

International Journal of Agriculture Extension and Social Development

Volume 9; Issue 6; June 2026; Page No. 444-452

Received: 03-04-2026
Accepted: 10-05-2026

Indexed Journal
Peer Reviewed Journal

Assessment of business management and product diversification in millet enterprises

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DOI: <https://www.doi.org/10.33545/26180723.2026.v9.i6f.3723>

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Abstract

Millet is an important coarse cereal crop for resource-poor farmers for their nutritional and livelihood security. Utilization of millets through value addition and commercialization of products helps to improve the health of consumers, thus driving the demand for millets. However, growing health awareness and increasing demand for value-added products have revived interest in millet-based enterprises. This study assesses the management practices, production systems, marketing strategies, and constraints of millet-based micro-enterprises across five Indian states Tamil Nadu, Karnataka, Telangana, Andhra Pradesh, and Maharashtra. A purposive random sampling method was employed to select 50 millet-processing units, including micro-enterprises and self-help groups. Primary data were collected on investment patterns, raw material sourcing, processing technologies, product diversification, marketing channels, and export performance. Descriptive statistical tools were used for analysis. The findings reveal that millet micro units are managed by well-educated, middle-aged entrepreneurs, with 56% possess postgraduate degrees. Most of the micro units depend on family for capital (82%), which indicates limited access to institutional finance. The source of Raw material is mainly farmers (66%), but the linkages with Farmer-Producer Organizations remain weak. The millet product portfolios are majorly low-risk, long shelf-life items such as flours and millet rice, ragi, while high-value ready-to-eat and ready-to-cook products remain limited due to lack of processing facilities and financial limitations. Raw materials constitute the biggest share of production costs, and higher profit margins are linked with value-added products like cookies, health mixes, and bakery items. The 42% of enterprises report annual turnovers exceeding ₹100 lakhs, while the export participation remains limited (24%). The major constraints were short shelf life, inadequate processing machinery, weak market linkages, and lack of government support. The study emphasizes the need for improved access to credit/financial Institutions, advanced processing technologies, skill development and capacity building, and strong market integration. Strengthening farmer-enterprise linkages and promoting value addition can significantly enhance the competitiveness and sustainability of millet-based enterprises in India.

Keywords: Millets, management, value addition, processing, shelf life, marketing and export

Introduction

Millets are important coarse cereal crops for resource-poor farmers for their nutritional and livelihood security. Millets crops comprising of sorghum, pearl millet, finger millet; comprising kodo, foxtail, banyard, proso and little millets. They are well adapted to arid and semi-arid tracts of Asia, Africa and America. Millets area cultivation in India covers an area of 16 million Ha. Several reviews (e.g., Muthamilarasan & Prasad, 2021; Anitha *et al.*, 2020) ^[2, 15] highlight that millets are climate-resilient crops with a high capacity to thrive under arid and semi-arid conditions of Asia, Africa and parts of the Americas. In India, millets occupy nearly 16 million hectares and produce about 18.66 million tonnes annually. Given their rich nutrient profile especially micronutrients such as calcium, iron and zinc they have been reclassified as nutri-cereals (Devi *et al.*, 2014; Saleh *et al.*, 2013). Major millet-growing states include Maharashtra, Karnataka, Tamil Nadu, Rajasthan, Madhya Pradesh, Uttarakhand, Haryana, Chhattisgarh, Telangana and Andhra Pradesh, where they are predominantly cultivated by small and marginal farmers under low-input systems. Despite of several positive

attributes, millets have lost their importance in terms of both production and consumption in India. The reasons include easy availability of fine cereals like rice and wheat at a affordable price, the challenges in millets processing, and a lack of government support for the promotion of millets. These constraints have restricted the mainstreaming of millets in India's food systems.

