

An Overview on Value Chain Development in Millets

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ABSTRACT: Millets are known for their high nutrient content, including fiber, protein, and essential micronutrients, addressing malnutrition concerns and promoting overall health. The millets value chain encompasses various stages, including production, processing, marketing, and consumption. At every stage the value chain has diversified challenges such as climate change, market access barriers, knowledge gaps, limited infrastructure, and lack of standardized grading. To address these challenges there is need for holistic approach which can create a resilient and sustainable agricultural system that aligns with the goals of environmental conservation, economic development, and improved nutrition. At the production level, emphasis is placed on adopting climate-smart agricultural practices to enhance yield while minimizing environmental impact. This involves promoting efficient water and resource management, incorporating organic farming methods, and leveraging innovative technologies. In the processing phase, value addition plays a crucial role in increasing the marketability of millet products. The development of processing units and the promotion of traditional and modern processing techniques contribute to the diversification of millet-based products, ranging from flours and cereals to snacks and beverages. This not only caters to consumer preferences but also creates income-generating opportunities for local communities. Marketing strategies focus on creating awareness about the nutritional benefits of millets and establishing market linkages between farmers, processors, and consumers. Strengthening these linkages ensures fair pricing, reduces post-harvest losses, and promotes a more inclusive and sustainable value chain. Furthermore, the adoption of millets in mainstream diets contributes to improved food security by diversifying the sources of nutrition. This review paper advocates for a comprehensive and collaborative approach involving farmers, government agencies, non-governmental organizations, and the private sector to drive millets value chain development.

Keywords: Millets value chain, Nutri cereals, Entrepreneurship development, Value addition, Policy interventions, Millets promotion.

INTRODUCTION

A variety of small-seed nutritional grains known as millets are widely produced in the earth's natural semi-arid regions. Millets have historically been produced for their high nutritional value, low water and input requirements, and resistance to climate change. All nine of the regularly used millets are grown in India, which is also the second-largest producer and exporter of millets worldwide. In India, millets are cultivated in an area of 12.09 million hectares, producing 13.71 million tonnes with a yield of 1134 kg/ha (Dayakar Rao *et al.*, 2016). The Indian government has recognized the benefits of millets and has taken several actions, including declaring millets to be nutri-cereals, observing 2018 as the National Year of Millets, and recommending the UN General Assembly declared 2023 as the International Year of Millets. The International Year of Millets resolution was adopted by the UNGA to raise awareness of millets and promote their use as future food sources in climate change. The IYM 2023 is tasked with stepping up interventions to

expand millet production and area, diversify processing equipment and technologies, and serve a variety of domestic and international market segments. The nation's collaboration led by the ICAR-Indian Institute of Millets Research has taken on the task of revitalizing millets production and carried out several value chain interventions. The value chain in millets refers to the sequence of activities involved in the production, processing, distribution, and marketing of millet-based products. The millet value chain typically includes the following stages:

◆ Stages in Millet Value Chain:

— **Input and Raw material:** The supply of inputs to millet growers at this stage includes seeds, fertiliser, and insecticides. The quality and availability of inputs can significantly impact the yield and quality of the final product.

— **Farming:** Millets are cultivated by farmers through various agricultural practices, including land preparation, sowing, irrigation, and pest management. Good agricultural practices and sustainable farming

methods are important to ensure high-quality millet crops.

— **Harvesting:** Once the millet crops reach maturity, they are harvested by farmers. Proper timing and techniques are crucial to ensure optimal yield and minimize losses.

— **Processing:** After harvesting, the millets need to be processed to remove impurities, husks, and other unwanted materials. Processing may involve cleaning, dehusking, milling, grinding, and polishing to obtain millet grains or flour suitable for consumption or further processing.

— **Packaging:** Processed millet products are packaged in appropriate containers, which may include bags, boxes, or other packaging materials. Proper packaging ensures product safety, shelf life, and attractiveness to consumers.

— **Distribution:** This stage involves the transportation and distribution of millet products from processing units to wholesalers, retailers, and ultimately, consumers. Efficient logistics and distribution networks are essential to ensure the timely availability of millet products in the market.

— **Marketing and Sales:** Millet products need to be marketed effectively to create awareness and generate demand among consumers. This stage involves activities such as branding, promotion, pricing, and sales to reach the target market and maximize sales.

