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EXAMINING POTENTIAL OF FODDER PROMOTION IN WESTERN HIMALAYA: A SMALL NOTE

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SUMMARY

Livestock rearing has served as the foundation of the Himalayan economy for generations, acting as the main source of energy for agricultural activities and animal protein for the local population. The current situation presents a challenge in terms of adequate fodder supply, with limited options for alternative resources due to land scarcity in the region. The focus on maximizing forage production aims to address periods of scarcity caused by extreme weather conditions, particularly during winter (December to January) and summer (May to June). Given the rising demand for fodder in the Western Himalaya, exploring various alternatives becomes crucial to meet the needs of livestock and close the gap between supply and demand. Enhancing these alternatives not only alleviates the burden on women but also contributes to soil enrichment, slope stability, and potentially curbing migration. However, the availability of alternative fodder remains a challenge in the region due to small land holdings and inadequate Crop Residue Fodder (CRF) supply. While traditional grasses are still relied upon, the increasing demand necessitates a shift towards alternative fodder resources to sustain livestock. Our analysis highlights the importance of exploring different fodder options to address the demand-supply gap in animal feeding systems.

Key words: Crop Residue Fodder, fodder supply, fodder demand and tree leaves fodder

The livestock sector in India plays a crucial role in the country's agricultural output, with the rural economy heavily dependent on livestock production. A significant disparity exists between the demand for fodder in rural areas and the actual production of fodder, leading to shortages of green fodder (36%), dry fodder (40%), and feed concentrates (57%). According to the Planning Commission (2001), there is a projected deficit of over 60% in green fodder and over 20% in dry fodder.

TABLE 1
Projection of fodder supply and requirement in India

Year	Deficit as % of Demand (actual demands)	
	Green	Dry
2015	63.50 (696)	23.56 (143)
2020	64.21 (728)	24.81 (157)
2025	64.87 (759)	24.92 (162)

Source: Draft report of the working group on animal husbandry and dairying for five year plan (2002-07), Planning Commission, Govt. of India, August-2001.

Plant biomass serves various purposes in developing nations with weaker power sectors. In these regions, individuals rely on conventional fodder sources such as grasses and agricultural residues. However, with the growing need for fodder driven by the high demand for dairy products, there is a necessity to explore alternative fodder resources to support the livestock cycle. This review assesses the suitability of alternative fodder resources in the Western Himalaya region in the current context.

Fodder: Current Setup

Numerous species thrive in the Himalayan rangelands, yet some have not received adequate attention from previous researchers due to lack of management. These rangelands cover about half of the world's land surface, with some estimates suggesting that 70% of the total global area consists of rangelands. The Himalayan region boasts a wide range of rangeland ecosystems, which play a crucial role in supporting the livestock industry, serving as vital watershed areas, and offering valuable and diverse biological resources.

Rangeland Fodder Diversity

The Western Himalaya boasts a diverse range

of wild plants with fodder value, some of which can be seen growing on the steep slopes of fields or along the edges of hill agriculture. These plants are crucial in preserving the ecological balance of the region, as highlighted by Gaur (1999), as they create a buffer zone between two crop fields, counteracting the impacts of cultivated plants.