Recently, growing interest in value addition, diversification of processing technologies, and the commercialisation of millet-based products has renewed consumer and market attention, given the early onset of lifestyle diseases such as obesity, diabetes, and cardiovascular diseases. Enterprises engaged in millet processing and value addition will play a major role in market reach, enhancing product diversity, and improving processing efficiency (Gowda *et al.*, 2023; Seetharam *et al.*, 2021) ^[9]. Strengthening these enterprises can greatly aid in developing innovative products, improving shelf-life, standardising machinery and promoting region-specific value-added millet foods. Against this backdrop, a comprehensive assessment of millet-based entrepreneurs becomes essential. Such an assessment would

provide insights into raw material procurement and storage, processing technologies, machinery utilisation, branding, marketing, export readiness and business sustainability. Previous studies (Meena *et al.*, 2019; Singh & Raghuvanshi, 2012) indicate that micro-enterprises often face constraints related to technological access, quality standards, market linkages and financial stability. Understanding these issues will help design strategies to enhance efficiency, competitiveness, and entrepreneurial success within the rapidly emerging millet sector.

Methodology

Study area and sample

The present study was undertaken to assess the management practices, administrative processes and product profiles of millet-based entrepreneurs.

A total of 50 millet-based micro-units were selected by using purposive random sampling technique. The selected units represents different business models, product types, and operational scales. Millet-based micro-units were selected across five states Tamil Nadu, Karnataka, Telangana, Andhra Pradesh and Maharashtra covering selected market centres namely Chennai, Madurai, Dindigul, Coimbatore, Tiruchirappalli, Bengaluru, Mysuru, Dharwad, Vijayapura, Bidar, Raichur, Vijayawada, Guntur, Visakhapatnam, Kurnool, Nandyal, Anantapur, Sri Sathya Sai district, East Godavari, Hyderabad and Pune were purposively selected. Based on millet markets and processing activities the locations were selected. The study selected regions includes tier-I and tier-II cities.

Table 1: State-wise Distribution of Entrepreneurs (n = 50)

S.No	Name of the state	City	Entrepreneurs
1	Tamil Nadu	Coimbatore	5
		Dindigul	1
		Madurai	1
		Palakkad(Kerala)*	1
		Trichi	1
		Chennai	4
2	Karnataka	Bengalore	8
		Mysore	1
		Bidar	1
		Vijayapur	2
		Dharwad	2
		Raichur	1
		Hubli	1
3	Andhra Pradesh	Vijayawada	1
		Guntur	2
		East Godavari	1
		Kurnool & Nandyala	2
		Anantapur & Satyasai	4
		Vishakapatnam	2
10	Telangana	Hyderabad	8
11	Maharashtra	Pune, Mumbai	1
	Total		50

The data was collected on the social profile of the micro unit owners and aspects like initial investment, source of raw material & storage methods, production processing

machinery, technology, new product development, shelf-life, marketing, exports, revenue sustainability, and constraints faced in millet processing and marketing. The statistical tools mean Standard Deviation, were used in analysis of data.

Results and discussion

Profile of Micro Unit (MU) Owners

Age

Table 2: Age of millet entrepreneurs (n = 50)

S.No	Category	Frequency	Percentage
1	Young (below 35 years)	7	14%
2	Middle (36-50)	34	68%
3	Old (above 50)	9	18%

The study reveals that the majority of Micro Unit (MU) Owners (68%) belong to the middle-aged group (36-50 years), followed by old (18%) and young (14%). This indicates the middle-aged group has strong potential for fast learning, rapid expansion, and consistency. These are the key factors required for competing in the emerging millet processing sector.

Education profile of Micro Unit (MU) owners

Table 3: Educational qualification of Micro Unit (MU) owners

S.No.	Category	F	P
1.	Illiterate	0	0%
2.	Primary school (Up to 5 th Class)	0	0%
3.	Upper primary school (6 th to 7 th Class)	0	0%
4.	High school (8, 9 and 10 th Class)	2	4%
5.	Intermediate	1	2%
6.	Under Graduation	19	38%
7.	Post-Graduation and above	28	56%

More than half of the entrepreneurs (56%) possessed postgraduate qualifications, and 38% held undergraduate degrees. Only a small percentage were educated up to high school or intermediate level. This indicates that the millet enterprise sector is primarily driven by well-educated individuals who bring managerial and technical skills to the business.

