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Value chain dynamics of millet cultivation among tribal farmers in Attappadi, Kerala

¹C Ritu and ²Mercykutty MJ

¹M.Sc. Scholar, Department of Agricultural Extension, College of Agriculture, Vellanikkara, Kerala Agricultural University, Thrissur, Kerala, India

²Professor and Head, Department of Agricultural Extension, College of Agriculture, Vellanikkara, Kerala Agricultural University, Thrissur, Kerala, India

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Corresponding Author: C Ritu

Abstract

Millet has regained significance as climate-resilient and nutritionally superior crops capable of strengthening food and livelihood security, especially among smallholders and tribal communities. In India, these grains continue to hold ecological and cultural importance across rainfed regions. Attappadi, a major tribal block in Kerala inhabited by the Irula, Kurumba and Muduga communities, has traditionally relied on millet-based farming systems deeply rooted in Indigenous Technical Knowledge (ITK). Millet cultivation has declined in recent decades due to environmental, socio-economic and institutional pressures. This study examines the millet value chain dynamics, documents the role of institutional actors, and identifies SWOC of the value chain in Attappadi. The results show that cultivation remains largely subsistence-oriented, with production shaped by climatic variability, wildlife intrusion and infrastructural gaps. Institutional actors such as Farmer Producer Companies (FPCs) and Kudumbashree microenterprises have emerged as central players in processing and value addition. Despite the fragmented nature of the value chain, growing consumer demand and improved institutional support present opportunities for upgrading. Revitalising millet cultivation could significantly improve livelihood resilience, food security, women's empowerment and cultural preservation in Attappadi.

Keywords: Millet cultivation, value chain, profile characteristics, tribal farmers

Introduction

Millet, often termed a nutri-cereal, includes grains such as finger millet (*Eleusine coracana*), foxtail millet (*Setaria italica*), and little millet (*Panicum sumatrense*). These crops are drought-tolerant, require less water, and thrive in marginal soils, making them ideal for rainfed regions like Attappadi (FAO, 2021; Mukherjee *et al.*, 2025) ^[1, 5]. The Irula, Kurumba and Muduga communities practised shifting cultivation and later settled rainfed farming systems centred on diverse millet varieties adapted to local topographies and microclimates (Sreeni, 2023) ^[8]. However, recent decades have witnessed a decline due to land-use changes, climate stress, and erosion of traditional knowledge. Millets have re-emerged in global policy discourse, further strengthened by the United Nations' declaration of 2023 as the International Year of Millets.

Strengthening millet value chains is widely recognised as critical for revitalising production and enhancing smallholder incomes. A value chain encompasses all activities from input provision, cultivation and harvesting to processing, aggregation, marketing and consumption. This study was undertaken to map the millet value chain and identify the key actors, and evaluate the strengths, weaknesses, opportunities and challenges (SWOC) influencing millet production and marketing in Attappadi.

Materials and Methods

The study was conducted in the Attappadi tribal block located in the Palakkad district of Kerala, as it has the highest area under millet cultivation. It is also recognised as the 'Millet Village of Kerala' by the government of Kerala. It occupies an area of 745 sq. km and consists of three panchayats, namely, Agali, Pudur, and Sholayur. The Irula, Kurumba and Muduga are the three main ethnic groups in Attappadi, residing in small hamlets called 'oorus', there are 192 tribal hamlets or *oorus* in the block. A total sample of 150 respondents was selected, comprising 120 tribal millet farmers chosen through random sampling and 30 value chain actors identified through random and snowball sampling.

Primary data were collected using semi-structured interviews, focus group discussions and key informant interviews with traditional leaders and institutional representatives. Separate schedules were used for producers and actors. Secondary data were obtained from government reports, published research articles and project documents. The data were analysed using IBM SPSS software and MS-Excel and involved descriptive statistics, value chain mapping was employed to systematically chart actors, processes, and relationships. Socio-demographic analysis and a SWOC matrix framed the discussion around strengths,

weaknesses, opportunities, and challenges of the value chain in Attappadi.