— **Consumption:** The final stage of the millet value chain involves the consumption of millet-based products by individuals or households. This can include various food products such as millet-based bread, porridge, snacks, and beverages.

Several challenges must be overcome throughout the value chain to scale up even more and enter foreign markets (Dayakar Rao *et al.*, 2021).

◆ **Challenges along the value chain:**

Production and Sourcing (Dayakar Rao *et al.*, 2021):

- Inability to consistently obtain raw materials of the preferred variety
- Lack of knowledge among producers.
- Inadequately established grading and standards to enable millets to be sold for a higher price.
- MSPs, as declared by policymakers, are influencing millet farming.
- Logistics support is poor.
- Fewer FPOs focusing on millet

Research and Development in Processing Technologies:

- The absence of standardised technologies that facilitate large-scale processing
- Consumer perceptions of millet products are not yet comparable to those of counterparts made from rice, wheat, or corn.
- A significant challenge is the shelf-life of certain millets
- Alternative popular food categories made from millet are still in the initial stages of development.

Marketing Aspects (Dayakar Rao *et al.*, 2021):

- Nutritional claims lack complete validation.
- Low repeatability

Shanmuka & Shireesha

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- Modern retail has strong entry barriers due to large profits, listing fees, and marketing expenditures.

- In Tamil Nadu, Karnataka, Odisha, AP, and Telangana, there is a reasonable level of market awareness for both the product kinds and the components. A shortage of knowledge in the remaining parts of the country.

Regulatory Challenges (Dayakar Rao *et al.*, 2021):

- Products made from millet are not covered under standard foods, thus they must go through an approval process before the FSSAI can take these unique products into account and develop standards.

- Lack of knowledge about export regulations and an awareness of international markets

- To encourage the usage of millet-based products, improve their marketing, and increase customer acceptance, there should be no taxation (no GST) on them.

- Quality standards and their certification continue to be a significant impediment to export.

- Millet-based product claims ought to be included in the FSSAI's list of authorized claims so that interested businesses can use them in PR.

Fundraising (Dayakar Rao *et al.*, 2021):

- Angel and venture capital investments have changed significantly.

- Major financing organizations continue to view millets as a tiny niche.

- A lack of robust business concepts that can bring investors exponential value

◆ **Strategies for value chain development in millets:**

Focus on policy interventions:

Millets have gained attention and importance due to their nutritional value, climate resilience, and their potential in addressing food security challenges. National Food Security Mission (NFSM): The Government of India, through the Ministry of Agriculture and Farmers Welfare, launched the NFSM to increase the production and productivity of various crops, including millets. Under this mission, specific interventions were made to enhance millet cultivation through the adoption of improved technologies, capacity building, and market linkages.

- **Rashtriya Krishi Vikas Yojana (RKVY):** RKVY is a flagship program of the Government of India aimed at incentivizing states to increase investment in agriculture and allied sectors. Some states have used RKVY funds to promote the cultivation of millets by providing subsidies for seeds, equipment, and irrigation facilities.

- **National Mission for Sustainable Agriculture (NMSA):** NMSA is another initiative by the Ministry of Agriculture and Farmers Welfare that promotes sustainable agricultural practices. It emphasizes climate-resilient crops, including millet, and supports the adoption of conservation agriculture, organic farming, and integrated farming systems.

- **Millets Development Program (MDP):** The Government of Karnataka, India, launched the MDP to promote millet production, processing, marketing, and consumption within the state. The program focuses on creating awareness among farmers, providing training,

developing market linkages, and supporting value addition and product diversification.

• **Millets in Public Distribution Systems (PDS):** Some states in India have taken steps to include millets in the public distribution systems to make them more accessible and affordable. This move aims to improve the nutritional intake of vulnerable populations and create a market.

The government of India has launched many production incentives, MSP, procurement of produce, development of FPOs, and promotion of many processing units as policy initiatives to develop awareness about millet and increase its inclusiveness in the diet of every Indian.

Research and development efforts:

Research and development efforts in millet cultivation focus on several key areas to address the challenges and promote sustainable production. Some of the key areas of focus include:

• **Variety Improvement:** Developing improved millet varieties is crucial to enhance productivity, nutritional content, and resilience to pests, diseases, and abiotic stresses. The research aims to develop high-yielding varieties with desirable agronomic traits, such as drought tolerance, disease resistance, and early maturity.

