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Swot Analysis of the Production Ecosystem of Attapady Black Goat Towards Geographical Indication Status

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ABSTRACT

Background: Attapady Black goats, a distinct native meat-type breed traditionally reared under extensive systems, show strong potential for geographical indication (GI) recognition. The study used SWOT analysis to assess the key strengths, weaknesses, opportunities and threats of the prospective GI value chain pertaining to the production ecosystem of Attapady Black goats. As an effective tool for integrating multiple factors influencing livestock systems, SWOT analysis helped identify the determinants and interventions needed for prospective GI protection and guided the development of a strategic framework for future GI governance.

Methods: The study, conducted in Attapady Block panchayat from November 27, 2023, to October 23, 2024, adopted an exploratory research design involving diverse actors of Attapady Black goat value chain. SWOT factors across five domains of territory and biodiversity, knowledge and practices, production and transformation, marketing and consumption and governance, were prioritised using Garrett's ranking technique.

Result: The SWOT analysis identified key strengths such as the native Attapady Black goat breed of the region, rich local biodiversity, traditional knowledge systems, rising demand for organic meat and supportive tribal and goat husbandry programmes. Major weaknesses included declining breed numbers, indiscriminate breeding, biodiversity degradation, substance abuse and absence of formal governance structures. The top ranked opportunities were growing market for organic produce, available certification mechanisms, provisions of the GI Act and strong institutional support systems. Key threats included wildlife attacks, forest clearance, denial of tribal rights and lack of breed specific conservation schemes.

Key words: Attapady black goat, Garrett ranking, Geographical indication, Production system, SWOT, Value chain.

INTRODUCTION

Attapady hill tracts located in the north-eastern part of Palakkad district in Kerala, lies within the Western Ghats, a globally recognized biodiversity hotspot and borders Tamil Nadu to the east. It is acknowledged as the geographical production area of Attapady Black goat, a breed evolved and nurtured by local tribal communities under traditional, low-input, forest-based free-ranging systems (Stephen *et al.,* 2005). A Geographical Indication (GI) is a form of intellectual property right (IPR) that identifies a product as originating from a specific geographical area, wherein a given quality, reputation, or other characteristic is essentially attributable to its geographical origin. In India, GI is governed by the Geographical Indications of Goods (Registration and Protection) Act, 1999. Attapady Black goat, the distinct indigenous meat breed, officially recognized and registered (NBAGR, 2025) as a native breed of Attapady by ICAR-NBAGR, exhibits unique adaptive traits and holds strong potential for Geographical Indication (GI) status.

Origin-linked products can promote sustainable rural development in fragile regions by transforming production constraints into opportunities through value addition (FAO, 2009). In the GI development process, a preliminary assessment involves identifying the key strengths and weaknesses of the origin-linked product and its production system, along with opportunities and threats influencing them through a SWOT analysis. This analysis is crucial for guiding subsequent stages of GI evaluation. A successful GI enablement process must strategically capitalise on the inherent strengths and emerging opportunities of the potential product while effectively addressing its

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weaknesses and mitigating potential threats. The SWOT analysis of the Attapady Black goat production ecosystem is vital for ensuring that the prospective GI evolves in an inclusive and sustainable manner. Accordingly, the study applied SWOT framework to assess the current status of the production ecosystem, identifying its key strengths, weaknesses, opportunities and threats, that would support local efforts to pursue GI protection and recognition for Attapady Black goat and its products.

MATERIALS AND METHODS

The study was conducted during November 27, 2023 to October 23, 2024 in Attapady Block panchayat of Palakkad district, Kerala, encompassing the grama panchayats of Agali, Pudur and Sholayur (Fig 1), where the Attapady Black goats have been evolved and developed by the tribal communities of the region.

The case study employed an exploratory, predominantly inductive research design (Yin, 2018), with respondents selected through theoretical sampling (Charmaz, 2014; Qureshi, 2018). Sample size was determined based on theoretical saturation (Glaser and Strauss, 1967). The diverse actors across the prospective GI value chain of Attapady Black goat and its products constituted the respondents of the study and their identification and categorisation were guided by qualitative system dynamics paradigm described by Garcia-Dorado *et al.* (2021). Based on the conceptual framework of Larson (2007), the prospective GI value chain was operationally defined as a geographically differentiated value chain encompassing tangible elements such as territory and biodiversity and intangible elements such as traditional knowledge and practices. It further included the components of production and transformation, marketing and consumption, with governance structures serving as the central linking mechanism across these elements.