Results and Discussion

The socio-demographic characteristics of the tribal farmers are given in Table 1. The majority of respondents (47.5%) belonged to the 36-59 years age group, signifying that the active farming population is primarily in their middle age. 36.7% respondents were above 60 years, while only 15.8% were below 35 years, suggesting limited involvement of youth in millet cultivation. In terms of family size, 51.7% of the respondents belonged to families with less than four members. This indicates a predominance of nuclear families in the study area, which may influence labour availability for farm operations as most of the farm families relied on family labour. Of the respondents, 39.2% of tribal farmers own more than 2 acres and only 7.5% use more than 2 acres

for millet cultivation. About 28.4% of the tribal farmers have less than 1 acre under millet cultivation, a much larger share of the respondents (64.2%) restricted millet cultivation to about 1-2 acres. The data show a clear divergence between total landholding and the area actually allocated to millet cultivation. This indicates that farmers, regardless of their total landholding, allocate only a modest portion of their land to millets. The pattern reflects a subsistence-oriented approach, where millets are maintained primarily for household consumption rather than commercial expansion. With respect to farming experience, 79.2% of the respondents had more than 20 years of experience in agriculture. Tribal farmers cultivated millets based on indigenous agricultural knowledge passed on orally through generations. The educational profile of the respondents indicated that 72.5% were illiterate.

Table 1: Socio-demographic characteristics of tribal farmers

Characteristics	Category	Number	Percentage
Age	≤35	19	15.8
	36-59	57	47.5
	≥60	44	36.7
Sex	Male	58	48.3
	Female	62	51.7
Family size	≤4	62	51.7
	5-7	51	42.5
	≥8	7	5.8
Landholding size	<1 acres	35	29.2
	1-2 acres	58	31.7
	> 2 acres	47	39.2
Area under millet cultivation	<1 acres	34	28.4
	1-2 acres	77	64.2
	>2 acres	9	7.5
Farming experience	<5 years	4	3.3
	5-10 years	5	4.2
	11-15 years	8	6.7
	16-20 years	8	6.7
	>20 years	95	79.2
Education	Illiterate	87	72.5
	Can read and write	1	0.8
	Primary school	1	0.8
	Middle school	16	13.3
	High school	4	3.3
	Higher secondary school	6	5.0
	Graduation	5	4.2

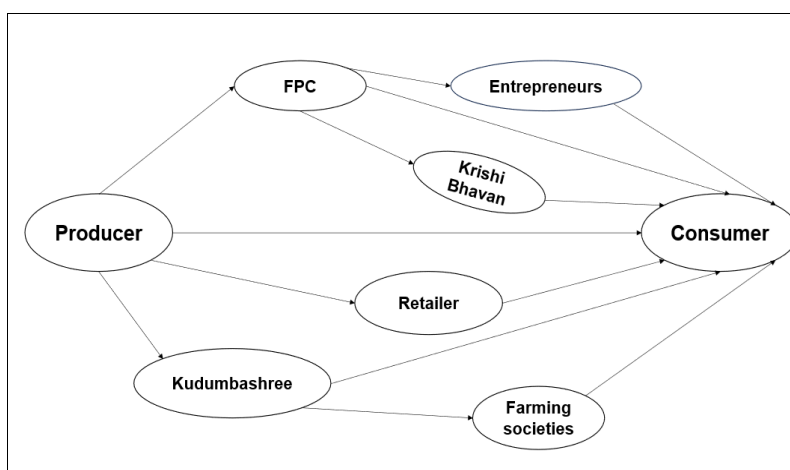


Fig 1: millet value chain map of Attappadi

Millet Value Chain Structure

The actors involved in the millet value chain of Attappadi are producers (tribal farmers), FPCs, *Kudumbashree* microenterprises, co-operative farming societies, entrepreneurs, Krishi bhavan, retailers and consumers. This study reveals that millet cultivation remains largely subsistence-oriented. Farmers primarily grow millets for their household food security, and the quantities available for sale are small and inconsistent. Farmers relied on traditional cultivars and practiced natural or organic farming based on their indigenous knowledge (Prabhakaran *et al.*, 2017) ^[6]. Ecological constraints such as erratic rainfall and wildlife intrusion resulted in lower yields (e.g., attack by wild boars and peacock) and similar findings were reported by Karanth *et al.* (2019) ^[2] and Logeshwar *et al.* (2024) ^[4]. Value addition is primarily carried out by FPCs, *Kudumbashree* microenterprises, and entrepreneurs. The transformation of raw millets into flour, flakes, mixes, and bakery items adds economic value and opens market opportunities. The FPCs and *Kudumbashree* units collected millet grains directly from the hamlets and transported it to their processing units, where cleaning, drying, sorting, milling, and other value addition activities were carried out. *Kudumbashree* is a poverty alleviation and women empowerment initiative started by the government of Kerala and it promotes upliftment of socio-economic status of women through entrepreneurship opportunities (Kumar *et*

