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Agroforestry: A way to conserve MPTs in North Western Himalaya

Yadav R.P. and Bisht J.K.
Vivekananda Parvatiya Krishi Anusandhan Sansthan (ICAR), Almora-263601, INDIA

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Abstract

The North Western Himalayan region is rich in fodder tree species which are traditionally maintains in agriculture fields as an indigenous agro-forestry. The fodder produced from arable land alone, cannot support a large livestock population. Tree fodder is valuable in the hills particularly during winter and summer months when very less availability of green fodder in both quantity and quality. Agroforestry can be a good step to check deforestation and erosion in the hills. It can reduce the dependence on the forest by meeting the requirement of forage, timber and fuel wood locally. Agroforestry will help in Himalayan region to endorse the socio-economic improvement of the people of hills in harmony with safeguarding of ecological balance. In present paper a list of multipurpose tree species (MPTs) is presented with their concise description on their uses, nature and distribution, which are appropriate for agroforestry.

Keywords: Agroforestry, Himalaya, livestock, tree fodder, quality, MPTs, conservation.

Introduction

In the North West Himalaya, livestock is the integral part of environment and economy especially in the rural areas. Indian Himalaya is known for its unique physiographic, climatic conditions, soil characteristics and biological diversity. Agroforestry can play foremost role in shielding environment and forest[1,2]. The agroforestry practices in the hills of Uttarakhand in Western Himalayan region is eternal characteristic of farming landscape[3,4]. People have little alternative in collection of plants and whatever grows in nature is accepted. The farmers have incorporated crops, trees and livestock in their agricultural and land management systems realistically for solving the crisis of severe shortages of fuel wood, forage and other forest produce[5]. Therefore, the key objective of the action oriented research in Himalayan region is to support the socio-economic upliftment of the hill people in harmony with safeguarding of ecological balance. It should envision protection and utilization of ecosystem of Himalayan region under the thrust area such as, soil, water and fodder resources.

A huge farm animal's population can not be maintained on the forage produced on arable land alone. Therefore, to sustain healthy livestock, farmers have to mostly depend on the forest resources[6]. Himalayan forage resources usage pattern is very scattered and diffused. The major source of fodder in the Himalayas is forest, grasslands, agriculture and agroforestry systems. Farmers maintains naturally regenerating tree species, particularly on the terraces of farming fields and it's termed as indigenous agroforestry system. Tree fodder is valuable in the hills especially during winter and summer months when very less availability of green forage in both quantity and quality. Nearly 279 tree species have been reported in the western Himalayas[7], which have been used to feed livestock. The meager quality of fodder is insufficient to keep up the body weight of livestock[8].

Agroforestry can be a good step to check deforestation and erosion in the hills. It can meet up the requirement of fodder, timber and fuel locally and thus diminish the dependence on the forest. So far in the plantation activity large numbers of exotics constitute 90% of plantation programme, which may comprise a menace to the ecological safety of the region and unfit for the local requirements. Numerous tree species are utilized for forage purposes in hilly region of North Western Himalaya. In this manuscript, the study presented an inventory of fodder trees which are aboriginal to hilly region of North Western Himalayan region and apt for agroforestry.

Material and Methods

The study covers the whole hilly region of Uttrakhand, which lies in between 28'44" N to 31'28" N latitude and 77'35" E to 81'01" Elongitude. Physiographically, the entire landscape is hilly and can be divided in to three zones lower Himalayan zone, middle Himalaya and upper Himalaya. The study is based on extensive surveys of the literature and studies carried out by the author in the area during diverse seasons in a range of zones of the area. A provisional list of fodder trees was compiled which incorporated more than 80 trees species with descriptions on their adaptation and use. Multiple utility of the species based on the use of the species. The credentials of species was done with the help of regional floras[9-14]. The description includes botanical names, vernacular/common names, phenology (Flowering/ Fruiting), distribution (altitude), nature, feeding season and uses of plants other than fodder.