The initial sample, based on a preliminary systems framework, consisted of 30 key informants that included local elected representatives, animal husbandry officials, researchers and NGO members of the study area. Subsequent respondents across the nodes of the value chain were identified through snowball sampling, with key informants acting as referral points. Accordingly, the final respondent pool consisted of 520 diverse actors representing various categories within the Attapady Black goat value chain, which included 200 traditional goat keepers, 65 intermediaries (aggregators, traders and butchers), 37 consumers (end users of goat or meat) and 218 governance actors.

For the SWOT analysis, strengths referred to those internal attributes of Attapady Black goat production system that could be utilised effectively to enable GI registration of the breed and its products, while weaknesses denoted internal factors that could be detrimental in the accomplishment of this goal. Opportunities referred to external conditions that could facilitate GI enabling, whereas threats represented external factors that might impede progress. Internal attributes (strengths and weaknesses) were within the control of local stakeholders and system governance, while external attributes remained largely beyond their short-term control.

The perceived importance of strengths, weaknesses, opportunities and threats related to Attapady Black goat production ecosystem was analysed using Garrett's ranking technique (Garrett and Woodworth, 1969). A comprehensive inventory of internal (strengths, weaknesses) and external (opportunities, threats) factors was first compiled through a literature review and pilot study insights. Strengths and weaknesses were organised under the domains of territory and biodiversity, knowledge and practices, production and transformation, marketing and consumption and governance, while opportunities and threats were classified under the socio-economic and environmental context and policies, programmes and external organisations. This repository was subsequently prioritised using responses from 520 actors across the prospective GI value chain. In the next stage, Garrett's ranking technique was employed, whereby respondents' rank orders were converted into numerical scores using Garrett's formula based on per cent positions to quantify the relative importance of SWOT factors across domains.

$$\text{Per cent position} = \frac{100\ (R_{ij} - 0.5)}{N_j}$$

Where

R_{ij} = Rank given for i^{th} item by j^{th} respondent.

Nj = Number of items ranked by j^{th} respondent.

The per cent position of each rank was converted into scores referring to the Garret ranking conversion table (Garrett and Woodworth, 1969). For each item, the total score was calculated by summing up the scores stemming from the respondents. Subsequently, the mean scores of items were calculated using the formula:

$$\text{Mean score of item} = \frac{\text{Total score of items}}{\text{Total number of respondents}}$$

Further, the scores were arranged in descending order and the ranking hierarchy denoted the importance of items.

RESULTS AND DISCUSSION

The factors pertaining to perceived strengths under the five domains were ranked based on mean Garrett scores and represented in Fig 2 to 6. Respondents identified several key strengths that highlight the GI potential of Attapady Black goat and its products. Across the domains studied, the top-ranked strengths included the breed's adaptability to the local terroir, traditional extensive and low-input rearing practices, rising domestic dem and for chevon and presence of Integrated Tribal Development Project (ITDP) and tribal extension offices (TEO) implementing tribal development programmes. These were followed by the breed's inherent reputation, indigenous knowledge

and innovative practices, natural breeding methods, preference for local goat breeds and ongoing on-farm conservation of the Attapady Black Goat. The extensive rearing systems practised by the Irula, Muduga and Kurumba communities of Attapady with natural breeding practice was reported by Stephen *et al.* (2005).

The region is the natural breeding tract of the breed, whose inherent reputation and distinct characteristics *viz.,* jet black coat colour, slender legs, lean body, bronze-coloured eyes, disease resistance, climate resilience and flavourful meat, have been documented across multiple studies (Radhika *et al*., 2018; Singh *et al.*, 2023). The genotypically and phenotypically distinct breed with medium drooping ears and curved, bunchy tail (Stephen *et al.,* 2005; Radhika *et al*., 2015) is highly adaptable, disease-resistant and generally low in prolificacy. Nisha *et al.* (2025) have documented ethnoveterinary practices followed by the ethnic producers of Attapady. The breed, officially recognised