The plants growing in the border area of the fields check soil and water erosion (Gaur 1999). Singh *et al.* (2008) evaluated several rangeland fodder species in Western Himalaya and some of these are *Artemisia nilagirica*, *Arthraxon lanceolatus*, *Arthraxon prionodes*, *Arundinella bengalensis*, *Arundinella nepalensis*, *Barleria cristata*, *Bidens biternata*, *Bidens pilosa*, *Boehmeria platyphylla*, *Bupleurum hamiltonii*, *Capillipedium parviflorum*, *Crotalaria albida*, *Cyperus corymbosus*, *Cyperus monocephalus*, *Cyperus nutans*, *Cyperus rotundus*, *Desmodium laxiflorum*, *Desmodium microphyllum*, *Digitariaa dscendens*, *Erigeron bonariensis*, *Galiuma parine*, *Galiume legans*, *Girardinia diversifolia*, *Impera tacylindrica*, *Leptodermis lanceolata*, *Oplismenu scompositus*, *Panicuman tidotale*, *Panicum miliaceum*, *Panicum psilopodium*, *Pennisetum orientale*, *Polygonum capitatum*, *Polygonum hydropiper*, *Pouzolzia zeylanica*, *Rubia manjith*, *Rubus ellipticus*, *Rumex dentatus*, *Rumex hastatus*, *Saccharum bengalensis*, *Saccharum spontaneum*, *Salvia hians*, *Sperma dictyonsauveolens*, *Thalictrum foliolosum*, *Themeda anathera*, *Urtica dioica*, etc.

Tree Leaves Fodder

The scientific community has recognized the crucial role of trees and shrubs in livestock production in developing countries, as highlighted by Swaminathan (1989). Singh (1984) reviewed the work in India, evaluating a large number of species for their fodder value. Tree leaf fodder is an important source of supplementary protein, offering an alternative source of livestock feeding and the potential to fulfil fodder shortage and nutritional deficiency (Cheema *et al.,* 2011). These trees and shrubs provide green leaves fodder, especially during periods of grass fodder scarcity. Fodder production is limited by climatic extremes, leading to critical shortages in winter (Dec. to Jan.) and summer (May to June). Fodder tree leaves are an alternative source of livestock feeding and have the potential to alleviate some of the feed shortages and nutritional deficiencies for small ruminants, an important component of goats and sheep diets (Kamalak *et al.,* 2004). Trees forage is used as protein and energy sources for small ruminants (Singh *et al.,* 1989) because the secondary plant compounds (Tannins) present in tree leaves enable the ruminants to receive higher levels of dietary protein at post rumen for digestion and absorption (Leng, 1997). Trees and shrubs are an important source of supplementary protein, vitamins, and minerals in developing countries (Baumer, 1992).

Tree fodders contain high levels of protein and minerals in comparison to grasses, making them a suitable supplement for low-quality grasses (Agang and Tshwenyane 2003). The crude protein values of different fodder species were evaluated by different researchers and are listed in Table 2.

Agroforestry Fodder

Trees and forests have long been viewed as a fundamental aspect of Indian culture. The Himalayan agroforestry system boasts numerous tree species, with a majority of them being leguminous. These leguminous trees play a crucial role in rejuvenating depleted land by enhancing nutrients through nitrogen-fixing, as well as accessing water from deep underground sources to endure periods of drought. Throughout the Himalayas, tree fodder is primarily

TABLE 2
Crude Protein Value of some tree fodder species of Himalaya

Species	Crude Protein (% of Dry Matter)	Source
Acacia spp.	23	Jones and Wilson, 1987
Celtis australis	15.5	Chanda and Bhaid, 1987
Ficus isleta	7.3	Chanda and Bhaid, 1987
Grewia oppositifolia	16.4	Chanda and Bhaid, 1987
Melia azadarach	21.8	Gohl, 1981
Morus alba	19.6	Kundu and Sharma, 1988
Quercus leocotrichophora	10.2	Chanda and Bhaid, 1987
Terminalia arjuna	9.9	Chanda and Bhaid, 1987