• **Agronomic Practices:** Research focuses on optimizing agronomic practices for millet cultivation. This includes identifying appropriate planting techniques, seed rates, nutrient management, water-efficient irrigation methods, weed and pest management strategies, and post-harvest management practices to maximize yields and minimize losses.

• **Climate Resilience:** With the increasing challenges posed by climate change, research aims to develop millet varieties that are more resilient to changing climatic conditions. This involves identifying traits that enable millets to withstand drought, heat stress, and other adverse environmental factors.

• **Sustainable Farming Systems:** Research emphasizes the development of sustainable farming systems that integrate millets into diverse cropping systems. This includes intercropping, agroforestry, and conservation agriculture approaches, which enhance soil health, biodiversity, and water use efficiency.

• **Post-Harvest Management and Processing:** Research focuses on improving post-harvest management practices to reduce losses and enhance the quality of harvested millets. This includes developing appropriate storage methods, processing techniques, and value-added product development to increase the marketability of millets.

• **Nutritional Enhancement:** Research aims to enhance the nutritional quality of millets by addressing factors such as the bioavailability of micronutrients, improving protein quality, reducing antinutritional factors, and promoting biofortification strategies to address micronutrient deficiencies.

• **Market Development and Value Chain Improvement:** Research focuses on understanding market dynamics, and consumer preferences, and developing effective value chains for millet-based

products. This involves identifying market opportunities, promoting millet-based products, and improving market linkages for farmers and processors.

• **Capacity Building and Knowledge Sharing:** Research efforts include training programs, workshops, and knowledge-sharing platforms to disseminate research findings, best practices, and innovations to farmers, extension workers, and other stakeholders involved in millet cultivation.

Training and entrepreneurship development:

The entrepreneurial status of millets in India has been evolving in recent years, with increasing interest and opportunities in the millet sector. Here are some key aspects of the entrepreneurial status of millets in India:

• **Startups and Enterprises:** There has been a rise in the number of startups and enterprises focusing on millets in India. These entities are engaged in various activities such as millet processing, value-added product development, marketing, and distribution. They often emphasize the health benefits, sustainability, and cultural significance of millet to attract consumers.

• **Value Addition and Product Diversification:** Millets are being used as ingredients in a wide range of products, including bakery items, snacks, breakfast cereals, beverages, and ready-to-cook meals. Entrepreneurs are exploring innovative ways to incorporate millets into diverse food products to cater to changing consumer preferences and promote their consumption.

• **Market Linkages:** Entrepreneurial efforts are helping to establish strong market linkages for millet farmers. Startups and enterprises collaborate directly with farmers, providing them with a market for their produce. This creates a demand-driven approach and ensures farmers receive fair prices for their millet crops.

• **Consumer Awareness and Promotion:** Entrepreneurs play a vital role in raising consumer awareness about millets. They conduct awareness campaigns, participate in food exhibitions and events, and utilize digital marketing platforms to educate consumers about the nutritional benefits and versatility of millet. This has contributed to an increased demand for millet-based products.

• **Policy Support:** The Indian government has recognized the potential of millet and has taken policy initiatives to support millet-based entrepreneurship. This includes promoting millets in government schemes, providing financial assistance and subsidies to entrepreneurs, and creating an enabling environment for millet-based businesses to thrive.

• **Research and Development Collaborations:** Entrepreneurs often collaborate with research institutions and agricultural organizations to develop innovative millet-based products and technologies. Such collaborations help in improving processing techniques, developing value-added products, and enhancing the overall quality and marketability of millet-based offerings.

• **Export Opportunities:** Entrepreneurs are exploring export opportunities for millet-based products. Millets have gained international recognition due to their

nutritional value and climate resilience, opening up avenues for entrepreneurs to tap into global markets.

The Government of India has taken several initiatives to promote entrepreneurship in the millet sector. These initiatives aim to support and encourage startups, enterprises, and individuals interested in venturing into millet-based entrepreneurship. Some of the key government initiatives include:

• **Millets Processing and Value Addition Scheme:** The Ministry of Agriculture and Farmers Welfare has launched the Millets Processing and Value Addition Scheme. It provides financial assistance to establish millet processing units, infrastructure for value addition, and equipment procurement. The scheme aims to enhance value addition, promote millet-based products, and create market linkages for millet farmers.