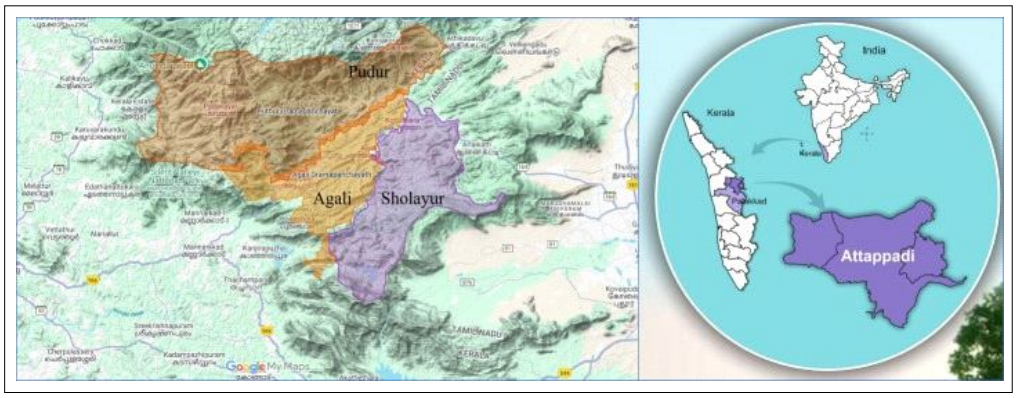

Fig 1: Map showing the study area.

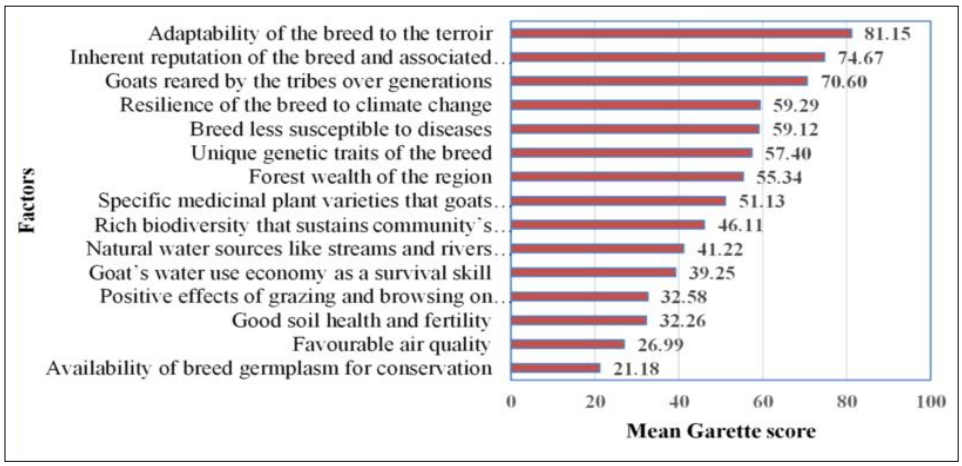

Fig 2: Prioritisation of factors pertaining to perceived strengths under the domain of territory and biodiversity.

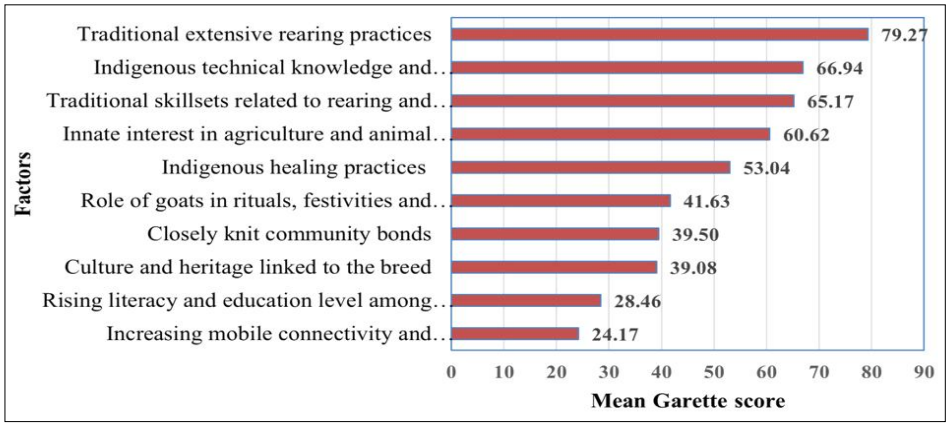

Fig 3: Prioritisation of factors pertaining to perceived strengths under the domain of knowledge and practices.

by ICAR–NBAGR in 2007, remains one of India's 41 registered goat breeds. Indigenous technical knowledge, natural breeding practices followed by the traditional producers and on-farm conservation in the region have contributed to maintaining the breed's genetic identity. The ecological richness of Attapady, sustained by Bhavani, Siruvani and Varagar rivers and its biodiversity with medicinal flora, further supports the quality traits valued for GI enabling of the breed. Conservation and improvement initiatives by Kerala Livestock Development Board (KLDB), Kerala Veterinary and Animal Sciences University (KVASU) and National Bureau of Animal Genetic Resources (NBAGR), through both in situ and ex situ measures, reinforce this potential. Additionally, support from ITDP of Attapady, Animal Husb andry Department, TEOs, Attapady Special Project of *Kudumbashree*, Kerala Institute of Local Administration-Centre for Tribal Development and Natural Resource Management at Agali and local governance institutions strengthens the governance environment required for the GI initiative.

