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Potential of Agroforestry, Inventorization, Distribution Pattern and Phytosociological Analysis of Tree Species in Block Ramgarh, Samba (J&K), India

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Abstract

Trees play an important role in ecosystem in all terrestrials and provide a range of products and services to rural and urban people. As natural vegetation is cut for agriculture and other types of development, the benefits that trees provide are best sustained by integrating trees into agricultural system — a practice known as agroforestry. Farmers have practiced agroforestry since ancient times. Agroforestry focuses on the wide range of trees grown on farms and other rural areas. In the present study, we analyzed distribution pattern, diversity and phytosociology of tree species in Block Ramgarh, Samba, Jammu and Kashmir. Data were collected through sample plot surveys. A total of thirty sample plots of one hectare size (100x100m) each were selected in agriculture fields. A total of 17 tree species were encountered in agricultural fields with Zizyphus maurtiana, Mangifera indica, Melia azadirachta, Dalbergia sissoo etc. the dominant tree species. Mangifera indica was the most dense tree species with density value of 1.9 tree/ha followed by Melia azadirachta having density of 1.1 tree/ha. Bauhinia purpurea was the least dense species (0.03 tree/ha). The highest basal area in case of tree species was obtained for Zizyphus maurtiana (5.13m^2/ha) followed by Ficus religiosa (2.94m^2/ha). The value of Shannon Weiner index was found to be 2.41 for trees in agriculture fields. The results of the study revealed that, the trees in agriculture fields are very sparse which can be exploited as potential sites for tree plantations.

Keywords: Agroforestry, Phytosociology, Basal area, Shannon Weiner index etc.

INTRODUCTION

In recent years the effects of inappropriate agricultural, pastoral, and silvicultural practices throughout the world have become increasingly apparent. Loss of soil fertility, soil erosion, and consequent deterioration of rural economies have led many agriculturists, animal scientists, and foresters to search for more sustainable food, fiber, and fuel production systems. Agroforestry systems in India include trees in farms, community forestry and a variety of local forest management and ethnoforestry practices (Pandey, 1998). A wider definition of agroforestry encompasses a variety of practices, including trees on farm boundaries, trees grown in close association with village rainwater collection ponds, crop-fallow rotations, and a variety of agroforests, silvopastoral systems, and trees within settlements. These systems have been presented as a solution to rising fuelwood prices in India resulting from increase in demand and decrease in supply of fuelwood due to forest degradation (Bowonder *et al*.1988).Agroforestry could contribute to livelihood improvement in India, where people have a long history and accumulated local knowledge. India is particularly notable for ethnoforestry practices and indigenous knowledge systems on tree-growing. Quali (2001) recognized suitable community plantations of non-timber forest products in tribal areas such as Jharkhand which can potentially serve the dual purpose of conserving useful species as well as livelihood improvement of local people. There is robust evidence that agroforestry systems have the potential for improving water use efficiency by reducing the unproductive components of the water balance such as run-off, soil evaporation and drainage (Turner and Ward, 2002). Rashid and Sharma (2012) analysed the exploration of economically important Fodder plants of district Rajouri J&K. They reported a total of 68 plant species belonging to 42 families in the study area. The diversity of fodder plants is a proportion of the enormous biodiversity occurring in this part of the North Western Himalaya. Their findings suggest a very high scope of the utilization of natural and unculturated biodiversity for supporting livestock in the region. Ecologically sound agroforestry systems such as intercropping and mixed arable-livestock systems can increase the sustainability of agricultural production while reducing on-site and offsite consequences and lead to sustainable agriculture (Rasmussen *et al*.1998). Keeping in view the potential of agroforestry, the present study is conducted with objectives to find out the tree diversity and to carry out inventory of trees in the study area.