al., 2016) ^[3]. It plays a crucial role in value addition through its micro-enterprises. These units brand the processed products and channel them to cooperative farming societies for retail marketing through their outlets. The role of Farmer Producer Companies is especially significant, as FPCs serve as aggregators, processors, and market linkages for small entrepreneurs (Trebbin, 2014; Vignesh *et al.*, 2019) ^[9, 10]. FPCs also offer technical assistance to tribal farmers and facilitate marketing through both online platforms and physical sales outlets (Sangappa *et al.*, 2023) ^[7]. The value addition is primarily undertaken by tribal women at decentralized milling units. In addition to local marketing, processed millet products are distributed to entrepreneurs across Kerala and also sold at Keralagro stores. Keralagro is a brand established under the Department of Agriculture and farmers Welfare, Government of Kerala to sell locally sourced, high quality agricultural products to the consumers. Krishi Bhavans also procure the products from FPCs for sale at government-organized exhibitions. Entrepreneurs procured primary processed millet grains from FPCs, and did further processing and value addition. Overall, FPCs like ATFAM and *Kudumbashree* units (Madhuvani, Malliswara and True Spices) serve as critical institutional linkages and support systems, strengthening the economic resilience and market integration of tribal farmers in Attappadi.

Table 2: Millet value chain actors and their roles

Actor	Role	Level in Value Chain
Tribal Farmers	Production, limited surplus sales	Primary producers
FPCs	Procurement, processing, marketing	Aggregation, value addition
<i>Kudumbashree</i> Units	Processing, packaging, retail	Microenterprise value addition
Co-operative Societies	Retail	Marketing
Krishi Bhavan	Institutional support, promotion	Government facilitation
Regional Retailers	Direct purchase	Local market
Entrepreneurs	Secondary processing	Business-to-business
Consumers	Purchase	Terminal markets

SWOC Analysis of the Millet Value Chain in Attappadi

The SWOC analysis reveals that Attappadi's millet value chain is supported by strong Indigenous Technical Knowledge (ITK), active institutional actors such as FPCs and *Kudumbashree* units, and growing demand for millet-based foods. However, the system remains constrained by subsistence-oriented production, weak post-harvest infrastructure, fragmented supply chains, and limited access to market information. Opportunities such as governmental

projects, institutional procurement, and expanding digital markets offer scope for strengthening the millet value chain. The significant challenges identified are climatic variability, wildlife intrusion, high transportation costs, and competition from commercial brands. Overall, the analysis underscores the need for targeted interventions to enhance value-addition capacity, improve infrastructure, and build resilience against ecological and market-related risks.

Table 3: SWOC matrix of millet value chain of Attappadi

Strengths (S)	Weaknesses (W)
Strong Indigenous Technical Knowledge (ITK) among tribal farmers	Predominantly subsistence-oriented production with low marketable surplus
Presence of FPCs for aggregation, processing and marketing	Fragmented supply chain with inconsistent raw material flow
Active women-led <i>Kudumbashree</i> microenterprises performing value addition	Lack of farmer participation in processing and value addition
Growing health-conscious demand for millet products	Poor post-harvest infrastructure and transportation facilities
Diverse marketing channels for product flow	Limited literacy and inadequate access to market information
Opportunities (O)	Challenges (C)
Rising national and global demand for millet-based health foods	Climatic variability and erratic rainfall affecting yield
Government support through national Millet Missions and FPO promotion schemes	Wildlife intrusion (elephants, boars, peacock) causing significant crop losses
Expansion of women/youth-led millet startups and innovations in products	High transportation and transaction costs in hilly terrains
Scope for institutional procurement	Market competition from large commercial brands
Digital marketing and e-commerce for niche urban health markets.	Youth disengagement from agriculture and allied activities

Conclusion

Millet cultivation continues to play an important role in food security, culture and ecological resilience in Attappadi. The existing value chain, though fragmented, is strengthened by FPCs, *Kudumbashree* enterprises and rising market demand. Revitalising millet cultivation requires integrating indigenous knowledge with value chain development, improving processing infrastructure, supporting women's enterprises and strengthening institutional procurement. With targeted policy support, millet-based livelihoods can significantly enhance tribal welfare, agro-biodiversity conservation and sustainable rural development.

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