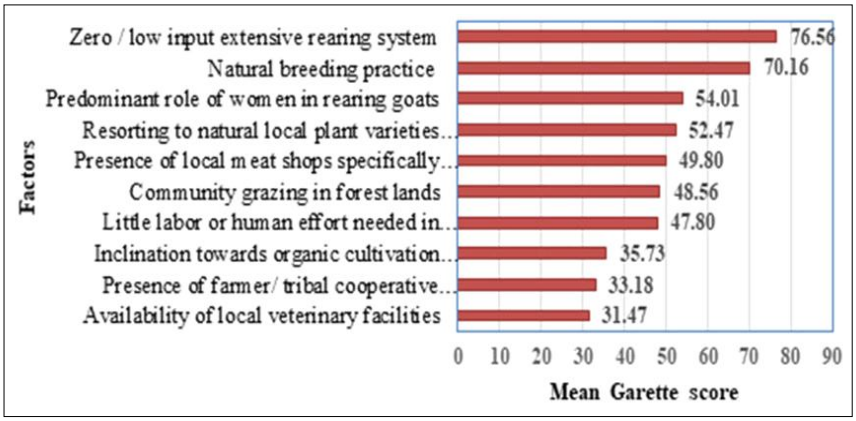

Fig 4: Prioritisation of factors pertaining to perceived strengths under the domain of production and transformation.

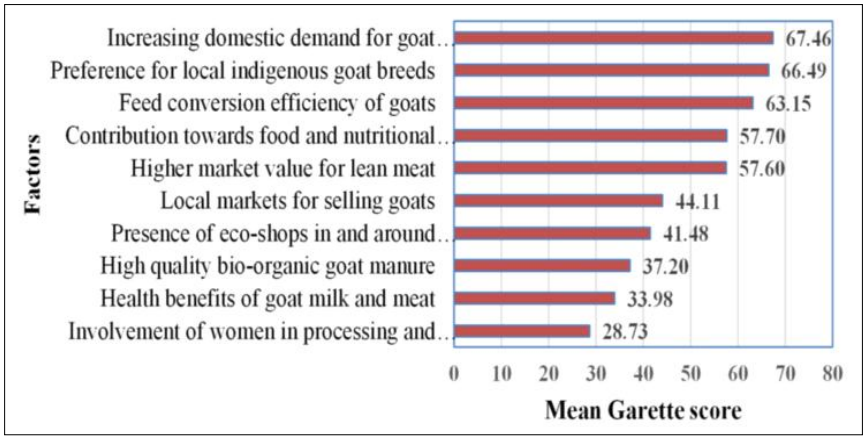

Fig 5: Prioritisation of factors pertaining to perceived strengths under the domain of marketing and consumption.

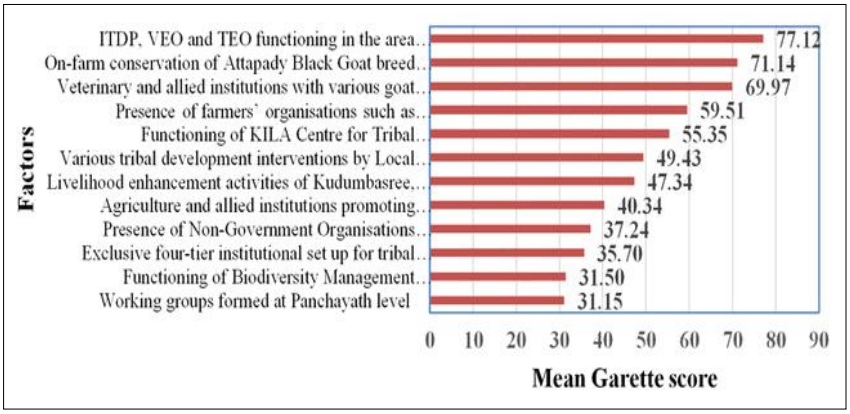

Fig 6: Prioritisation of factors pertaining to perceived strengths under the domain of governance.

Fig 7 to 11 reflect the perceived importance of weaknesses of the production ecosystem of Attapady Black goat across various domains. The key weaknesses identified across domains included declining population of the breed, alcoholism and ill health among tribal producers, genetic dilution from indiscriminate crossbreeding, exploitation by informal market intermediaries and poor communication facilities. These were followed by overuse of local biodiversity, declining interest of youth in traditional rearing, producers' inability to ensure regular supply of pure-bred meat, the remoteness of areas where pure goats are reared and continued exploitation by middlemen. Uncontrolled natural mating with non-descript bucks has significantly eroded genetic purity (Venkatachalapathy *et al.*, 2020).