STUDY AREA

Jammu and Kashmir constitutes northern most extremity of India having geographical area of 2, 22, 236 km^2. The state is situated between 32^0 $27^/$ and 37^0 $30^/$ North latitude and 73^0 $26^/$ and 80^0 $30^/$ East longitude (Digest of the Forest Statistics, J&K, 2000).The state has been divided into three divisions i.e., Jammu, Kashmir and Ladakh. There are 22 districts in the state which include 8 recently formed districts. Jammu division has 10 districts in all and Samba is one of these districts.

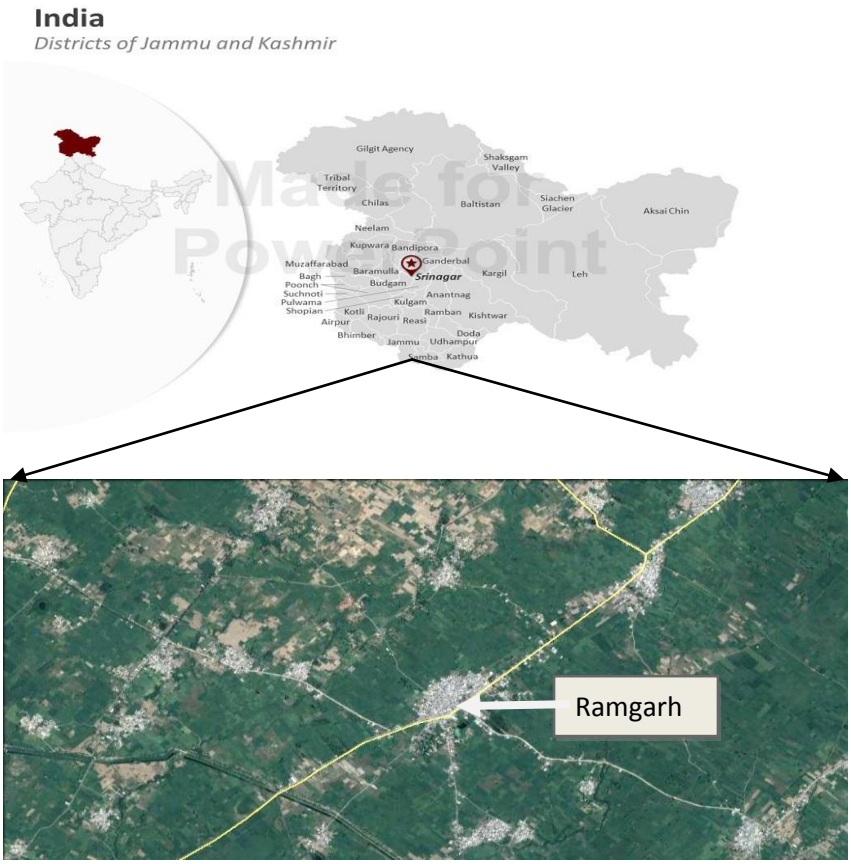

Fig.1 Geographical Location of Ramgarh Block of Samba

The headquarter of Samba district is situated in range of Shivalik hills alongside the National Highway 1-A/ on the bank of river Basantar at a distance of 40 km. from Jammu city. Samba district is adjacent to the International Border with Pakistan. About two third of the area of the tehsil Samba is *Kandi* and rain fed. The southern area downside of the national highway is irrigated through Ravi Tawi Irrigation Canal Network which contributes towards cultivation of major cereals crops and vegetables cultivation. Special focus has been assigned to these activities by the Government of India, Ministry of Water Resources through command area development department. The climate of the district is sub-tropical being hot and dry in summer and cold in winter. The temperature ranges between 6^0C in winter and 45^0C in summer. The agricultural fields are characterized by the various tree species growing as scattered trees on agricultural lands, along the road side and canal side and in the sacred groves. The present study, was conducted in the agriculture fields which, were randomly selected from Ramgarh block of Samba district.

