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Full Length Research Paper

Tropical Fruit Tree Genetic Resources in Coffee-based Landscapes of Kodagu: Diversity and On-farm Conservation.

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Abstract

Tropical Fruit Tree (TFT) genetic resources are a subset of agro-ecosystems and natural forests of Kodagu, one of the worlds' natural heritage sites. Occurring mainly in home gardens of Kodagu, TFTs provide livelihood and nutrition benefits to people and contribute to ecosystem services. However, TFT genetic resources are vanishing at an alarming rate. The study aims at assessing the levels of diversity and on-farm conservation of TFTs. 39 Tropical Fruit Trees species were recorded from home gardens of Kodagu, of which 12 were non-native, suggesting a changing pattern of TFTs. Citrus, jack and mango varieties were the common-most, while Bilimbi, Tamarind occurred rarely. Single species shade trees of coffee, such as Grewilia, Erithrina etc. also contribute to the rarity of traditional fruit trees.

Key words: *Tropical fruit trees, biodiversity, conservation.*

Introduction

The traditional fruit tree verities contribute to the livelihoods, nutritional benefits for local communities. They play a vital role in shade tree management in coffee agroforestry systems and on farm conservation of biological resources. These traditional fruit tree verities consisting diverse multipurpose benefits such as shade, fruits, nuts, seeds, fuel wood, medicine, etc,. Fruits are generally high in fibre, water, vitamin C and sugars. From ancient time edible wild fruits played a very vital part in supplementing the diet of the people. Many people in rural areas still use them extensively as a supplement to their basic food requirement; some are preserved for use during periods of scarcity (Anil Kumar Khaple 2012). This diversity has been conserved and protected for over thousand years by the farmers. It is not only the crops and wild relatives but also a large number of related technologies, which we call the Traditional Knowledge, were maintained and transferred to the posterity by these farmers. In major component of multi-crop farming systems including home gardens in the humid tropics. Some of these species have been well adapted to marginal lands, and in agroforestry and farm-forestry systems (Bhag Mal 2011). The challenge of ecological sustainable development is the single most important issue that confronts humans today; and diversity of biological resources provides the foundation block for sustainable development (J. U. Ogbu 2010). Cultivation of TFT species has been a part of the culture of the farming communities. However, diversity and composition of TFT species and its relationship with family income has rarely been studied systematically in the central Western Ghats (Vasudeva 2015).

Materials and Methods

Study area

The study was conducted in Kodagu district. Kodagu district is part of Central Western Ghats one of the 8 Hottest hot spots of biodiversity in the world. The district is one of the largest wooded regions in the country with 80% of the land area under tree cover which includes coffee based agroforestry systems. The GPS co-ordinates of Kodagu district is at elevation of 1000 amsl, Latitude: $12^0$26 N and Longitude: $75^0$57 E. The forest types include evergreen, semi evergreen, and deciduous types. Sacred forests are the unique biodiversity indicators managed by local peoples through worshiping deities inside the forest.

Survey

Survey of nine villages of Kodagu district, selected to represent three levels of rainfall (Low, medium and high) and associated forest type (Evergreen, Semi evergreen, Deciduous), were taken into consideration and survey was done using structured questionnaire to collect data on the species, varieties, abundance, traditional uses, pattern of growing and threats to tropical fruit tree grown in home gardens and coffee plantations. In every village, data from about 10 to 25 households were collected. Field observations, photographs and specimen collection were to identify the species and varieties. The questionnaire included details on general information of the family, major production system, details of the land holdings, details of the TFT species and their utilization etc. The above mentioned information is presented in the table below.