Declining interest among the educated youth and ill health among elders have reduced the number of traditional goat keepers (Nair and Saisree, 2021). The absence of

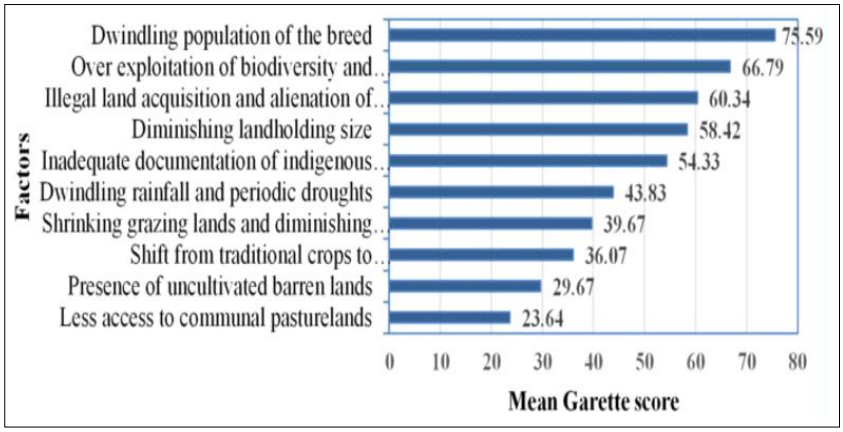

Fig 7: Prioritisation of factors pertaining to perceived weaknesses under the domain of territory and biodiversity.

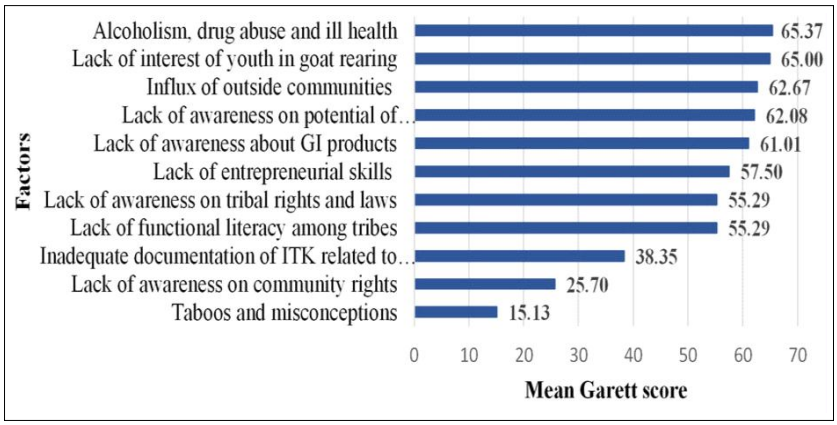

Fig 8: Prioritisation of factors pertaining to perceived weaknesses under the domain of knowledge and practices.

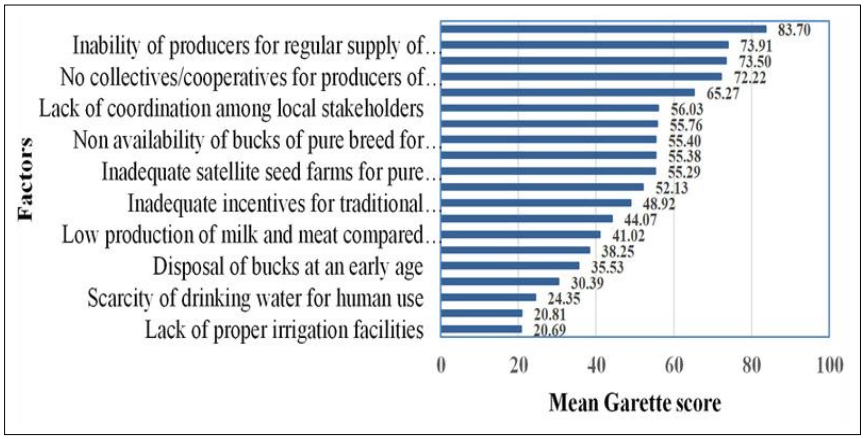

Fig 9: Prioritisation of factors pertaining to perceived weaknesses under the domain of production and transformation.

organised producer groups, limited veterinary outreach, lack of quality breeding stock, weak infrastructure and inadequate transport and disease-control measures were also reported to be persistent concerns (Chakrabarty and Gupta, 2017; M andi *et al.,* 2023).

