Fodder Grass-Based Agroforestry Systems: For Livestock Productivity and Sustainability

Nishma Dechamma T M[1]* and Venkatesh L[2]

[1,2]*Department of Silviculture and Agroforestry, College of Forestry, Sirsi, Karnataka*

Corresponding Author
Nishma Dechamma T M
Email: tmnishmadechamma@gmail.com

OPEN ACCESS

Keywords

Agroforestry, Livestock, Sustainability

How to cite this article:

Dechamma, T. M. N. and Venkatesh, L. 2025. Fodder Grass-Based Agroforestry Systems: For Livestock Productivity and Sustainability. *Vigyan Varta* 6(4): 183-186.

ABSTRACT

India, with the world's largest livestock population, faces a critical fodder shortage that hampers productivity and rural livelihoods. Fodder grass-based agroforestry systems offer a sustainable solution by integrating trees, grasses, legumes and crops to ensure year-round fodder availability while enhancing soil fertility, reviving fallow lands and utilizing farm bunds and orchard spaces. Diverse models like silvopasture, horti-pasture and homegardens adapt well across agro-climatic zones, contributing to carbon sequestration, soil and water conservation and improved microclimates. Well-managed systems can double yields, increase crude protein content and buffer against climate extremes. The integration of alternatives such as hydroponics, Azolla, Moringa and fodder cactus further strengthens fodder security during lean periods. Beyond providing fodder, these systems support biodiversity, boost rural economies and build climate resilience. Supported by national policies and missions, fodder-based agroforestry is not just an option but a necessity for ensuring livestock sustainability. With strategic planning, farmer outreach and knowledge dissemination, this approach can transform livestock productivity, strengthen rural livelihoods and promote environmental stewardship across India.

INTRODUCTION

Agriculture and animal husbandry are deeply interconnected and mutually supportive. Livestock like oxen provide draught power for ploughing and their manure enhances soil fertility, boosting crop productivity. In return, crop residues serve as essential livestock feed. Animal husbandry also offers a steady income through milk, meat and wool, unlike seasonal agriculture, and acts as insurance during crop failure. When integrated with site-specific multi-purpose tree species, this system evolves into agroforestry, enhancing income, food security, nutrient cycling and ecological balance. India has the largest livestock population globally, about 535.78 million, comprising 20.4% small ruminants, 12.5% cattle and 56.7% of the world's buffaloes, growing at 1.21% annually. Livestock contributes 4.11% to GDP and 25.6% to Agriculture GDP. Despite leading in milk production (140 million tons annually), productivity remains 20–60% below global averages. Cattle productivity in 2019-20 was 1777 kg per animal annually compared to the global average of 2699 kg. Key constraints include inadequate feeding (50.2%), breeding issues (21.1%), diseases (17.9%) and poor management (10.5%) (Shahina et al., 2023). Fodder shortage results from land pressure for food grains and neglect of fodder crops. Rangelands are declining due to overuse and climate stress, with 50% of the world's 54% rangelands vulnerable to degradation (UNCCD, 2024). India grows green fodder on 8.4 m ha, just 5.23% of total area, which has remained static for decades. Ideally, 16–17% of land should be used for fodder, but IGFRI estimates deficits of 35.4% in green and 10.9% in dry fodder, projected to grow at 1.23% annually (Kumar *et al.,* 2023). Fodder grasses like hybrid napier, guinea and para grass, and legumes like cowpea and cluster bean, offer crude protein, fibre and omega-3s, reducing reliance on costly concentrate feeds and improving livestock output. Fodder types include green fodder (e.g. napier grass, maize, sorghum), dry fodder (e.g. paddy straw) and processed fodder (e.g. pelleted feed, neem cake). Ensuring year-round fodder requires integrated production models, especially during lean periods. IGFRI promotes crop intensification and integration of annual and perennial fodder species using mixed and sequential cropping for continuous supply.

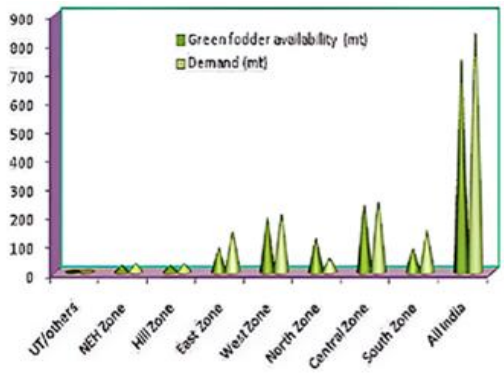

Fig. 1: Availability and demand scenario of green fodder in different agroclimatic zones of India (Source: Kamradi *et al.,* 2017)

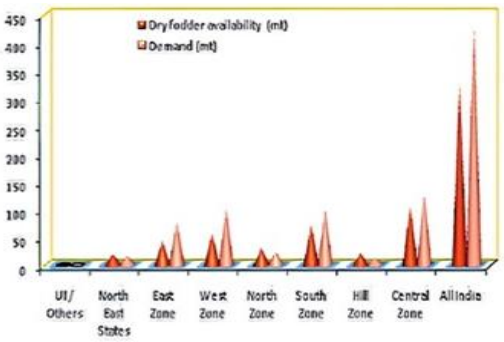

Fig. 2: Availability and demand scenario of dry fodder in different agroclimatic zones of India (Source: Kamradi *et al.,* 2017)

Strategies to Overcome Fodder Deficit:

- **Integrating Fodder Crops in Farmlands:** Fodder grasses like Hybrid Napier can be grown alongside traditional crops (e.g., cowpea) or between crop cycles (e.g., fodder bajra–lucerne rotation) to optimize land use and maintain soil health.