Results and Discussion

The present study records 82 fodder tree species in the hills of NW Himalaya. Majority of the woody species is managed through lopping/pollarding/cutting for fodder except some spiny species, which are usually browsed by sheep and goats, rarely by cattle. The fodder availability remains through out the year, particularly during winter months by evergreen trees and during summer months by deciduous trees. With the increase in altitude, the species richness as well as the human and livestock population decreases[15]. The utilization pattern of fodder species varies with altitude and from season to season according to availability of species in respective to altitude and season. All these fodder tree species is distributed in forests, grasslands, meadows and agroforestry systems. The nutritive worth of a fodder species is determined by its capability to provide a range of nutrients required by the animals for maintenance, growth, production and reproduction. It is related to intake, chemical composition, digestibility and the presence or absence of anti nutritional factors[16]. The various parts of these species are also used as food for human's medicine, fuel, timber and various other purposes and these species are classified as multipurpose species. The fodder tree species need proper conservation and management strategies whose regeneration potential is lost due to habitat degradation and their population is decreasing.

On the basis of appraisal conducted, it is fairly clear that agroforestry is though practiced but by and large is an unplanned activity in Garhwal and Kumaon of Western Himalayan region. Inhabitants have a preference to collect fodder for their farm animals in the area of their farming land, but rarely plant a tree. They anchorage and patronize trees which in nature grow and have no option on their selection. In general, the rule of natural selection and adaptableness governs the distribution. On the basis of study most frequently used fodder trees were identified in the whole hills of Uttrakhand in N-W Himalaya. The concise portrayal of the plants is presented as following:

Fodder trees:

1. *Acer caesium* Wall. ex Brandis, Vern. Kainjal, F. Aceraceae, upto 1500-3000 m; Fl. Mar.-May, Fr. Jul.-Oct.; Fs. winter and summer; Na. deciduous; Uses: Fodder, Fuel, House building.
2. *Acer oblongum* Wall., Vern. putali, F. Aceraceae, upto 500-2100 m; Fl. Feb.-Mar., Fr. Dec.-Apr.; Fs. winter and summer, Na. evergreen; Uses: Fodder, Fuel.
3. *Adina cordifolia* (Roxb.) Benth. & hook. f., Vern. Haldu, F. Rubiaceae, upto 1000 m; Fl. Mar.-May, Fr. May-Jul.; Fs. summer, Na. deciduous; Uses: Fodder, Fuel, House building.
4. *Aesculus indica* (Wall. Ex Camb.) Hook., Vern. Pangar, F. Sapindaceae, upto1500-2800 m; Fl. May-Jun., Fr. Sept.-Dec.; Fs. winter and summer, Na. deciduous; Uses: Fodder, Medicinal, Edible Fruit.
5. *Alangium salviifolium* (L.f.) Wangerin, Vern. Ankol, F. alangiaceae, upto 900-1800 m; Fl. Feb.-Apr., Fr. Apr.-Jul.; Fs. summer, Na. deciduous; Uses: Fodder, Medicinal.
6. *Albizia chinensis* (Osbeck) Merrill, Vern. Kala Siras, F. Mimosaceae, upto 300-1500 m; Fl. Mar.-May, Fr. Sept.-Jan.; Fs. summer, Na. deciduous; Uses: Fodder, Fuel, Timber
7. *Albizia lebbeck* (L.) Benth., Vern. Siris, F. Mimosaceae, upto 1000 m; Fl. Feb.-Apr., Fr. Oct.-Dec.; Fs. summer, Na. deciduous; Uses: Fodder, Fuel, Timber, Nitrogen fixing.
8. *Albizia procera* (Roxb.) Benth., Vern. Safed Siris, F. Mimosaceae, upto 900 m; Fl. May-Aug., Fr. Oct.-Feb.; Fs. summer, Na. deciduous; Uses: Fodder, Fuel, Timber, Medicine, Nitrogen fixing.
9. *Alnus nepalensis* Don, Vern. Uteesh, F. Betulaceae, upto1200-2700 m; Fl. Oct.-Nov., Fr. Oct.-Jun., Fs. winter, Na. deciduous; Uses: Fodder, Fuel, Timber and Nitrogen fixing.
10. *Anogeissus latifolia* (Roxb. ex DC.) Wall. ex Guill., Vern. Dhauda, F. Combretaceae, upto 1200 m; Fl. Jun.-Sept., Fr. Dec.-Mar.; Fs. summer, Na. deciduous; Uses: Fodder, Fuel, Medicine, Timber.
11. *Bauhinia purpurea* Linn., Vern. Kaniyar, F. Caesalpiniaceae, upto 300-800 m; Fl. Sept.-Nov., Fr. Jan.-Mar., Fs. Summer, Na. deciduous; Uses: Fodder, Fuel, Timber, Medicine, Nitrogen fixing.
12. *Bauhinia racemosa* Lam., Vern. Jhingora/Amli, F. Caesalpiniaceae, upto 1000-1600 m; Fl. Mar.-Jun., Fr. Jan.-May, Fs. Summer, Na. deciduous, Uses: Fodder, Fuel, Fiber, Timber, Medicine.
13. *Bauhinia retusa* L., Vern. Kachnar, F. Caesalpiniaceae, upto 1000-1500 m; Fl. Sept.-Nov., Fr. Feb.-Apr.; Fs. summer, Na. deciduous; Uses: Fodder, Fuel, Timber, Medicine, Nitrogen Fixing.
14. *Bauhinia ariegate* L., Vern. Kwiriyal, F. Caesalpiniaceae, upto 300-1800 m; Fl. Feb.-Apr., Fr. May-Aug.; Fs. Summer, rainy and autumn, Na. deciduous; Uses: Fodder, Fuel, Timber, Medicine, Nitrogen fixing.
15. *Bauhinia vahlii* Wight & Arnott, Prodr., Vern. Malu, F. Caesalpiniaceae, upto 1300 m; Fl. Apr.-Jun., Fr. Jun.-Sept.; Fs. summer, Na. deciduous; Uses: Fodder, Fuel, Fiber, Cup-plats.
16. *Betula alnoides* Buch.-Ham., Vern. Katbhoj, F. Betulaceae, upto 1500-2700 m; Fl. /Fr. Mar.-Jun.; Fs. Summer, rainy and autumn, Na. deciduous, Uses: Fodder, Fuel, Timber, Nitrogen fixing.
17. *Boehmeria rugulosa* (BR) Wedd. Vern. Genthi, F. Urticaceae, distribution 500-1600 m; Fl./Fr. Jul.-Nov.; Fs. winter and summer, Na. evergreen; Uses: Fodder, Edible, Fuel, Medicine.
18. *Bridelia Montana* (Roxb.) Willd., Vern. Gondni, F. Euphorbiaceae, upto 300-1500 m; Fl. /Fr. Aug.-Sept., Fs. Winter, Na. evergreen; Uses: Fodder, Fuel, Medicinal.
19. *Bridelia retusa* (L.) Spreng., Vern. Kaja, F. Euphorbiaceae, upto 900 m; Fl. May-Aug., Fr. Nov.-Mar.;