Gender profile of Micro Unit (MU) Owners

Table 4: Gender profile of Micro Unit (MU) owners

S.No	Gender	Frequency
1	Male	33
2	Female	17

Men constituted the majority (66%) of millet entrepreneurs, whereas women accounted for 34%. Despite being fewer in number, women entrepreneurs showed strong participation, especially in SHG-led and micro food-processing units. This finding underscores the existing role of women in the industry and highlights the potential to encourage greater female participation through dedicated policies and initiatives

Initial investment, source of capital, raw material and Type of Storage**Table 5:** Initial Investment, Source of Capital, Raw Material and Type of Storage

Particulars	Categories	No. of MUs	%age out of 50 MUs
Initial Investment	Up to 10 lakhs	13	26%
	10-25	10	20%
	25-50	7	14%
	50-100	8	16%
	>1 Crore	12	24%
Source of Capital	Family	41	82%
	Friends	11	22%
	Money lenders	3	6%
	Private banks	3	6%
	Nationalised Banks	11	22%
Source of Raw Material	Govt Agencies	9	18%
	Directly from Farmers	33	66%
	Farmer Producer Organisations (FPO's)	15	30%
	Self Help Groups (SHG's)	2	4%
	Millers	6	12%
Type of Storage	Traders & Wholesalers	26	52%
	Bag storage	49	98%
	Mud bins	1	2%

Initial investment & Source of capital data

It is observed that only 24% of MUs have invested above Rs. 1 Cr. and 60% of MUs have invested only Rs. 50 lakh or below. In addition, the data is showing that only 18% of MUs availed capital from Govt. agencies, 22% have availed from Nationalized banks and mere 6% have availed from Private banks, while 82% MUs have availed capital from family and 22% MUs have availed from friends. This is suggesting that initiatives to link the MUs with better funding alternatives for raising their capital required for establishing/upgrading processing facilities, and improve branding and marketing efforts.

Source of raw material

It is showing that only 34% of MUs are sourcing grains from FPOs and SHGs together, while a dominant portion of

MUs (66%) are sourcing from farmers, followed by traders and wholesalers (52%) and millers (12%).

It suggests that a very few FPOs and SHGs have facilities for grain preprocessing and indicates one of the gaps in increasing farmers' income linked to farm-level value addition.

Type of storage

It is clear that 98% of MUs are still using the Bags as their means of storage which are vulnerable to moisture, temperature and other risks related to rats, insects, etc.

It is suggesting the need for advancing the development and study of alternative affordable storage facilities for MUs.

Products range of enterprises and shelf life**Table 6:** Product Range and Shelf Life

S.No	Product category	Frequency	Percentage	Shelf life (Months)
1	Millet rice	13	26	6
2	Flours	11	22	6
3	Multi Millet Flour	5	10	6
4	Ravvas	5	10	9
5	Instant mixes	11	22	9
6	Noodles	8	16	9
7	Pasta	4	8	9
8	Flakes	2	4	5
10	Biscuits	4	8	5
11	Cookies	6	12	12
12	Batter	3	6	7 Days
13	Bread/Cakes	3	6	3 Days
14	Composite	4	8	9

- A limited number of MUs engage in producing ready-to-cook (RTC) products such as noodles (16%), ravva (10%), multi-millet flours (10%), pasta (8%), batter (6%), and flakes (4%).
- Similarly, the ready-to-eat (RTE) segment includes cookies (12%), biscuits (8%), and bread/cakes (6%).
- A significant portion of MUs focus on millet rice (26%), instant mixes (22%), and flours (22%), while a

very few focus on composite foods (8%).

- This lack of diversification in product portfolios suggests barriers in accessing capital and value-addition technologies.
- Encouraging the development of new RTC, RTE, and composite products could improve marketability and profitability.

The prices and cost of production of millets products

Table 7: Prices and cost of production of millets products.