Fig 12 and 13 illustrate the perceived importance of opportunity factors across the domains. Respondents noted several policy and institutional opportunities that could support GI enabling of the breed and its products. Among socio-economic and environmental context, the top ranked opportunities were the growing trend of forming entrepreneur associations and farmer producer organisations (FPOs), followed by recognition of Western Ghats as a biodiversity hotspot.

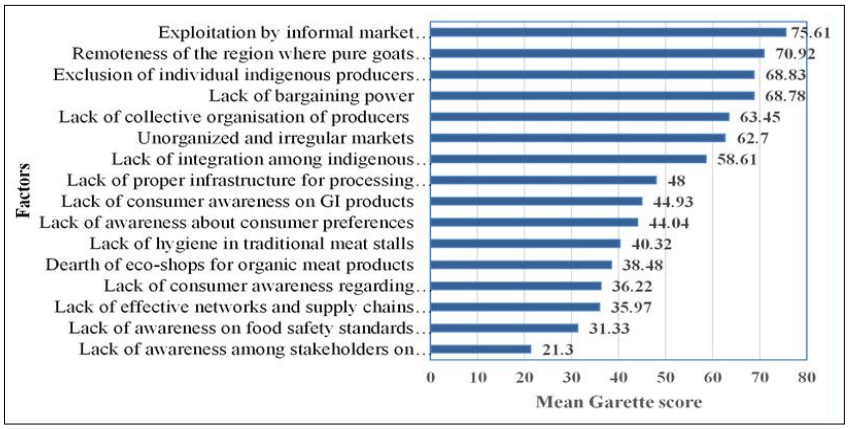

Fig 10: Prioritisation of factors pertaining to perceived weaknesses under the domain of marketing and consumption.

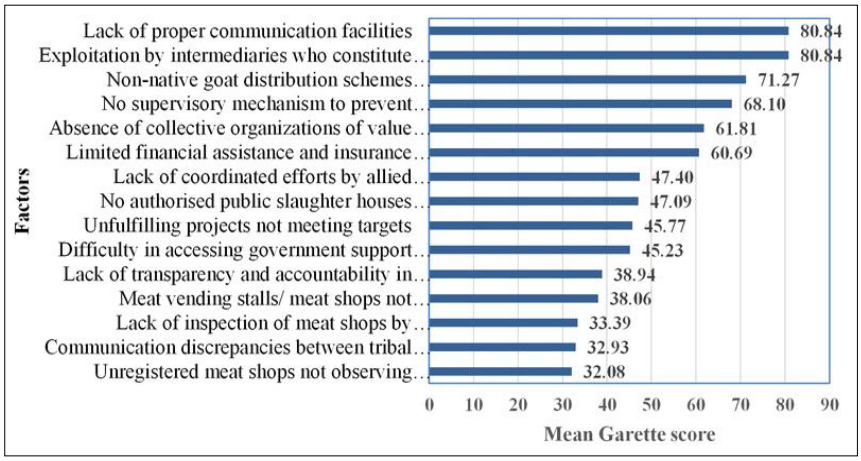

Fig 11: Prioritisation of factors pertaining to perceived weaknesses under the domain of governance.

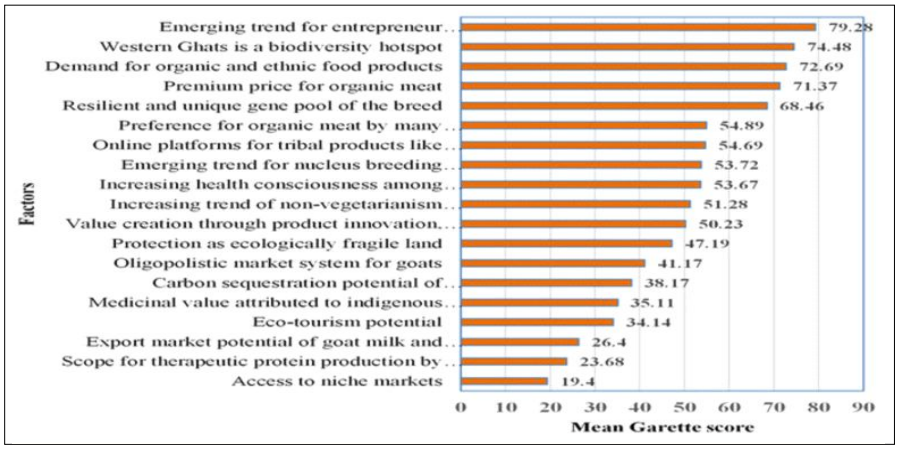

Fig 12: Prioritisation of factors pertaining to perceived opportunities under the domain of socio-economic and environmental context.