Fs. winter and summer, Na. evergreen, Uses: Fodder, Fuel, Medicinal.

20. *Bischoffia javanica* Blume, Vern. Kotsemla, F. Euphorbiaceae, upto 1100 m; Fl. Aug.-Nov., Fr. Feb.-Jun., Fs. Summer, Na. deciduous; Uses: Fodder, Vegetables, Fuel, Fiber, Medicine.
21. *Bombax ceiba* Linn., Vern. Semal, F. Bombacaceae, upto800-1500 m; Fl. Jan.-Mar., Fr. Apr.-May, Fs. summer, Na. deciduous; Uses: Fodder, Fuel, Fiber, Timber, Medicine.
22. *Brassaiopsis aculeata* (Buch.-Ham. ex D.Don) Buch.-Ham. ex Seem., Vern. NA, F. Araliaceae, upto 1200-1400 m; Fl. Dec.-Mar., Fr. Jun.-Aug., Fs. summer, Na. evergreen; Uses: Fodder, Timber, Medicinal.
23. *Butea monosperma* (Lam.) Kuntze, Vern. Dhak, F. Fabaceaee, upto 1500 m; Fl. Feb.-Apr., Fr. Mar.-Jun.; Fs. summer and rainy, Na. deciduous; Uses: Fodder, Fuel, Timber, Medicinal.
24. *Casearia glomerata* Roxb., Vern. Gilchi, F. Flacoutiaceae, upto 1500 m; Fl. Jan.-Feb., Fr. Mar.; Fs. summer, Na. deciduous; Uses: Fodder, Vegetable, Fuel.
25. *Callicarpa arborea* Roxb., Vern. Ghiwala, F. Verbenaceae, upto 1500 m, Fl. May-Jul., Fr. Aug.-Dec.; Fs. Winter and summer, Na. evergreen; Uses: Fodder, Agricultural tools.
26. *Celtis australis* L., Vern. Kharik, F. Ulmaceae, upto 1100-2400 m; Fl. Mar.-Apr., Fr. Sept.-Oct.; Fs. summer, Na. deciduous; Uses: Fodder, Edible fruit, Fuel, Timber, Medicine.
27. *Celtis eriocarpa* Decne., Vern. Kharik, F. Ulmaceae, upto 900-1800 m; Fl. /fr. May-Jul.; Fs. summer, Na. deciduous, Uses: Fodder, Edible, Fuel.
28. *Celtis tetrandra* Roxb., Vern. Khari, F. Ulmaceae, upto300-1800 m, Fl. Jan.-Mar., Fr. Feb.-Apr., Fs. winter and summer, Na. deciduous; Uses: Fodder, Edible, Fuel.
29. *Cordia vestita* Hook.f & Thoms., Vern. Lassuri, F. Boraginaceae, upto 300-1200 m; Fl. /Fr. Mar.-Apr., Fs. winter and summer, Na. deciduous; Uses: Fodder, Edible fruit, Fuel, Medicine.
30. *Cordia obliqua* Willd., Vern. Lassura, F. Boraginaceae, upto 1500 m; Fl. Apr.-May, Fr. Jul.-Aug.; Fs. winter and summer, Na. deciduous; Uses: Fodder, Edible fruit, Fuel, Medicine.
31. *Dalbergia sericea* G. Don, Vern. Siristi F. Fabaceae, upto 600-1500 m; Fl. Feb.-Apr., Fr. Jun.-Sept.; Fs. summer, Na. deciduous; Uses: Fodder, Fuel.
32. *Debregeasia longifolia* (Burm.f.) Wedd., Vern.Tusara F. Urticaceae, upto 600-1500 m; Fl. Aug.-Dec., Fr. Sept.-Feb.; Fs. winter and summer, Na. evergreen; Uses: Fodder, Fiber, Edible Fruits.
33. *Debregeasia salicifolia* (Roxb. ex D.Don) Rendle, Vern. Siharu, F. Urticaceae, upto 800-2100 m; Fl. /Fr. Mar.-Jun.; Fs. winter and summer, Na. evergreen; Uses: Fodder, fiber, Edible Fruits, Medicine.
34. *Dendrocalamus strictus* (Roxb.) Nees., Vern. Bans, F. Poaceae, upto 300-1500 m; Fl. Nov.-Feb., Fr. Feb.-Apr.; Fs. winter, Na. evergreen; Uses: Fodder, Edible young shoots, Agricultural implements.