S No	Millet products	SKU	Price (MRP)	Total Raw Material cost	Processing cost including Labour	Packaging Material and labelling	Marginal Profit	Total
1.	Finger millet	500g	60	39	12	3	6	60
2.	Kodo Millet	500g	90	59	18	5	9	90
3.	Little millet	500g	90	59	18	5	9	90
4.	foxtail millet	500g	90	59	18	5	9	90
5.	Barnyard Millet	500g	90	59	18	5	9	90
6.	Ragi flour	500g	65	33	16	5	11.7	65
7.	All flours	1kg	100	60	10	5	25	100
8.	Instant Mixes	500g	60	36	15	3	6	60
9.	Health Mix	1kg	350	203	63	10.5	73.5	350
10.	Instant Millet Noodles	180gm	120	38.4	6	15.6	60	120
11.	Millet Pasta	180gm	65	39	10	7	10	65
12.	All Vermicelli	150g	45	24.75	9	4.5	6.75	45
13.	Instant millet pasta	180g	95	57	19	7.6	11.4	95
14.	Ragi, jowar idly dosa batter	1kg	200	64	10	26	100	200
15.	Millet Instant Dosa	250g	70	38	15	7	11	70
16.	All millet cookies	1kg	400	260	70	20	50	400
17.	Pearl, finger, foxtail laddu	1kg	600	300	108	12	180	600
18.	Multi millet digestive biscuits	150gm	60	33	15	3	9	60
19.	All millet biscuits	150gm	60	35	15	5	5	60
20.	Millet Bread	1kg	140	76	17	7	40	140
21.	All Millet Idli & Upma Rawa	500g	60	35	10	5	10	60
22.	All Millet Flakes	500g	120	74.5	24	7	14.5	120

- From the above results, it can be concluded that, the raw material cost accounted for the largest share of total production cost, ranging from 33% in ragi flour to nearly 60% in premium products such as health mix, laddu, and cookies.
- Processing costs, including labour wages, contributed between 10% and 25% of the total cost, depending on product complexity. Packaging and labelling expenses varied from 3–26%, with high costs observed in cookies and bakery products.
- The marginal profit incorporated by entrepreneurs ranged between 5 and 50%, with higher margins recorded for products requiring greater value addition, such as cookies (₹50/kg), laddu (₹180/kg), health mix (₹73.5/kg), and millet bread (₹40/kg).
- The primary processing products such as flours, rava, and instant idli, upma, kichidi mixes and dehulled minor millets, showed lesser margins of ₹6–₹25 per unit. The price is competitive for millet products such as finger millet, kodo millet, little millet, foxtail millet, and barnyard millet priced at ₹60–90 per 500 g. The price is high for value-added products like health mix (₹350/kg), cookies (₹400/kg), millet laddu (₹600/kg), and millet bread (₹140/kg) due to increased processing and ingredient costs.
- The entrepreneurs gain greater economic benefits when diversifying into products such as cookies, instant mixes, pasta, noodles, health mixes, and baked items rather than focusing only on raw grain sales.
- The price study in combination with product portfolio study reveals that MUs predominantly focus on low-margin products such as millet rice (10%), instant mixes (10%), and flours (18%-25%), while not fully leveraging high-margin products like instant noodles (50%), batter (50%), millet laddu (30%), and bread (~29%).
- This preference towards low-margin products indicates constraints in accessing efficient processing machineries.
- These findings reveal the importance of value addition, improved processing technologies, for sustainability of millet enterprises.

Annual total Production, Turnover & Exports

Table 8: Annual total production, turnover & exports

Particulars	Categories	N=50	
		Frequency	Percentage
Yearly Production tons	Upto 10	13	26
	10-25	9	18
	25-50	9	18
	50-100	6	12
	>100	13	26
Yearly Exports tons	No exports	38	76
	Up to 10	9	18
	>10	3	6
Yearly Turnover (Rs. In lakhs)	Upto 10	7	14
	10-25	10	20
	25-50	9	18
	50-100	3	6
	>100	21	42

A major proportion of Micro units owners (42%) reported that, an annual turnover more than Rs. 100 lakhs which indicates the strong commercial potential and market demand for millet-based products among micro units.

About 20% of the units reported the annual turnover between Rs. 10–25 lakhs, and 18% earned between Rs. 25–50 lakhs annually. While 14% earned less than Rs. 10 lakhs, indicating micro-enterprises are with low production capacity. Only 6% achieved turnovers in the Rs. 50–100 lakh range.

The results suggest that a majority of enterprises were small to medium-scale. The higher annual turnover category (>Rs. 100 lakhs) highlights the scalability and market viability of millet processing enterprises when supported with effective labelling, branding, marketing.