MATERIAL AND METHODS

A total of thirty sample plots in agriculture fields of 100x100m size were randomly selected in the study area. In each plot, four corners of the plot were identified NE, NW, SE, and SW with the help of a compass by placing it at the point identified. The plants having girth of more than or equal to 30cm were considered as trees and their circumference at breast height (1.3 meters above the ground) was measured. The information collected regarding trees was used for phyto-sociological analysis. An inventory of trees species was prepared with family

of each species mentioned in the inventory. The quantitative analysis of frequency, density and abundance was done by using the standard expressions. The importance value index (IVI) was determined as the sum of relative frequency, relative density and relative dominance.

In calculating the importance value index, the percentage value of relative frequency, relative density, and relative dominance are summed together and this value is designated as importance value index or IVI of species (Curtis, 1959) which determines vegetation status and importance of component species with in a stratum stand.
The basal area was calculated by using following formula.
Basal area= $\frac{(CBH)^2}{4\pi}$

The A/F ratio was used to interpret the distribution pattern of the species. This ratio has indicates regular (<0.025), random (0.025-0.05) and contagious (>0.05) distribution pattern (Whitford,1949). Species diversity was computed by using Shannon Weiner index(1949).

Table 1: List of tree species encountered in Agricultural Fields in Ramgarh Block

Name of species	Family	Common name	Uses
Ficus religiosa Linn.	Moraceae	Peepal	Religious, medicinal.
Melia azadirachta L.	Meliaceae	Drenk	Fodder, medicinal, fuel wood.
Mangifera indica L.	Anacardiaceae	Mango	Fruit, timber, religious, medicinal.
Tectona grandis L.	Lamiaceae	Teak	Furniture, carving, boat building.
Morus alba Linn.	Moraceae	Mulberry	Fruit, basket.
Syzygium cumini (L.) Skeels	Myrtaceae	Jamun	Fruit, fodder.
Eucalyptus citridora Linn.	Myrtaceae	Safeda	Timber, fuelwood.
Salix acmophylla Boiss.	Salicaceae	Beant	Timber, fuelwood
Acacia nilotica	Mimosaceae	Kikar	Agricultural tool,
Zizyphus maurtiana. Lam.	Rhamnaceae	Ber	Fruit , fodder.
Dalbergia sissoo Roxb.	Fabaceae	Tali	Timber, fuelwood, shade.
Psidium guajava L.	Myrtaceae	Guava	Fruit, fodder
Albizzia lebeck	Fabaceae	Sreen	Fodder, fuelwood
Populus cilliata	Salicaceae	Poplar	Fooder,medicinal,timber
Emblica officinalis	Euphorbiaceae	Amla	Fruit, medicinal
Butea monosperma (Lam.)Taub.	Fabaceae	Plash	Leaves as dinner plates
Bauhinia purpurea	Fabaceae	Kalyad	Mrdicinal.Food

Table 2. Phytosociological Parameters for Tree in Agriculture

Name of Species	Total Basal Area (m^2/ha)	Density (Tree/ha)	Frequency	A/F	IVI
Ficus religiosa	2.93	0.2	16.6	0.07	23.72
Dalbergia sissoo	1.65	0.93	43.3	0.05	33.45
Eucalyptus citridora	0.58	0.5	30	0.06	18.19
Mangifera indica	1.92	1.9	60	0.05	52.01
Acacia nilotica	1.26	0.73	46.6	0.03	29.73
Melia azadirachta	1.32	1.1	46.6	0.05	34.72
Tectona grandis	0.39	0.16	6.66	0.38	6.29
Psidium guajava	0.08	0.1	10	0.1	4.59
Emblica officinalis	0.08	0.06	3.33	0.6	2.28
Butea monosperma	0.34	0.23	10	0.23	7.72
Zizyphus maurtiana	5.13	0.36	10	0.37	36.17
Populus cillata	0.61	0.6	16.66	0.22	15.77
Salix acmophylla	0.35	0.43	10	0.43	10.31
Morus alba	0.31	0.2	10	0.2	7.11
Sygygium cumini	0.71	0.2	16.66	0.07	11.27
Albizzia lebbeck	0.14	0.1	10	0.1	4.89
Bauhinia purpurea	0.08	0.03	3.33	0.3	1.84
Total	**17.89**	**7.86**			**300**
Shannon Weiner index			**2.41**		