35. *Diploknema butyracea* (Roxb.) H.J.Lam, Vern. Pahadi Mahua, F. Sapotaceae, upto 400-1400 m; Fl. Oct.-Nov., Fr. Jun.-Jul.; Fs. winter, Na. deciduous; Uses: Fodder, Edible oil as Ghee, Fuel, Medicine.
36. *Ehretia acuminata* R. Br., Vern. Nalsura, F. Boraginaceae, upto 400-1400 m; Fl. Sept.-Nov., Fr. Jan.-Apr.; Fs. winter, Na. deciduous; Uses: Fodder, Edible Fruit, Fuel.
37. *Ehretia Laevis* Roxb., Vern. Chamror, F. Boraginaceae, upto 1200 m; Fl. /Fr. Mar.-May; Fs. winter, Na. deciduous; Uses: Fodder, Edible, Fuel.
38. *Emblica officinalis* Gaertn., Vern. Amla, F. Euphorbiaceae, upto 1500 m; Fl. Feb.-Apr., Fr. Sept.-Nov.; Fs. summer, Na. deciduous; Uses: Fodder, Medicine, edible, Fuel, Religious.
39. *Ficus glomerata* Roxb., Vern. Umra, F. Moraceae, upto 900 m; Fl. Mar.-May, Fr. Jun.-Aug.; Fs. winter and summer, Na. deciduous;Uses: Fodder, Fuel, Fruit, Medicine.
40. *Ficus hispida* Linn., Vern. Bhumra, F. Moraceae, upto 1200 m; Fl. Mar.-Apr., Fr. May-Jun.; Fs. winter and summer, Na. evergreen; Uses: Fodder, Fuel, Edible fruit, Fiber, Medicine.
41. *Ficus nemoralis* Wall. ex Mir, Vern. Chil, F. Moraceae, upto1200- 2000 m; Fl. Mar.-Apr. Fr. Aug.-Sept.; Fs. winter and summer, Na. semi-deciduous; Uses: Fodder, Fuel, Edible fruit.
42. *Ficus palmata* Forsk., Vern. Bedu, F. Moraceae, upto 1800 m, Fl. Mar.-Apr., Fr. Jun.-Aug., Fs. winter, Na. deciduous, Uses: Fodder, Fuel, Fruit, Medicine.
43. *Ficus religiosa* Linn., Vern. Pipal, F. Moraceae , upto 1500 m; Fl. /Fr. winter/spring; Fs. winter and summer, Na. deciduous; Uses: Fodder, Edible, Religious.
44. *Ficus roxburghii* Wall., Vern. Timal, F. Moraceae, upto 500-1700 m; Fl. Mar.-Apr., Fr. Jun.-Jul.; Fs. winter and summer, Na. deciduous; Uses: Fodder, Edible, Plates.
45. *Ficus semicordata* Buch.-Ham. ex Sm., Vern. Khaina, F. Moraceae, upto 1500 m; Fl. May-Jun., Fr. Jun.-Oct.; Fs. throughout, Na. evergreen; Uses: Fodder, Fuel, edible Fruit, Fiber, Medicine.
46. *Ficus subincisa* Buch.-Ham. ex Sm., Vern. Chanchri, F. Moraceae, upto 500-1500 m; Fl. /Fr. Mar.-Jun., Fs. throughout, Na. evergreen; Uses: Fodder, Fuel, Fruit, Medicinal.
47. *Grewia asiatica* Linn., Vern. Dhaman, F. Tiliaceae, upto 1500 m; Fl. Apr.-May, Fr. Jun.-Aug.; Fs. winter and rainy, Na. evergreen; Uses: Fodder, Fuel, Fruit, Fiber, Medicine.
48. *Grewia optiva* J. R. Drumtnond ex Burret, Vern. Bhimal, F. Tiliaceae, upto 300-1200 m; Fl. Apr.-Jun., Fr. Aug.-Nov.; Fs. winter, Na. evergreen; Uses: Fodder, Fuel, Fruit, Fiber, Medicinal.
49. *Leucomeris spectabilis* D. Don, Vern. NA F. Asteraceae, upto 1500 m; Fl./Fr. Mar.-May; Fs. summer, Na. evergreen; Uses: Fodder, Fuel.