Processing Machinery

Primary Processing Machinery

Table 9: Primary Machinery Used

S.No.	Machine	F	P
1	Grader cum Aspirator cum Destoner	19	38
2	Dehuller	17	34
3	Polisher	9	18
4	Gravity separator	10	20
5	Colour sorter	8	16
6	Millers	2	4

Majority of the Micro Units (68% and 76%, respectively) utilize grader cum aspirator cum destones and Dehuller. only 4% of MUs use millers and 16% use color sorters followed by 18% use polishers and 20% use gravity separators.

This data indicates that very few MUs have a complete set of primary processing machinery which affecting their ability in cleaning, dehulling and optimal processing of grains.

Secondary Processing Machinery

Table 10: Secondary processing equipment

S.No.	Secondary processing	F	P
1	Baking line	2	4
2	Chikki line	4	8
3	Extruder line	2	4
4	Mixers	5	10
5	Hammer miller	4	8
6	Oven	4	8
7	Tray dryer	4	8
8	Pulvarisers	2	4
9	Grinders	4	8
10	Blenders	6	12
11	Roasters	6	12
12	Dehydrators	2	4
13	Dryer	2	4
14	Shifter	2	4

From the Table 12 it can be concluded that, the most commonly used secondary processing machines were

blenders (12%) and roasters (12%). This indicates the both machines role in product formulation, mixing, roasting, and flavour development of millet products. Mixers (10%) were also widely used which are essential for homogenizing ingredients in instant mixes, health mixes, and composite flours.

Grinders, ovens, tray dryers, chikki lines, and hammer mills were used by 8% of the enterprises each. The extruder line (4%) and baking line (4%) were used by relatively few enterprises, indicting the limited adoption of advanced technologies required for producing noodles, pasta, extruded snacks, and baked products. The category “others” (4–8%) includes less commonly used machinery such as pulverizers, dehydrators, dryers, and shifters, further.

The findings suggest that while most entrepreneurs possess basic and moderately advanced secondary processing machinery, the adoption of high-end technologies remains limited. This may be attributed to financial constraints, the high cost of extruders and baking lines, or limited technical knowledge. Expanding access to modern machinery could significantly improve product quality, production efficiency, and market competitiveness for millet enterprises.

Marketing

Table 11: Marketing channels utilized by millet-based enterprises. please indicate the following marketing facilities that you have

S.No.	Market to which product is supplied	Frequency	Percentage
1	Traders	8	16
2	Whole sale market	20	40
3	Retail market (small shops, super markets & hyper markets)	31	62
4	Both whole sale and retail	5	10
5	Consumers	23	46
6	Exporters	15	30
7	B2B (distributors)	15	30
8	E-Commerce (Online)	25	50
9	Own outlet	12	24
10	White labelling.	11	22
11	Franchise Sales	2	4

- From the market channels data, it is visible that a very insignificant number of MUs are able to expand through franchise sales (4%) and almost 50% of the MUs are still not adopting e-commerce platforms, indicating the need for awareness creation, training and handholding for technology adoption and business expansion.
- The very limited B2B supply (30%) is also indicating the need for handholding MUs for building market linkages with bulk requirements from giant e-commerce, IT companies, etc.
- Furthermore, participation in B2G is completely absent among the MUs, and it's highlighting the need for proactive initiatives by government departments for sourcing and introducing millets into public-funded schemes.

Export Profile of Millet-Based Enterprises**Table 12:** Export of millet products

Sl No	Name of Millet Enterprise	Product Name	Export Country name	Quantity (Tons)	Building of Linkages
1	Some more foods	Noodles	US	7	Own
2	Uttara Enterprises	Noodles	US	0.1	Own
3	Sri Velavan Agro	All Products	US	-	Middle(LuLu)
4	AA Enterprise & Foods	Health Mix Rice Mix Noodles	Singapore Malaysia Australia Indonesia UAE Abu Dhabi	12	FXI Logistics
5	Triguni Foods	Kodo millet lentil pulav, tomato jowar with lentil.	Singapore U.S. Europe	1	Own
6	PVR foods	Millet atta flour Millet Ada dosa Millet Instant Dosa Millet Sweet mix Millet Kangi	USA UK	17.5	Own
7	Urban Monk Pvt. Ltd (Millet Amma)	All Products	US	5.4	-
8	Quessentials Pvt. Ltd	All Millets	Lebanon	10	-
9	Frescogreens Pvt. Ltd (merged with Nourish you)	Millet Grains	Japan	10	Exhibition
10	Sri Sai Raghavendra Consortiur	Milllet Grains	US	1	Friends
11	Millet Mantra Pvt. Ltd	All Products	US	Sample or der	Friends
12	Aditi Millets & Organics	Millet Rice	Malaysia	-	3 rd Party
13	Sattva Millets & Food Products	Whole Grain Rawa Flour	Netherlands	1100*	-
14	Smart Foods	Noodles	Norway Nepal Netherlands	6	LinkedIn Comsultant

