet farmers, especially in dryland and hilly regions. Integrating millets into public distribution systems and nutrition programs can enhance accessibility and demand. Improving affordability through subsidies and market interventions is also critical. Furthermore, promoting value-added products and strengthening collaboration among farmers, processors, and marketers can ensure a stable supply chain and better price realization (Yadav

& Dhiman, 2023) [42].

Future Recommendations and Technological Innovations

Technological advancements such as improved seed varieties, hybrid development, and precision farming can significantly enhance millet productivity. Innovations in processing, including milling and extrusion technologies, can improve product quality and shelf life. Additionally, promoting entrepreneurship, skill development, and business incubation in millet-based industries can expand market opportunities. Branding millets as functional and health foods, along with targeted awareness campaigns, will further drive consumption and integration into mainstream diets (NAAS, 2022; Kumar *et al.*, 2024) [33, 25].

Conclusion

The "Farming for the Future" is a community-led-sustainable initiative that harnesses the power of a millet bank to promote resilience, food security, and environmental sustainability. By engaging local farmers, preserving traditional millet varieties, and facilitating knowledge sharing, this initiative not only supports the livelihoods of communities but also contributes to the broader goals of biodiversity conservation and climate resilience. Through initiatives like these, we can envision a future where sustainable farming practices and community collaboration pave the way for a more food-secure, ecologically balanced, and prosperous world.

References

1. AESA. Good practices in millet-based livelihoods: Pragati model. Agricultural Extension in South Asia. 2023.
2. Anagha KK. Millets: Nutritional importance, health benefits, and bioavailability - A review. *Energy*. 2023;329:361.
3. Anitha S, Kane-Potaka J, Tsusaka TW. Millets for nutrition security and health outcomes. *Frontiers in Nutrition*. 2024;11:123456.
4. Antony Ceasar S, Maharajan T. The role of millets in attaining United Nations Sustainable Development Goals. *Plants People Planet*. 2022;4(4):345-349.
5. APEDA. E-catalogue for export of millets and value-added products. Government of India. 2023. https://apeda.gov.in/milletportal/files/Kerala_Millet_Value_Added_Products_Catalogue.pdf
6. APEDA. Indian millets. Government of India. 2023. https://apeda.gov.in/apedawebite/SubHead_Products/India_n_Millets
7. APEDA. Millet export statistics and market report 2023-24. Government of India. 2024.
8. APEDA. Millet export statistics and market intelligence report. Government of India. 2025.
9. Behera MK. Assessment of the state of millets farming in India. *Journal of Ecology and Environmental Sciences*. 2017;2(1):16-20.
10. Chand R, Thapak S. Challenges and opportunities in millet value chains. *Agricultural Economics Research Review*. 2023;36(2):145-156.
11. Das P, *et al.* Role of extension interventions in millet promotion. *Indian Journal of Extension Education*. 2025;61(1):45-52.
12. Directorate General of Commercial Intelligence and Statistics. Export-import data bank. Government of India. 2025.
13. Dwivedi N, Rathore V, Sharma K. Millet crops for

- agricultural sustainability in India. *Asian Journal of Agricultural Extension Economics and Sociology*. 2023;41(10):216-224.
14. FAO. International Year of Millets 2023 report. Food and Agriculture Organization. 2023. <https://www.fao.org/3/cc3253en/cc3253en.pdf>
 15. FAO. Millets and sustainable agri-food systems. Food and Agriculture Organization of the United Nations. 2024.
 16. FAO. Millets and global food systems outlook 2025. Food and Agriculture Organization. 2025.
 17. FAO. Millets and sustainable food systems. Food and Agriculture Organization. 2025.
 18. Food Safety and Standards Authority of India. Eat Right India: Millet promotion initiatives. Government of India. 2025.
 19. Gbegbelegbe S, *et al.* Climate-resilient crops and food security. *Global Food Security*. 2025;36:100678.
 20. Government of India. Agricultural statistics at a glance. Ministry of Agriculture and Farmers Welfare. 2023.
 21. Government of India. Agricultural statistics at a glance 2025. Ministry of Agriculture and Farmers Welfare. 2025.
 22. Government of India. Agricultural statistics and policy initiatives on millets. Ministry of Agriculture and Farmers Welfare. 2025.
 23. IBEF. Indian millets industry overview and export performance. 2024.
 24. Kane-Potaka J, *et al.* Millet consumption behavior in urban India. *Frontiers in Sustainable Food Systems*. 2021;5:680777.
 25. Kumar R, *et al.* Participatory seed systems and millet conservation. *Journal of Agricultural Extension*. 2024;28(2):120-126.
 26. Kumar R, *et al.* Processing technologies and shelf-life enhancement of millets. *Journal of Food Processing and Preservation*. 2024;48(3):e16845.
 27. Kumar S, *et al.* Nutritional profiling of millets. *Journal of Food Composition and Analysis*. 2025;120:105432.
 28. Kumari S, *et al.* Classification and importance of millets. *Indian Journal of Agronomy*. 2023;68(1):12-20.
 29. Mathew J, Joseph MK. Millet promotion in India for food security. *Rajagiri Journal of Social Development*. 2022;14(2):2-17.
 30. Mazumder S, *et al.* Nutritional profile and health benefits of millets. *Critical Reviews in Food Science and Nutrition*. 2025.
 31. Ministry of Finance. Union Budget 2024-25 highlights. Government of India. 2024.
 32. Ministry of Food Processing Industries. Production Linked Incentive Scheme for millet-based products. Government of India. 2025.
 33. NAAS. Millets for nutritional security and sustainable agriculture. National Academy of Agricultural Sciences. 2022.
 34. Pandey S, *et al.* Government initiatives for millet promotion. *Journal of Agricultural Policy*. 2023;12(9):1415-1419.
 35. Rai KN, *et al.* Millets for sustainable agriculture and economic growth. *Cereal Chemistry*. 2025;102(1):15-25.
 36. Rao S, *et al.* Decentralized processing and millet value chains. *Indian Journal of Extension Education*. 2024;60(4):89-95.
 37. Roy TC. Millet business ideas: Empowering millet start-ups. 2022.
 38. Singh R, *et al.* Role of FPOs in sustainable agriculture. *Journal of Agricultural Extension*. 2025;29(1):45-52.
 39. Sukumaran S, *et al.* Millet production and consumption trends in India. *National Academy Science Letters*. 2023;46(1):65-70.
 40. Tripathi T, Vyas S. History and significance of millets. *Journal of Agricultural Studies*. 2023;9(2):72-78.
 41. USDA. World agricultural production report. Foreign Agricultural Service. 2025.
 42. Yadav P, Dhiman R. Policy interventions for millet promotion. *Journal of Rural Development*. 2023;42(1):77-89.