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Value addition, marketing channels and quality constraints in the millet value chain of Raipur city, Chhattisgarh, India

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Abstract

Millet has re-emerged as a policy priority in India following the International Year of Millets (2023) and state-level missions such as the Chhattisgarh Millet Mission, yet the downstream value chain that converts procured grain into marketed products remains poorly characterised at the city level. Chhattisgarh's procurement of kodo, kutki and ragi under the Minimum Support Price rose from about 5,273 tonnes in 2021-22 to 13,050 tonnes in 2022-23, but the processing, marketing and quality-assurance stages that determine whether this procured grain reaches urban consumers as viable products have received comparatively little empirical attention. This study examined the structure, stakeholder profile, marketing channels and quality/market-reach constraints of the millet value chain in Raipur city, the principal consumption and trading hub of Chhattisgarh. Primary data were collected from 19 purposively selected value-chain actors (processor-cum-retailers, retailers and wholesalers) using a structured schedule. Category composition, business experience, product-form portfolio, procurement sources and certification status were analysed using frequency and percentage analysis, while quality and market-reach constraints were prioritised using a severity-rating framework and Garrett's Ranking Technique. Retailers constituted 42.1% of surveyed actors, processor-cum-retailers 31.6% and wholesalers 26.3%. Direct farmer procurement (63.2%) and FPO sourcing (57.9%) were the dominant upstream linkages, and FSSAI certification (68.4%) was far more common than ISO (36.8%) or AGMARK (10.5%). Four marketing channels were identified, with the conventional processor-retailer channel and the emerging online channel most preferred. Garrett ranking identified inadequate storage and warehousing (score 71.7) and high transportation and logistics cost (68.3) as the most severe constraints to market reach. The Raipur millet value chain is retail and processor-retail concentrated, with post-harvest infrastructure rather than demand constituting the principal bottleneck to efficient market access, indicating that infrastructure-focused rather than purely promotional interventions are needed to consolidate the gains of the Millet Mission.

Keywords: Millet marketing channels, value-chain actors, Garrett ranking, post-harvest constraints, processor-retailer integration, food certification, Chhattisgarh, Nutri-cereals

Introduction

Millet pearl millet, sorghum, finger millet and the minor millets (kodo, kutki, little millet, barnyard millet and foxtail millet) are increasingly recognised as climate-resilient, Nutrient-dense "Nutri-cereals" suited to rainfed and marginal environments where rice and wheat perform poorly. India is the world's largest millet producer, contributing about 38.4% of global output and 180.15 lakh tonnes in 2024-25 (Government of India, 2025), a scale actively cultivated through policy: India's UN proposal, Backed by 70 countries, led to 2023 being declared the International Year of Millets to raise awareness and stimulate both production and consumption (Kumar, Das, & Jat, 2023) [6].

Chhattisgarh has positioned itself among the most proactive millet-promoting states, the first in India to procure Kodo, Kutki and ragi at a Minimum Support Price and to integrate them into the Rajiv Gandhi Kisan Nyay Yojana under its Millet Mission (Government of Chhattisgarh, 2021). MSP procurement rose from about 5,273 tonnes in 2021-22 to 13,050 tonnes in 2022-23 and cultivated area nearly tripled over the same period. These interventions have concentrated on production-side incentives, while the processing, branding, retailing and consumer-facing

segments through which procured grain must pass to generate sustained income remain comparatively under-researched at the district or city level the specific gap this study addresses.

Raipur, the administrative and consumption hub of Chhattisgarh, is not among the state's principal millet-producing districts cultivation is concentrated in Bastar and Surguja but functions as the principal node through which produce from these belts is processed, branded, retailed and promoted to urban consumers, making it an appropriate but so far unstudied site for this analysis. Against this background, the present study set out to (i) Characterise the structure and stakeholder profile of the millet value chain in Raipur city, Including actor category, Business experience, Product-form portfolio, Procurement linkages and Certification status; (ii) Identify the principal marketing channels through which millet-based products reach urban consumers; and (iii) Prioritise, using a severity-rating framework and Garrett's Ranking Technique, the constraints limiting product quality and market reach. Its novelty lies in city-level, actor-disaggregated profiling of an emerging millet value chain in an early-adopter policy state, contributing a ranked, evidence-based account of where infrastructural investment would most improve market access.