In the domain of policies, programmes and outside organisations, the Geographical indications of Goods (Registration and Protection) Act emerged as the most significant opportunity, as it provides a legal framework for protecting indications that identify a product as originating from a specific geographical area (Ghritalhare *et al*., 2025). The Geographical Indications of Goods (Registration and Protection) Act, 1999 recognises livestock under Class 31 (live animals) and Class 29 (meat), enabling registration of both the breed and its meat products. Organic certification systems such as National Programme for Organic Production (NPOP) and Participatory Guarantee System (PGS)-India, support of Agricultural and Processed Food Products Export Development Authority (APEDA) for traceability and export promotion and recent reductions in GI registration fees further facilitate the process (GoI, 2023). National and state initiatives such as10,000 FPO scheme, make in India, One District One Product (ODOP), Particularly Vulnerable Tribal Groups Mission (PVTG) Mission aligned with Pradhan Mantri Janjati Adivasi Nyaya Maha Abhiyan (PIB-GoI, 2023), Jaiva Keralam, ST youth entrepreneurship schemes, Tribal Cooperative Marketing Development Federation of India (TRIFED) marketing platforms and Micro, Small and Medium Enterprises (MSME) support for GI registration, create an enabling environment (GoI, 2021).

Fig 14 and 15 present the perceived importance of threats across the studied domains. Man-animal conflict emerged as the most critical threat, with predation by wolves, tigers

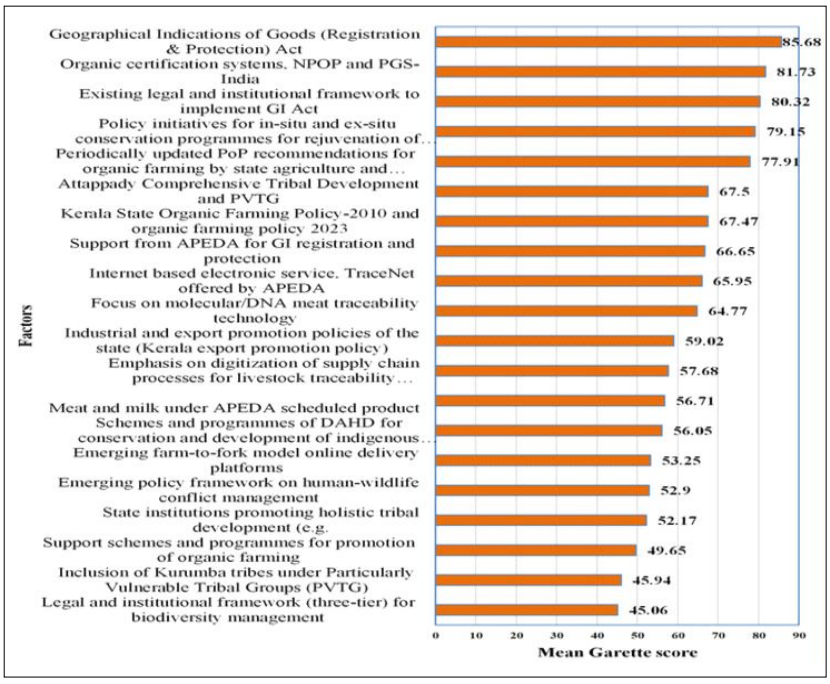

Fig 13: Prioritisation of factors pertaining to perceived opportunities under the domain of policies, programmes and outside organisations.

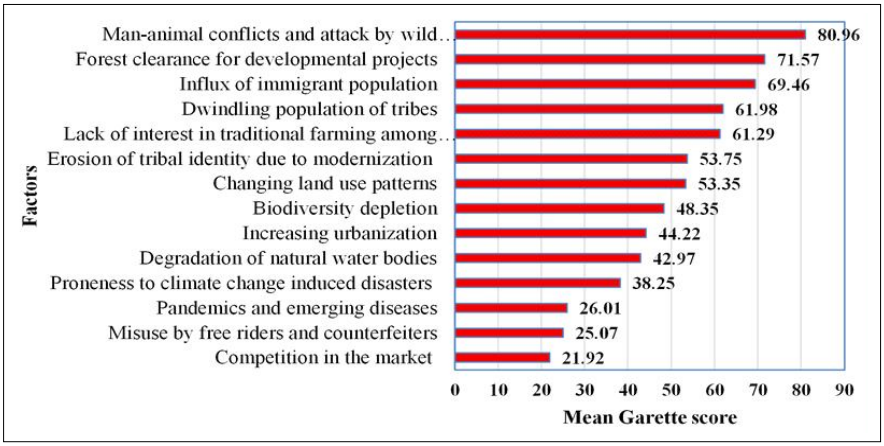

Fig 14: Prioritisation of factors pertaining to perceived threats under the domain of socio-economic and environmental context.