A notable proportion of enterprises export to the United States, which emerged as the leading destination for millet-based products. Units such as *Some More Foods*, *Uttara Enterprises*, *Sri Velavan Agro*, *PVR Foods*, *Urban Monk Pvt. Ltd.*, and *Sri Sai Raghavendra Consortium* exported noodles, flour, rice mixes, instant mixes, and whole grains to the US market, with quantities ranging from 0.1 to 17.5 tons. Others, such as *Millet Mantra Pvt. Ltd.*, have sent product samples to buyers in the US, indicating early-stage export engagement. Several enterprises also export to multiple Asian and Middle Eastern countries, including Singapore, Malaysia, Indonesia, UAE, Abu Dhabi, and Lebanon. *AA Enterprise & Foods* exported a diverse range of products (health mixes, rice mixes, noodles) totaling 12 tons, supported by linkage partnerships with FXI Logistics. *Quessentials Pvt. Ltd.* exported millet-based products to Lebanon (10 tons), while *Aditi Millets & Organics* supplied millet rice to Malaysia through third-party arrangements.

Exports to Europe and other developed markets were also observed. *Triguni Foods* exported ready-to-eat millet products to Singapore, the US, and Europe, while *Smart Foods* supplied millet noodles to Norway, Nepal, and the Netherlands. *Sattva Millets & Food Products* exported whole grain, rava, and flour to the Netherlands, with the highest export volume of 1100 tons, indicating strong international demand and market penetration.

Some micro units established their own export networks, while others utilized intermediaries such as friends, online consultants, exhibitions, or retail chains (e.g., LuLu Group for Sri Velavan Agro). This suggests that entrepreneurs used various strategies to export, ranging from personal networks to corporate partnerships. Strengthening export facilitation by agencies like APEDA, certification support, and international marketing could further enhance the exports of Indian millet products.

Constraints**Table 13:** Production related

S.No	Problem	Frequency	Percentage	Rank
1.	Low shelf life of Millet products	18	36	1
2.	Low production capacity but high demand	3	6	8
3.	Require fully automatic machinery	3	6	9
4.	Poor knowledge on primary processing machines	3	6	10
5.	Availability and procurement Problems of raw materials from farmers, and in bulk quantity	16	32	2
6.	Non-availability of labour	5	10	5
7.	Non-availability of Effective machinery for millet processing	14	28	3
8.	End product specific cultivar not available.	11	22	4
9.	Non-availability of bulk Sprouting process machines	4	8	6
10.	Lack of knowledge on preparation of RTE products.	3	6	7

- The most commonly reported challenge is the short shelf life of millet-based products (36%, ranked #1), which affects storage, distribution, and market expansion. As observed from previous data, the lack of effective packaging solutions and preservation techniques may also limit the product longevity, affecting sales and export potential.
- Majority MUs struggle with sourcing raw materials (32%, ranked #2), especially in bulk quantities, due to fragmented supply chain, indicating the need for farmer-MU linkages and strengthening the role of FPOs.
- Non-availability of effective machinery for millet processing (28%, ranked #3) is also a major constraint, as we also witnessed the lack of end-end processing Machinery in previous data.
- The lack of end product-specific cultivars (22%, ranked #4) is also a most limiting constraint for attaining the more quality RTE and RTC products, as the product composition data also suggesting the same.
- Finally, non-availability of labor (10%, ranked #5) is also a critical challenge in the emerging segments like millets, indicating a strong need for capacity building on millet processing under various schemes like PMFME.
- The other constraints such as lack of bulk sprouting machines, knowledge on RTE products, demand-supply match, automation in technology and knowledge on primary processing were reported by 6%- 8% of MUs out of 50 MUs.