Materials and Methods

Study Area, Sampling and Sample Size

Chhattisgarh was purposively selected as the study state for its proactive, policy-driven approach to millet promotion, including MSP procurement of kodo, kutki and ragi and their integration into the Rajiv Gandhi Kisan Nyay Yojana (Government of Chhattisgarh, 2021). Raipur district was purposively selected within the state as its administrative headquarters: although not among Chhattisgarh's principal producing districts cultivation being concentrated in Bastar and Surguja Raipur functions as the principal hub through which produce from these belts is processed, branded, retailed and promoted, making it the appropriate site for the value-chain and marketing objectives reported here. The value-chain component surveyed 19 respondents processors-cum-retailers, retailers and wholesalers operating in Raipur city forming part of a wider study sample of 129 that also included 110 consumers surveyed for a companion analysis. Given the limited, specialised population of millet value-chain actors in the city, a fixed sampling fraction was not applied; actors were purposively selected to represent the chain's major functional categories.

Data Collection

Primary data were collected through a structured interview schedule administered by personal interview, capturing functional category and business experience, product forms handled, procurement sources and marketing channels, certification and labelling status, marketing-mix strategies (Weighted Mean Score framework) and constraints limiting quality and market reach, via a ten-item severity-rating block and a five-item Garrett-ranking block. Secondary data were compiled from the Directorate of Economics and Statistics (Government of India and Chhattisgarh), ICAR-IIMR crop statistics, NITI Aayog, PIB, NABARD, the Raipur Municipal Corporation and peer-reviewed millet literature (2018-2025); gaps in district-disaggregated secondary data were flagged rather than estimated.

Analytical Framework and Statistical Tools

Frequency and Percentage Analysis

Frequency and percentage analysis summarised the categorical

distribution of actors by category, experience, product form, procurement source and certification status:

$$\text{Percentage} = (\text{Frequency} / \text{Total Respondents}) \times 100$$

Garrett's Ranking Technique

Garrett's Ranking Technique (Garrett & Woodworth, 1969) [3] converted respondents' ordinal ranks of the five overarching constraints (storage and warehousing, transportation and logistics cost, aggregation systems, processing infrastructure, intermediaries) into an interval-scaled composite score:

$$\text{Per cent position} = 100 \times (\text{Rij} - 0.5) / \text{Nj}$$

where Rij is the rank given by the j-th respondent to the i-th constraint and Nj is the number of constraints ranked. Percentage positions were converted to Garrett scores via the standard conversion table, and the mean score per constraint determined its final rank (higher = more severe). The technique is appropriate here as it avoids the information loss of simple mode-ranking and allows constraints of differing character to be compared on one standardised scale.

Severity Rating and Software

A complementary ten-item severity-rating block (High/Medium/Low) characterised constraints at each functional node input supply, production, post-harvest, processing, value addition, marketing as a qualitative counterpart to the Garrett-ranked overarching constraints. Data were coded and analysed in Microsoft Excel and SPSS; Garrett conversions followed the standard published table (Garrett & Woodworth, 1969) [3], whose non-uniform rank-to-score transformation is a standard, retained assumption in extension research.

Results & Discussion

This section presents the structure, stakeholder profile, marketing channels and constraints of the millet value chain among the 19 processor-cum-retailer, retailer and wholesaler enterprises surveyed in Raipur city.