- **Fodder-Based Agroforestry Systems:** Agroforestry spaces such as inter-rows in plantations or orchards (e.g., Hybrid Napier under *Melia dubia*, Guinea grass in mango/sapota orchards) offer ideal niches for fodder cultivation.

- **Utilizing Waste and Fallow Lands:** Farm boundaries, bunds and pond embankments can be used for fodder cultivation, minimizing weed growth and maximizing land productivity.

- **Fodder Preservation:** Hay (sun-dried fodder) and silage (fermented green fodder) ensure feed availability during lean periods.

- **Non-Conventional Fodder Species:** Region-specific species like moringa, fodder cactus (*Opuntia spp.*) and mulberry (*Morus alba*) are nutrient-rich and suitable for drought-prone areas.

- **Alternative Feed Sources:** Azolla (rich in protein and minerals), hydroponic fodder (quick-growing in controlled setups) and fodder beet (dual-use crop with high yield) are promising alternatives during feed shortages.

Region wise fodder-based systems

Fodder grass-based agroforestry systems provide an integrated solution to fodder scarcity while improving productivity and ecosystem services. Region-specific models like the silvopastoral system in Kerala (Varsha *et al*., 2019) yielded 48 Mg ha^{-1} of dry fodder, 6.3 Mg ha^{-1} crude protein and 147 Mg ha^{-1} carbon storage. In Rajasthan, an agri-silvi-pastoral system with trees and Sewan grass produced 16.74 t/ha green fodder and 915 kg/ha cluster bean grain (Sharma, 2015). In Uttar Pradesh, horti-pasture systems under kinnow orchards supported livestock for 116 days using just 0.18 ha space (Ghasal *et al*., 2024), while in Kerala homegardens, Napier grass showed high yield under partial shade. Silvopasture also improved livestock performance goats gained 28.6 g/day versus 10.8 g/day in grasslands (Mahanta, 2013). These systems reduce feed costs, enhance carbon sequestration, mitigate methane emissions and increase climate resilience. Government initiatives like the National Livestock Mission and Dairy Entrepreneurship Development Scheme support silvipasture and fodder banks, while IGFRI and FPOs promote region-specific fodder strategies.

CONCLUSION

Fodder grass-based agroforestry systems offer a resilient and sustainable strategy to ensure livestock productivity in India. By integrating trees, shrubs, legumes and grasses, these systems provide year-round, nutrient-rich fodder, reduce production costs and enhance ecological balance. Adoption of such systems, supported by policy frameworks and farmer awareness, is essential for achieving food and fodder security while mitigating climate change effects.

REFERENCES

Ghasal P C, Ravisankar N, Debashis Dutta, Amit Nath, Samander Malik, Prusty A K, Poonam Kashyap, Shamim M and Panwar A S, 2024, Productivity and quality of different rabi fodder crops under Kinnow mandarin based hortipasture system. *Range Management and Agroforestry*, 45(1): 167-170.

Kamardi, S, Shilpa Shree J, Vankayala, J and Achoth, L, 2017, District wise demand and supply of fodder (Crop Residues) production in Karnataka - A gap analysis. *International Journal of Livestock Research.* 7(7): 123-131.

Kumar S, Preeti Singh, Uma Devi, Yathish K R, Saujanya P and Mahanta S, 2023, An overview of the current fodder scenario and the potential for improving fodder

productivity through genetic interventions in India. *Animal Nutrition and Feed Technology*, 23(3): 631-644

Mahanta S K, 2013, Grazing management and silvopasture systems for raising small ruminant production. *Indian Journal of Agroforestry*, 15(1): 12-21.

Shahina N N, Asha K Raj and Sarath S, 2021, Understorey light availability and productivity of selected fodder grasses in homegardens of Kerala. *Journal of Agriculture and Technology*, 8(1&2): 31-38.

Sharma K C, 2015, Performance of different grain legumes and pasture grasses under agri-silvi-pastoral system in arid tropics of India. *Range Management and Agroforestry*, 36(1): 41-46.

Varsha K M, Asha K Raj, Kurien E K, Betty Bastin, Kunhamu T K and Pradeep K P, 2019, High density silvopasture systems for quality forage production and carbon sequestration in humid tropics of Southern India. *Agroforestry Systems*, 93(1): 185-198.