50. *Litsea monopetala* (Roxb.) Pers., Vern. Kadwai, F. Lauraceae, upto 1500 m; Fl. Mar.-Jul., Fr. Jul.-Nov.; Fs. Throughout, Na. evergreen; Uses: Fodder, Fuel, Timber, Medicine.
51. *Madhuca indica* J. F. Gmel., Vern. Mahwa, F. Sapotaceae, upto 1000 m; Fl. Mar.-Apr., Fr. Jun.-Jul.; Fs. summer, Nat. deciduous: Uses: Fodder, Timber, Medicine.
52. *Mallotus philippensis* (L.) Muell., Vern. Kamela, F. Euphorbiaceae, upto 1500 m; Fl. Sept.-Nov., Fr. Mar.-May; Fs. summer, Na. evergreen; Uses: Fodder, Fuel, Timber, Medicine.
53. *Melia azedarach* L., Vern. Batain, F. Meliaceae, upto 1500 m; Fl. Mar.-Apr., Fr. Apr.-May; Fs. summer, Na. deciduous; Uses: Fodder, Fuel, Timber, Medicine.
54. *Morus laevigata* Wall. ex Brandis, Vern. Sahtoot, F. Moraceae, upto 300-600 m, Fl./Fr. Feb.-Jan.; Fs. winter and summer, Na. deciduous; Uses: Fodder, Fuel, edible Fruit, Fiber, Medicine.
55. *Morus serrata* Roxb., Vern. Keemu, F. Moraceae, upto 1000-2700 m; Fl. Feb.-Mar., Fr. Mar.-Jun.; Fs. winter and summer, Na. deciduous; Uses: Fodder, Fuel, Fruit, Fiber, Medicine.
56. *Myrica esculenta* Buch.-Ham.ex D.Don, Vern. Kaphal, F. Myricaceae, upto 900-2100 m; Fl. Aug.-Oct., Fr. Apr.-Jun., Fs. winter, Na. evergreen; Uses: Fodder, Fuel, Fruit, Timber, Medicine.
57. *Ougeinia oojeinensis* (Roxb.) Hochreutiner, Vern. Sandan, F. Fabaceae, upto 300-1500 m; Fl. Mar.-Apr., Fr. May-Jul.; Fs. Throughout, Na. semi-deciduous; Uses: Fodder, Fuel, Medicine, Timber.
58. *Phoenix humilis* Royle, Vern. Khajoor, F. Arecaceae, upto 300-1800 m; Fl. Mar.-Apr., Fr. May-Jun.; Fs. winter and summer, Na. evergreen; Uses: Fodder, Fuel, Fruit, Fiber, Medicine.
59. *Pistacea integerrima* (Stewart.) Rech., Vern. F. Anacardiaceae, upto 600-1800 m; Fl. Mar.-May, Fr. Jun.-Oct.; Fs. summer, rainy and autumn, Na. deciduous; Uses: Fodder, Medicinal, Fuel, Timber.
60. *Kydia calycina* Roxb., Vern. Pulia, F. Malvaceae, upto 1200 m; Fl. Sept.-Nov., Fr. Nov.-Feb.; Fs. summer, Na. deciduous; Uses: Fodder, Medicinal, Agricultural implements.
61. *Populus ciliata* Roy, Vern. Pahari pipal F. Salicaceae, upto 1700-3000 m; Fl. Feb.-Mar., Fr. May-Jun.; Fs. summer, Na. deciduous; Uses: Fodder, House building, Fiber, Medicine.
62. *Prunus cerasoides* D. Don, Vern. Padam, F. Rosaceae, upto 600-2100 m; Fl. Oct.-Dec., Fr. Feb.-Mar.; Fs. summer, Na. deciduous; Uses: Fodder, Fuel, Timber, Medicine, Religious.
63. *Prunus undulata* Buch.-Ham. ex D. Don., Vern. NA, F. Rosaceae, upto 1400-2700 m; Fl. Aug.-Oct., Fr. Dec. - Mar.; Fs. summer, Na. deciduous; Uses: Fodder, Edible fruit, Fuel.
64. *Pyrus pashia* Buch.-Ham. ex D., Vern. Mehal, F. Rosaceae, upto 800-2400 m; Fl. Feb.-Mar., Fr. May-Dec.; Fs. winter and summer, Na. deciduous; Uses: Fodder, Fuel, Fruit, Timber, Medicine.