Value-Chain Architecture in Raipur City

The millet value chain in Raipur comprises five functional segments input supply and production, aggregation, processing, value addition, distribution, retail and final consumption. Harvested millet flows from farmers through three aggregation channels (FPOs, traders, wholesalers) to processors, where value addition converts grain into flour, processed foods and RTE/RTC products, before reaching consumers via retailers, online channels, or vertically integrated processor-retailers. A defining feature is the substantial presence of such processor-retailers, 31.6% (6 of 19) of surveyed actors, who shorten the chain and increase value capture within a single enterprise. This is consistent with earlier characterisations of the Indian millet chain as frequently truncated by weak intermediation (Shanmuka & Shireesha, 2023) [9] and with Karnataka evidence that shorter channels raise producer share (Banu *et al.*, 2022) [2], Raipur's actors appear to be resolving this truncation through vertical consolidation rather than independent intermediary growth, suggesting that supporting existing processor-retailers upgrading may deliver faster efficiency gains than developing a stand-alone wholesaling segment.

Stakeholder Profile of Value-Chain Actors

Category Composition: Standalone retailers constituted the

largest share of surveyed actors (42.1%), followed by integrated processor-retailers (31.6%) and wholesalers (26.3%) (Table 1).

Table 1: Distribution of surveyed value-chain actors by functional category

Actor category	Frequency	Per cent
Retailer (standalone)	8	42.1
Processor-cum-retailer	6	31.6
Wholesaler	5	26.3
Total	19	100.0

Source: Field survey

The small wholesaling segment (26.3%) relative to the combined retail and processor-retail base (73.7%) indicates a chain concentrated in downstream, consumer-facing activity, consistent with Shanmuka and Shireesha (2023) ^[9] on processing and diversification as efficiency drivers, and suggesting a buyer-driven configuration in which downstream actors coordinate sourcing and quality. Interventions to raise millet consumption are therefore likely most effective when targeted at retail and processor-retail enterprises, with certification and merchandising support prioritised at that level.

Business Experience

Most surveyed actors (8 of 19) had 3-5 years of business experience, followed by 7 with more than 5 years and 4 with less than 3 years. Processor-cum-retailers were concentrated in the 3-5 year band, retailers were fairly evenly distributed across experience categories, and wholesalers were predominantly established operators with more than 5 years of experience (Table 2).

Table 2: Business experience of value-chain actors by category

Actor category	< 3 years	3-5 years	> 5 years	Total
Processor-cum-retailer	1	4	1	6
Retailer	3	3	2	8
Wholesaler	0	1	4	5
All actors	4	8	7	19

Source: Field survey

The concentration of processor-cum-retailers in a moderate-experience band suggests vertical integration is a comparatively recent strategy rather than a legacy model, while longer-tenured wholesalers indicate bulk intermediation is the more established, if smaller, segment. Newer processor-retailers may therefore

need targeted business-development and certification support to consolidate their position, with capacity-building differentiated by actor tenure.

Product-Form Portfolio and Value-Addition Intensity

Flour (73.7%) and raw grain (68.4%) were the most commonly handled product forms among surveyed enterprises. Value-added products were also widely marketed, with processed foods (63.2%) and ready-to-eat products (57.9%) offered by more than half of enterprises, while ready-to-cook products (47.1%) had comparatively lower adoption (Table 3), indicating that most enterprises maintain a diversified, multi-tier product portfolio spanning primary, secondary and tertiary levels of value addition.

Table 3: Millet product forms handled by surveyed enterprises, by value-addition tier

Product form	No. of enterprises	Per cent	Value-addition tier
Flour	14	73.7	Primary processing
Raw grain	13	68.4	Nil / trading
Processed foods	12	63.2	Secondary processing
Ready-to-eat (RTE)	11	57.9	Tertiary / high
Ready-to-cook (RTC)	9	47.1	Tertiary / high

Source: Field survey

The widespread availability of processed and RTE products indicates a gradual shift toward higher value addition, consistent with Shanmuka and Shireesha (2023) ^[9] and Adekunle *et al.* (2018) on diversification as a performance driver. The comparatively lower RTC share suggests unrealised opportunity for convenience-oriented product development, a gap also reported by Meghana *et al.* (2024), realising it would require parallel investment in processing technology, best targeted through RTC-specific equipment support for FPOs and small enterprises.