• **National Mission on Food Processing (NMFP):** The NMFP, implemented by the Ministry of Food Processing Industries, supports the establishment of food processing units, including those focused on millet processing. The mission provides financial assistance, infrastructure support, and skill development training to entrepreneurs engaged in food processing, including millet-based products.

• **Pradhan Mantri Kisan Sampada Yojana (PMKSY):** The PMKSY is a comprehensive scheme for the development of the food processing sector in India. It includes provisions for promoting millet processing and value addition. The scheme provides financial assistance, infrastructure development, and capacity-building support to entrepreneurs engaged in food processing, including millet-based ventures.

• **Startup India Initiative:** The Startup India initiative aims to promote entrepreneurship and innovation across various sectors, including agriculture and food processing. Under this initiative, entrepreneurs in the millet sector can avail benefits such as access to funding, tax exemptions, incubation support, and intellectual property rights facilitation.

• **National Institute of Food Technology Entrepreneurship and Management (NIFTEM):** NIFTEM, an autonomous institution under the Ministry of Food Processing Industries, focuses on capacity building, research, and entrepreneurial support in the food processing sector. It provides training, technical support, and entrepreneurship development programs to individuals interested in setting up millet-based enterprises.

• **Market Access Initiatives:** The government facilitates market access for millet-based entrepreneurs through initiatives such as the National Agricultural Market (e-NAM) and e-commerce platforms. These initiatives promote transparent and efficient marketing and distribution of agricultural produce, including millet.

• **Research and Development Support:** The government supports research and development efforts in the millet sector, which indirectly benefits millet-based entrepreneurs. Financial assistance, infrastructure development, and collaborations with research institutions are provided to promote innovation, value

addition, and product development in the millet industry.

Regulatory measures and export strategies:

Regulatory Measures:

• **Agricultural and Processed Food Products Export Development Authority (APEDA):** APEDA, under the Ministry of Commerce and Industry, is responsible for regulating and promoting the export of agricultural products from India, including millets. It sets quality standards, provides certification, and facilitates market access for millet exporters.

• **Quality Standards and Certification:** Millet exports from India need to comply with quality standards set by APEDA. These standards cover various parameters such as moisture content, purity, foreign matter, and pesticide residues. Exporters may need to obtain certifications, such as the Phyto-Sanitary Certificate, to ensure compliance with the sanitary and phytosanitary requirements of the importing countries.

• **Packaging and Labeling Requirements:** Millet exporters must adhere to the packaging and labeling regulations of the importing countries. Proper labeling of the millet products, including information on ingredients, nutritional values, allergens, and country of origin, is typically required.

• **Export Documentation:** Exporters need to prepare and submit relevant documentation, including commercial invoices, packing lists, bills of lading, export declaration forms, and certificates of origin, as required by the importing countries. These documents facilitate customs clearance and provide necessary information for the destination market.

Export Strategies:

• **Market Identification and Research:** Identifying potential export markets for millets and conducting market research is essential. Exporters should analyze demand, consumer preferences, competition, and market entry requirements in different target countries to devise effective export strategies.

• **Market Development and Promotion:** Participating in international trade fairs, exhibitions, and buyer-seller meets can help showcase millet products, build networks, and establish business contacts. Digital marketing, online platforms, and leveraging social media can also be effective tools for promoting millet exports.

• **Government Support and Incentives:** The Indian government provides various export incentives and support programs to encourage millet exports. These include financial assistance, export subsidies, access to export credit, and trade promotion initiatives. Exporters can explore and utilize these schemes to enhance competitiveness and expand their export markets.

• **Product Diversification and Value Addition:** Developing value-added millet products and diversifying the product range can help cater to specific market demands. Investing in processing technologies and product innovation can create a competitive edge and capture higher-value export opportunities.

• **Collaborations and Partnerships:** Collaboration with industry associations, export promotion councils,

and research institutions can provide valuable support for millet exporters. Partnerships with other stakeholders in the value chain, such as farmers, processors, and logistics providers, can enhance the efficiency and competitiveness of export operations.