65. *Quercus glauca* Thunb., Vern. Phalyant, F. Fagaceae, upto 900-2000 m; Fl. May-Jun., Fr. Jun.-Aug.; Fs. winter and summer, Na. evergreen; Uses: Fodder, Fuel, Timber, Medicine.
66. *Quercus leucotrichophora* A. Camus, Vern. Banj, F. Fagaceae, upto 1200-2300 m; Fl. Mar.-Apr., Fr. Oct.-Jun.; Fs. winter and summer, Na. evergreen; Uses: Fodder, Fuel, Timber, Medicine.
67. *Quercus serrata* Murray, Vern. Manipuri Oak, F. Fagaceae, upto 1000-1800 m; Fl. Apr.-May, Fr. Oct.-Nov.; Fs. summer, Na. deciduous; Uses: Fodder, Fuel, House building, Edible.
68. *Rhus parviflora* Roxb., Vern. Murthi, F. Anacardiaceae, upto 900-2100 m; Fl. May-Jun., Fr. Jul.-Nov.; Fs. summer, Na. deciduous, Uses: Fodder, Fuel, Fruit, Medicine.
69. *Robinia pseudoacasia* L., Vern. Robinia, F. Papilionaceae, upto 1100-2400 m; Fl. Mar.-May, fr. Aug.-Oct.; Fs. summer, Na. deciduous; Uses: Fodder, Timber, Apiculture.
70. *Salix acmophylla* Boiss., Vern. Willow, F. Salicaceae, upto 500-1800 m, Fl./ Fr. Feb.-Apr.; Fs. summer, Na. deciduous; Uses: Fodder, Fuel.
71. *Salix babylonica* Linn., Vern. Bains, F. Salicaceae, upto 800-1600 m; Fl./ Fr. Apr.-May, Fs. summer, Na. deciduous; Uses: Fodder, Edible, Medicinal.
72. *Saurauia napaulensis* DC., Vern. Gogan, F. Actinidiaceae, upto 900-1800 m; Fl./Fr. May-Dec., Fs. Throughout, Na. evergreen; Uses: Fodder, Edible, Medicinal.
73. *Sterculia pallens* Wall. ex King, Vern. Udaal, F. Sterculiaceae, upto 1400 m; Fl./Fr. Apr.-May; Fs. summer, Na. deciduous; Uses: Fodder, Edible.
74. *Syzygium cuminii* (L.) Skeels, Vern. Jamun, F. Myrtaceae, upto 1500 m; Fl. Mar.-May, Fr. Jun.-Jul.; Fs. summer, Na. evergreen; Uses: Fodder, Fuel, edible Fruit, Timber, Medicine.
75. *Terminalia bellerica* (Gaertner)Roxb., Vern. Bahera, F. Combretaceae, upto 1200 m; Fl. Apr.-Jun., Fr. Jun.-Jul.; Fs. summer, Na. deciduous; Uses: Fodder, Fuel, Fruit, Timber, Medicine.
76. *Terminalia chebula* Retz., Vern. Haira, F. Combretaceae, upto 1600 m; Fl. Apr.-Jun., Fr. Jun.-Sept.; Fs. winter and summer, Na. deciduous; Uses: Fodder, Fuel, Fruit, Timber.
77. *Toona ciliata* Roem., Vern. Toon, F. Meliaceae, upto 1200 m; Fl. Mar.-Apr., Fr. May-Jun.; Fs. rainy and summer, Na. deciduous; Uses: Fodder, Fuel, Timber.
78. *Trema orientalis* (L.) Blume., Vern. Gio, F. Cannabaceae, upto 600-1500 m; Fl. Feb. - Apr., fr. Dec.-may; Fs. Throughout, Nature evergreen; Uses: Fodder.
79. *Trema politoria* (Planch.) Blume, Vern. Gol, F. Cannabaceae, upto 300-1500 m; Fl./ Fr. Apr.-Jun., feeding season Throughout, Nature evergreen, Uses: Fodder.
80. *Ulmus wallichiana* Planch., Vern. Mahun, F. Ulmaceae, upto1500-2800 m; Fl. Spring; Fs. summer and rainy, Na. deciduous; Uses: Fodder, House building, edible leaves, Medicine.