TABLE 3
Some important Agro-forestry tree species of Western Himalaya

Tree Species	Altitudinal range (m)	Feeding season	Nature
Albizia chinensis	300-1500	S	D
Alnus nepalensis	1200-2700	W	D
Bauhinia purpurea	300-800	S	D
Bauhinia racemosa	300-600	S	D
Bauhinia retusa	300-1200	S	D
Bauhinia variegate	300-1800	S, R, A	D
Celtis australis	1600-2700	S	D
Celtis eriocarpa	900-1800	S	D
Celtis tetrandra	300-1800	W,S	D
Cordia vestita	300-1200	W,S	D
Cordia oblique	Upto 1500	W,S	D
Dalbergia sericea	600-1500	S	D
Debregeasia longifolia	600-1500	W,S	E
Debregeasia salicifolia	800-2100	W,S	E
Diploknema butyracea	Upto 1200	W	D
Emblica officinalis	Upto 1500	S	D
Ficus glomerata	Upto 900	S,W	D
Ficus hispida	Upto 1200	W,S	E
Ficus nemoralis	1200- 2000	W,S	SD
Ficus rumphii	Upto 1200	W,S	D
Ficus semicordata	Upto 1500	Th	E
Ficus subincisa	500-1500	Th	E
Grewia elastic	Upto 1500	W,R	E
Grewia oppositifolia	300-1200	W	E
Ilex dipyrena	1500-3000	W	E
Madhuca indica	Upto 1000	S	D
Mallotus philippensis	Upto 1500	S	E
Melia azedarach	Upto 1500	S	D
Morus laevigata	300-600	W,S	D
Morus serrata	1000-2700	W,S	D
Ougeinia oojeinensis	300-1500	Th	SD
Pistaciain tegerrima	600-1800	S,R,A	D
Kydia calycina	Upto 1200	S	D
Populus ciliate	1800-3000	S	D
Prunus cerasoides	600-2100	S	D
Prunus cornuta	2000-3600	S	D
Prunus undulate	1400-2700	S	D
Pyrus foliolosa	2700-3900	S	D
Quercus floribunda	2000-2700	W	E
Quercu glauca	900-2000	W,S	E
Quercus leucotrichophora	1200-2600	W,S	E
Quercus serrata	1000-1800	S	D
Robinia pseudo-acasia	1000-1600	S	D
Salix acmophylla	500-1800	S	D
Salix wallichiana	1800-3200	S	D
Saurauia napalensis	900-1800	Th	E
Sterculia pallens	Upto 1400	S	D
Trema orientalis	600-1500	Th	E
Trema politoria	300-1500	Th	E
Ulmus wallichiana	1500-2800	S, R	D

Source: Samant, www.fao.org/WAICENT/faoINFO/AGRICULT/AGP/.../109.doc (E= Evergreen; D = Deciduous; SD = Semi-deciduous; W = Winter; S = Summer; R= Rainy; A = Autumn; Th = Throughout year).

utilized as a supplementary feed to bridge the gap in livestock nutrition during times of scarcity and severe droughts.

In the Himalayas, approximately 37.8% of fodder is obtained from various sources such as agroforestry systems, low altitude grasslands, degraded lands, high altitude grasslands, and crop residues (Singh et al., 1988). This diverse range of fodder resources highlights the richness of the agroforestry system in the Himalayas. The majority of tree fodder species within the agroforestry system are leguminous, possessing the ability to enhance soil fertility by providing essential nutrients. Consequently, they play a crucial role in supporting other crops. Additionally, this tree species exhibit resilience to drought conditions, ensuring a continued supply of fodder for livestock during times of scarcity.

The Way Forward

In the current scenario of increasing demand for fodder in the Himalayas, exploring alternative fodder options could help bridge the gap between supply and demand. By enhancing the production of alternative fodder on rangelands and farmlands, we can not only support the dairy sector in the Western Himalayas but also bolster the local economy in the long term. To effectively implement the alternative fodder system, it is important to identify underutilized resources with high nutritive value and digestive potential. Additionally, organizing Information, Education, and Communication activities targeted at women's groups, who are key stakeholders in the livestock cycle, is crucial. Connecting the fodder promotion program with afforestation, reforestation, and CAMPA programs is essential. Strengthening breeding programs for tree species, ensuring the distribution of quality germplasms, and promoting maximum forage production are also important. Furthermore, efforts should be made to conserve fodder species both in-situ and ex-situ, and research should be promoted to develop a suitable combination of tree-crop for a less competitive land-use system.

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