Awareness creation and promotion:

The Government of India has undertaken various initiatives for awareness creation and promotion of millet to highlight their nutritional value, promote consumption, and support the millet sector. Some of these initiatives include:

- **National Year of Millets:** The Government of India declared 2018 as the National Year of Millets to create awareness about millets and their significance in promoting food and nutritional security. The year was marked by various events, campaigns, seminars, and workshops across the country to educate consumers, farmers, and other stakeholders about millet.

- **International Millets Year:** India, along with other countries, advocated for the United Nations to declare 2023 as the International Year of Millets. The proposed initiative aims to raise global awareness about millets' benefits, foster policy support, and promote sustainable production and consumption of millets.

- **National Nutrition Mission (Poshan Abhiyan):** The National Nutrition Mission focuses on addressing malnutrition and promoting healthy eating habits. Millets are being promoted as a nutritious food choice through various communication campaigns, educational programs, and behavior change interventions targeting women, children, and vulnerable populations.

- **Food and Nutrition Security Awareness Campaigns:** The government, in collaboration with various agencies and organizations, conducts awareness campaigns to promote the consumption of millet. These campaigns highlight the nutritional benefits of millet and educate consumers about their role in addressing malnutrition and promoting food security.

- **Millet Festivals and Exhibitions:** The government organizes millet festivals and exhibitions at regional, state, and national levels to showcase millet-based products, culinary diversity, and their health benefits. These events provide a platform for farmers, entrepreneurs, and consumers to interact, exchange knowledge, and explore business opportunities.

- **Millet Promotion Programs:** The government supports millet promotion programs through the Ministry of Agriculture and Farmers Welfare, Ministry of Food Processing Industries, and other relevant departments. These programs focus on capacity building, training, and providing technical assistance to farmers, entrepreneurs, and other stakeholders involved in millet cultivation, processing, and marketing.

- **Collaboration with States and NGOs:** The government collaborates with state governments, non-governmental organizations (NGOs), and self-help groups (SHGs) to implement awareness and promotion programs. These collaborations involve training programs, demonstrations, workshops, and field-level interventions to create awareness about millets and their benefits.

- **School Meal Programs:** Millets have been incorporated into the Mid-Day Meal Scheme, a government program providing nutritious meals to school children. This inclusion helps promote millet consumption among children, encouraging healthy eating habits from an early age.

Some of the research studies have exclusively focused on developing the value chain of millets in India. Adekunle, *et al.* (2018) conducted a study named Helping agribusinesses—small millets value chain—to grow in India in which a cluster map and condition assessment of the Indian small millets value chain was developed. The study also formulated a business model development canvas for the small millets value chain and ecosystem for a proposed open innovation concept for the Indian small millets' agribusiness chain. Reddy *et al.* (2018) analyzed the pearl millet market structure and value chain in India. To analyse the possibilities for improvements in marketing channels and value chains, the study gathered primary data from farmers, traders, commission agents, exporters, and importers with innovative marketing channels with aggregators (Self-Help Groups) and without aggregators. According to the study, there is a lot of room for market aggregators to develop scale economies to lower market costs in order to serve bulk food and industrial uses, since pearl millet production is thin and dispersed. While there was a market for high-quality grain for human consumption, but the starch, brewing, and cattle and poultry feed industries will account for the majority of future demand. Farmers must combine their produce and guarantee a consistent supply in large quantities in order to take advantage of these greater potentials, or at the very least to match the price of alternative grains like maize and broken rice.

CONCLUSIONS

Hence the value chain in millets can be developed through a good balance among supply and demand factors of millets. The production and consumption of millets must be augmented with appropriate policy initiatives as a continuation of their efforts under INSIMP and NFSM. Consortium-mode research may be pursued for validation of highly productive technology under real farming situations. Effective deployment of trait-specific germplasm available in gene banks for genetic enhancement and evolving strategies for better seed production with public, private, and NGO partnerships and establishment of seed villages may be encouraged. Strengthening backward integration and linking farmers with markets through PPP initiatives contributes to the value chain development in millets.

FUTURE SCOPE

The study highlights the existing issues in millet value chain and research evidence of the possible strategies and solutions for the same. The study will help to develop future understanding and usage of different millet technologies to streamline the issues in value chain for an enhanced knowledge spread and technology adoption by all the stakeholders in millet

value chain. The analysis helps in acting as a holistic guide for millet value chain issues and strategies for its development for researchers, policy makers and students.

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