81. *Wendlandia exserta* (Roxb.) DC., Vern. Pansar, F. Rubiaceae, upto 1700 m; Fl/ Fr. Mar.-Apr.; Fs. Throughout, Na. evergreen; Uses: Fodder, Fuel, Timber.
82. *Zanthoxylum armatum* DC., Vern. Timru, F. Rutaceae, upto 900-2100 m; Fl. / Fr. Mar.-Apr.; Fs. winter and summer, Na. evergreen; Uses: Fodder, Medicine, Edible.

In hilly area of Western Himalaya huge numbers of fodder trees grow indigenously and are used by the inhabitants for their requirements usually for fodder, fuel wood and also as economical timber. It has been noted that the wood is insect resistant in colder environment due to this the plants which are not used as building material in plains are fairly sufficient to meet the requirement in mountains. This economical wood and firewood comes from non-timber multipurpose trees which are similarly good quality as source of fodder[17]. The first choice of fodder tree at diverse altitude is also different. The Quercus and *Ficus* species are considered extremely precious fodder in the higher altitude location whereas *Celtis australis, Bauhinia species* and *Grewia optia* are considered the most excellent fodder in the lower altitude of hills of Western Himalayan region. The agroforestry was promoted on the marginal and un-irrigated land and treated as good complement to the poor crop yield. The community depended more on livestock's in this region.

The inhabitants judiciously think of a plant well known to them culturally and publicly. Therefore it is need to be familiar with the local fodder trees so that they may be included in agroforestry. They also make it superior from the point of view of crop-plant interface, since their experiment through ages. Further, the community agroforestry may embrace a new pledge to the maintenance of ecology and prosperity of natives. Any such association would engage a necessity of appropriate planting material. Here, we have chosen and identified most frequently used fodder trees providing full information of their uses and habitation. From the list presented, plants can be selected for particular location altitude wise.

Conclusion

Thus in Himalayan region the agroforestry can play a key role in restoring the ecological balance by meeting the requirement of fuel wood, fodder and cheap timber of the farming community locally around their fields. Indigenous fodder trees have other advantages also numerous of them give high quality fibre (*Ficus species, Grewia species* etc) and edible fruits (*Celtis australis*, *Grewia species, Ficus species, Pyrus pashia, etc*). Though, numerous workers have recently documented the flora of the region but no effort has so far been made to record the fodder trees, which can be suggested for agroforestry. Therefore, this work would be a significant step in popularizing the agroforestry in hills of N-W Himalaya.

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