Procurement Structure and Upstream Linkages

Direct procurement from farmers (63.2%) was the most common sourcing channel, followed by procurement through Farmer Producer Organisations (57.9%). Wholesalers sourced primarily from farmers and FPOs, processor-retailers procured mainly from traders and farmers, and retailers depended largely on processors and wholesalers, indicating a clear functional division of procurement roles across the chain (Table 4).

Table 4: Procurement sources of value-chain actors, by category

Procurement source	Processor-retailer	Retailer	Wholesaler	Total	Per cent
Farmer (direct)	4	3	5	12	63.2
FPO	3	3	5	11	57.9
Village trader	5	1	1	7	36.8
Wholesaler	4	3	0	7	36.8
Processor	0	5	2	7	36.8

Source: Field survey

The dominance of direct farmer and FPO procurement over trader-mediated sourcing suggests intermediaries between farm and processor are already comparatively few, which should support a higher producer share of final value, consistent with Banu *et al.* (2022) ^[2] for Karnataka's minor-millet channels. Strengthening FPO capacity and formal FPO-processor linkage agreements is therefore likely to have a direct effect on upstream value retention, and should be prioritized over generic market-yard infrastructure alone.

Certification and Quality-Assurance Profile

FSSAI certification was held by 13 of 19 enterprises (68.4%), indicating widespread compliance with statutory food-safety regulation. ISO certification was held by 7 enterprises (36.8%), while AGMARK certification was held by only 2 enterprises (10.5%) (Table 5), indicating that statutory certification is common but voluntary quality certification remains limited.

Table 5: Certification and quality-assurance status of value-chain enterprises

Certification held	No. of enterprises	Per cent of all actors
FSSAI	13	68.4
ISO	7	36.8
AGMARK	2	10.5

Source: Field survey

The gap between near-universal FSSAI compliance and limited voluntary certification implies enterprises meet minimum legal requirements but have not yet invested in the quality signalling

needed for premium or institutional-market access. Subsidised ISO/AGMARK certification schemes, linked to the Millet Mission's existing processor-facing support, could help differentiate Raipur's processor-retailers in these markets.

Marketing Channels in the Millet Value Chain

Synthesising the procurement linkages above with the functional position of each actor category yields four principal marketing channels through which millet products reach the Raipur consumer, differing in length and therefore in expected price spread and producer share (Table 6).

Table 6: Principal marketing channels identified in the Raipur millet value chain

Channel	Route	Length	Chain feature
I	Farmer → Processor → Retailer → Consumer	Long	Conventional multi-stage
II	Farmer → Processor → Online → Consumer	Short	Online channel
III	Farmer → Wholesaler → Processor → Retailer → Consumer	Longest	Fully intermediated
IV	Farmer → Processor → Consumer	Short	Integrated, direct-to-consumer

Source: Field survey

Channel I (conventional processor-retailer) and Channel II (online) were most preferred: Channel I benefits from an established retail network and accumulated consumer trust, while Channel II has gained traction among urban consumers for its convenience, choice and promotional offers. Channel III, despite being the longest route was comparatively less preferred, as multiple intermediaries were perceived to raise costs and consumer prices; Channel IV, the shortest and most integrated route, remains under-used owing to constrained direct-selling capacity. This co-dominance of a conventional and a digital channel suggests marketing-support interventions should be bi-directional strengthening retail merchandising while building e-commerce and last-mile logistics capacity for processor-retailers expanding Channel II.

Major Bottlenecks Limiting Product Quality and Market Reach

Constraints were captured through two complementary instruments: a severity-rating block covering ten node-specific bottlenecks, and a Garrett-ranking block covering five

overarching, cross-cutting constraints.

Value Chain Bottlenecks Affecting Product Quality

High-severity constraints were identified across almost every node of the chain: limited availability of certified high-yielding seeds and weak extension services at the input-supply stage; rainfed cultivation with erratic monsoon dependence and small, fragmented, low-mechanisation holdings at production; manual threshing, lack of drying yards and poor on-farm storage at the post-harvest stage, shortage of local de-hulling and grading mills and high processing-equipment costs at the processing stage, and fragmented mandis, absence of a dedicated millet market yard in Raipur and a low farmer share of the consumer rupee (approximately 25-30%) at the marketing stage (Table 7). Moderate-severity constraints included the absence of quality certification at the FPO level, limited product diversification, weak packaging and branding capacity, low urban consumer awareness beyond niche segments, and weak linkages with institutional buyers such as ICDS, the public distribution system and mid-day-meal programmes.