Table 14: Marketing related

S.No	Problem	Frequency	Percentage	Rank
1.	Fluctuation of the price of raw material	2	4	13
2.	High Retailers margin (40%) High and also asking 3 months credit facility.	3	6	8
3.	Receiving more returns from retailers.	1	2	16
4.	Registration problem of company and trade mark.	3	6	12
5.	Dealers are asking products more on credit basis only.	3	6	11
6.	Non availability of educated / skilled workers due this working time was extending and cost of the product is increasing.	3	6	9
7.	Poor knowledge on packaging materials and methods	1	2	15
8.	Funding problem to set up of machinery, marketing, labeling, branding and other R&D activities	8	16	4
9.	Non availability of reliable machine suppliers	3	6	10
10.	High GST (18%) on millets products	5	10	6
11.	Need to add HSN code for millet kakra, noodles, Atta etc	1	2	14
12.	Required people for processing for Millet Exports and to keep complete focus on opportunities	4	8	7
13.	Marketing Channel Problems	12	24	3
14.	Lack of Awareness on Millets	12	24	2
15.	Lack of Govt Initiatives	13	26	1
16.	High Price of Millets/ Millet Products	7	14	5

- The highly reported constraint on marketing side is lack of government initiatives (26%, ranked #1) for procurement of millet-based products, indicating the need for revamping the procurement policies by central and state governments by providing relaxations, reservations and increased procurement orders from MUs.
- The lack of awareness on millets (24%, ranked #2) is also persisting as one of major marketing constraints, reflecting the need for increased efforts by governments,

international organizations, industry bodies and celebrities.

Conclusion

The findings reveal that the millet enterprise ecosystem is driven primarily by well-educated, mid-career entrepreneurs who enter the sector with strong motivation but often limited managerial and financial support. The major source of capital was family, the low uptake of institutional credit highlights the gaps in access to formal finance from the

banks and government schemes. The procurement of raw material indicates a strong dependence on farmers and traders, indicating informally structured supply chains. Long-shelf-life products such as millet rice, flours, instant mixes, noodles, and cookies prove preference for items that minimize spoilage risks, ease distribution, and cater to urban demand for convenience foods. Higher profit margins were observed for value-added products such as cookies, laddus, health mixes, and bakery items. The limited production of low shelf life products, such as batter and bread, indicates operational constraints related to cold storage facilities and working capital turnover.

The adoption of primary processing machinery was widespread, but advanced secondary machinery, such as extruders, baking lines, and dehydrators, is confined to a few enterprises. This technological gap limits the diversification and entry into high-growth RTE/RTC categories. Marketing behaviour shows an increase in the major marketing channels, such as retail outlets, e-commerce platforms, direct consumer sales, and B2B networks. The expanding presence of millet products in supermarkets and online marketplaces indicates a structural shift toward formalized distribution. With 76% of enterprises not export their products. The export readiness of the sector remains emerging, despite India's rising global visibility in millet markets.

The results revealed that millet micro units have outstanding commercial potential, this requires expanding consumer demand, nutritional awareness, and policy momentum under the International Year of Millets (IYoM–2023) and National millet missions. Achieving long-term sustainability requires a multi-dimensional approach. Strengthening mechanization support, ensuring access to affordable credit, and capacity building programmes in quality certification, branding, packaging, and digital marketing can significantly enhance competitiveness. Establishing stronger linkages with farmers, farmer groups, and FPOs will ensure a consistent raw material supply to the entrepreneurs and stabilize the prices. Encouraging the adoption of advanced millet processing technologies, adoption of technology licenses developed by research institutions, along with facilitating incubation services and common processing centers, will allow micro-entrepreneurs to diversify into high-value products. Concerted efforts involving government agencies, research institutions, financial bodies, and private markets are required to transition from micro-scale food processors to large scale contributors in national and export-oriented value chains. Skill development trainings to build entrepreneurial capacity, improve technological access, and increase market integration can transform the millet processing sector into a vibrant, sustainable, and globally competitive agri-food industry.

Competing interests

Authors have declared that no competing interests exist.”

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