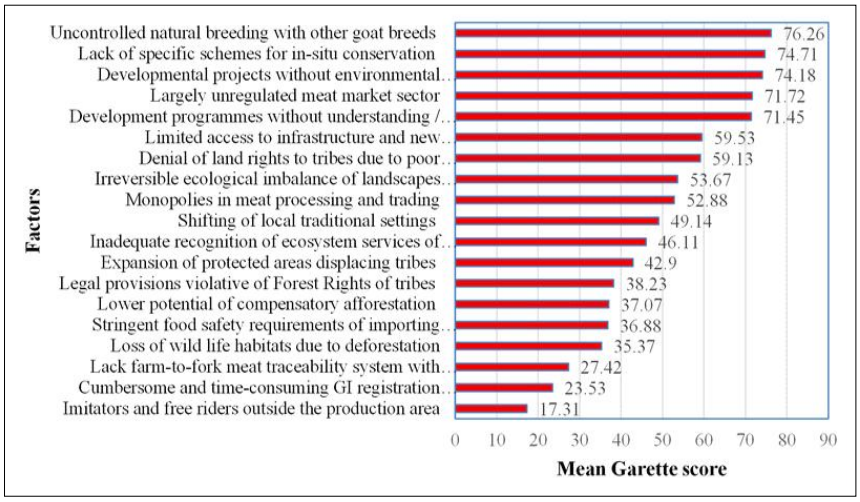

Fig 15: Prioritisation of factors pertaining to perceived threats under the domain of policies, programmes and outside organisations.

and wild boars and crop damage by elephants common across Attapady. Although mitigation measures such as *Jagratha Samithis* and fencing exist, conflicts persist due to ecological pressures and weak coordination. Habitat alteration, forest clearance for development, soil erosion, erratic rainfall and climate-related stresses threaten the production system (Alex *et al.*, 2016; Anon., 2024). Restrictive land-use regulations, unclear forest rights and l and alienation have further reduced grazing access (Sugathasakthivel *et al.*, 2019; Kozhisseri and Rajan, 2020; ITDP, 2024).

Genetic erosion remains a major threat due to uncontrolled cross-breeding facilitated by development schemes introducing non-native breeds (Venkatachalapathy *et al.*, 2020; s risk. Inadequate reporting systems, market information asymmetry and weak traceability present significant challenges for future GI-based market access.

CONCLUSION

The production ecosystem of Attapady Black goats exhibits strong GI-enabling characteristics, including ecological specificity, indigenous knowledge systems, unique breed traits and emerging institutional support structures. However, substantial weaknesses, particularly genetic erosion, declining populations, socio-economic vulnerabilities and ecological constraints, necessitate urgent conservation-oriented interventions. Opportunities from policy frameworks, FPO emergence, organic certification and national GI promotion initiatives provide promising avenues to strengthen the prospective GI value chain. Addressing critical threats such as man–animal conflict, habitat degradation and cross-breeding is essential to ensure long-term sustainability and successful GI registration.

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Disclaimers

The views and conclusions expressed in this article are solely those of the authors and do not necessarily represent the views of their affiliated institutions. The authors are responsible for the accuracy and completeness of the information provided, but do not accept any liability for any direct or indirect losses resulting from the use of this content.

Ethical approval and informed consents

The approval to conduct this study was obtained through the following permissions: Proceedings of the Kerala Veterinary and Animal Sciences University with Approval No. KVASU/DAR/A2/440/2023(2) dated 05/10/2023; research grants approval of the Dean, College of Veterinary and Animal Sciences, Mannuthy through Order No. CVAS/ MTY/ACAD- 3/6689/ 2023 dated. 07.12.2023. Permission letters from Nodal Officer, Attapady (RDOOTP/2315/2023-A1 dated 06.11.2023 and 16.12.2023) and from Project Officer, Integrated Tribal Development Project (ITDP), Attapady (E-4825/2022 dated 27.11.2023 and 27.12.2023), along with verbal consent obtained from respondents in the tribal hamlets, constituted the informed consents for the study.

Conflict of interest

The authors declare that there are no conflicts of interest regarding the publication of this article. No funding or

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