Table 7: Value-chain bottlenecks affecting product quality

Value-chain node	Bottleneck	Severity
Input supply	Limited availability of certified high-yielding seeds	H
Input supply	Weak extension services on package of practices	M
Production	Rainfed cultivation with erratic monsoon	H
Production	Small and marginal holdings; low mechanisation	H
Post-harvest	Manual threshing and lack of drying yards	H
Post-harvest	Poor on-farm storage (jute bags)	H
Processing	Shortage of local de-hulling and grading mills	H
Processing	Absence of quality certification (FSSAI, organic) at FPO level	M
Processing	High cost of processing equipment for SHGs/FPOs	H
Value addition	Limited product diversification (mostly flour/grain)	M
Value addition	Weak packaging and branding capacity	M
Marketing	Fragmented mandis; no dedicated millet market yard in Raipur	H
Marketing	Farmer share in consumer rupee only ~25-30%	H
Marketing	Low urban consumer awareness beyond niche segments	M
Marketing	Weak linkages with institutional buyers (ICDS, PDS, mid-day meal) beyond MSP procurement	M

Source: Field survey

Bottlenecks span the entire chain from input supply to marketing, indicating that single-node interventions seed supply alone, or market-yard construction alone are unlikely to substantially improve quality or market reach without

complementary investment at adjacent nodes; an integrated, multi-node investment package is therefore preferable to isolated schemes.

Constraints Limiting Market Reach in the Millet Value Chain

Garrett ranking of the five overarching constraints indicated that inadequate storage and warehousing facilities were perceived as the most critical constraint, with the highest mean Garrett score of 71.7, followed by high transportation and logistics cost (68.3) and weak aggregation systems (61.8). Limited processing infrastructure ranked fourth (54.8), and multiple intermediaries ranked fifth (49.8) among the five overarching constraints (Table 8).

Table 8: Garrett ranking of constraints limiting market reach in the millet value chain

Constraint	Mean Garrett score	Rank
Inadequate storage and warehousing facilities	71.7	I
High transportation and logistics cost	68.3	II
Weak aggregation system	61.8	III
Limited processing infrastructure	54.8	IV
Multiple intermediaries	49.8	V

Source: Field survey

The primacy of storage and logistics constraints over intermediary-related constraints indicates that the chain's principal limitation is physical and infrastructural rather than purely institutional qualifying the common policy emphasis on "eliminating middlemen" as the main efficiency lever. This is consistent with the node-level severity findings above and reinforces the case for prioritising storage and logistics investment, ahead of or alongside market-yard and intermediary-reduction interventions, within Millet Mission infrastructure funding.

Conclusion

This study provides city-level evidence that the millet value chain in Raipur, Chhattisgarh, is retail and processor-retail concentrated, procures most raw material directly from farmers and FPOs rather than through multi-layered intermediation and is constrained principally by inadequate storage/warehousing and transportation/logistics costs rather than by intermediary numbers or consumer awareness alone. Its scientific contribution is a ranked, node-disaggregated account of where an emerging, policy-supported millet chain is structurally constrained, qualifying the common assumption that disintermediation is the primary efficiency lever. Practically, enterprise-level investment in storage, de-hulling/grading infrastructure and voluntary certification is likely to improve market reach more than awareness campaigns alone. The Millet Mission should therefore reallocate infrastructure funding toward storage, logistics and processing-equipment support alongside certification subsidies, rather than weighting support predominantly toward procurement-price incentives. Future research should extend this analysis to Raipur's producing districts (Bastar, Surguja) and integrate it with companion consumer-behaviour data to model the joint supply and demand side determinants of millet market expansion.

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