RESULTS AND DISCUSSION

A total of 17 tree species were encountered in agricultural fields with *Zizyphus maurtiana, Mangifera indica, Melia azadirachta, Dalbergia sissoo* etc. the dominant tree species belonging to 10 families. A study conducted by Dangwal *et al.* (2012) in Nowshera block, Rajouri district also reported a total of 41 woody plants which comprised of 29 trees and 12 shrubs species. Rashid and Sharma (2012) analysed the exploration of economically important Fodder plants of district Rajouri J&K and reported a total of 68 plant species belonging to 42 families in the study area.

Phytosociological analysis

The phytosociological analysis carried out in the study area revealed that *Mangifera indica* was the most dense tree species with density value of 1.9 tree per hectare followed by *Melia azadirachta* having density of 1.1 tree per hectare. *Bauhinia purpurea* was the least dense species (0.03 tree/ha). *Mangifera indica* was also observed as the most frequent and abundant tree species during the study with values of 60 percent and 3.16 respectively which was followed by *Melia azadirachta* with their values of 46.66 percent and 2.36 respectively. *Bauhinia purpurea* was found to be the least frequent species with frequency value of 3.33 percent and *Psidium guajava, Albizzia lebbeck* as the least abundant species (Table 2). The highest basal area in case of tree species was obtained for *Zizyphus maurtiana* (5.13 m^2/ha) followed by *Ficus religiosa* (2.94 m^2/ha).The maximum importance value index (IVI) of 52.01 was observed to be high for Mangifera indica having relative density, relative frequency, and relative dominance of 24.15 percent, 17.14 percent and 10.71 percent respectively. Whereas *Bauhinia purpurea* tree species was found to have least IVI of 1.84 with relative density, relative frequency, relative dominance of 0.42 percent, 0.95 percent and 0.46 percent respectively (Table 5.2). The value of Shannon Weiner was found to be 2.41 for trees in agriculture fields. Similarly Grande *et al.* (2010) reported the diversity index value of 2.8 for scattered trees in pastures (STP) in the Sierra Region of Tabasco, Mexico.

Distribution Pattern

The distribution of different trees species in agricultural fields was mainly contagious. However, four species i.e. *Dalbergia sissoo, Mangifera indica, Acacia nilotica* and *Melia azadirachta* were randomly distributed. In a similar study conducted by Ahmed and Sharma (2014) in agriculture fields of Rajouri district of J&K, and noticed contagious distribution pattern except four trees (*Eucalyptus citriodora, Celtis australis, Mallotus philippensis and Melia azedarach*) which shows random distribution. Kumar and Bhatt (2006), also reported the contagious distribution pattern in forests of Garhwal Himalaya. Odum (1971) also stressed that contagious distribution is the commonest pattern in nature and it is due to small significant variations in the environment. Regular distribution occurs were severe competition between the individuals exists.

CONCLUSION

The results of the study revealed that, the trees in agriculture fields are very sparse which can be exploited as potential sites for tree plantations. There is wide scope of agro-forestry system of plantation in the study area. The awareness should be created by mobilizing local resources, specifically, active help and cooperation from the villagers or farmers. This means that villagers or farmers must be motivated through their own local knowledge of present forest resource crisis or they must be made aware of national or regional problems. Only those tree species must be selected, which grow in harmony with the local crops i.e canopy of trees should be such that it does not cast shadow on the crops. Although numerous issues are involved with livelihood improvement, agroforestry systems are one option with multifunctional value. Large area is available in the form of farm boundaries, bunds, waste lands where this system can be adopted.

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