Results and discussion

Results of the study indicated that the diversity of 39 Tropical Fruit Tree species were recorded from coffee based agroforestry systems including home gardens of Kodagu, of which 12 were exotic, 27 were traditional fruit trees (Table. 1), suggesting a changing pattern of TFTs. A detailed list of the TFT species, Citrus, jack and mango varieties were the common-most, while Bilimbi, Tamarind occurred rarely. The increased diversity TFFs are due to the multiple uses such as food, fodder, medicine, timber etc in addition ecological benefits like shade, water conservation, soil fertility and maintenance of micro-habitat for flora and fauna (Ramanatha Rao *et al.,* 2002). Many species of *Garcinia,* traditionally managed as shade trees in coffee agro-ecosystems and utilized to prepare various products by local people are relatively well conserved as studied by Vasudeva (2015). Since there is a greater demand for Garcinia species in the European market on its medicinal value (Charana, 2015). Among the TFTs recorded, higer number of species and genetic diversity were observed in *Citrus,* followed by *Garcinia, Artocarpus* and *Mangifera indica. In* the case of abundance of diversity more number is on Mango, followed by Jack and citrus. This may be due to the fact that, the alternative product as souring agent for tamarind in cooking purpose and source of traditional food this results are inconformity with Vanishree *et al.*2015.

Table 1. Tropical fruit species, use, production system and nativity.

Sl. No	Common name	Scientific name	Family	Exotic / Native	Production system	Major use
1	Pale hannu	*Crysophyllum lanceolatum*	Sapotaceae	Native	Home Garden and Scattered planting in estate	Fruits are edible
2	Sampige hannu	*Flacourtia Montana*	*Flacourtiaceae*	Native	Scattered planting in estate	Fruits are edible
3	Hunase	*Tamarindus indica* L.	Fabaceae	Native	Scattered planting in estate and boundary planting	Souring agent and Fruits are edible
4	Punarpuli	*Garcinia indica* (Thouras) Choisy.	Clusiaceae	Native	Scattered planting in estate, Home garden	Fruits are edible
5	Kachampuli	*Garcinia gummi-gutta* (L.) N. Robson	Clusiaceae	Native	Scattered planting , Home garden in estate	Fruits are edible
6	Javanani hannu	*Garcinia xanthochymus*	Clusiaceae	Native	Scattered planting in estate	Fruits are edible
7		*Aporosa lindleyana* (Wt.) Baill.	Euphorbiaceae	Native	Scattered planting in estate	Fruits are edible
8	Bettada nelli	*Emblica officinalis* Geartn.	Phyllanthaceae	Native	Scattered planting in estate and Home garden	Fruits are edible
9	Nerale	*Syzygium cumini* (L.) Skeels	Myrtaceae	Native	Scattered planting in estate	Fruits are edible
	Nerale	*Syzygium operculatum* Gamb.	Myrtaceae	Native	Home garden	Fruits are edible
10	Kaipuli	*Citrus spp*	Rutaceae	Native	Scattered planting in estate, Home garden	Pickle, Juice, Souring agent, Squash and medicine
11	Badapuli	*Citrus spp*	Rutaceae	Native	Scattered planting in estate, Home garden	Pickle, Juice, Souring agent, Squash and medicine
12	Dogguli	*Citrus spp*	Rutaceae	Native	Scattered planting in estate, Home garden	Pickle, Juice, Souring agent, Squash and medicine
13	Banduli	*Citrus spp*	Rutaceae	Native	Scattered planting in estate, Home garden	Pickle, Juice, Souring agent, Squash and medicine
14	Madhuli	*Citrus spp*	Rutaceae	Native	Scattered planting in estate, Home garden	Pickle, Juice, Souring agent, Squash and medicine
15	Chakkota	*Citrus spp*	Rutaceae	Native	Scattered planting in estate, Home garden	Fruits are edible and juice
16	Kiru nelli	*Phyllanthus acidus* (L.) Skeels.	Phyllanthaceae	Native	Home garden	Pickle and Fruits are edible

17	Goni	*Ficus mysorensis* L.	Moraceae	Native	Boundry planting	Fruits are edible
18	Kadu geru	*Semecarpus anacardium* L.f.	Anacardiaceae	Native	Scattered planting in estate	Medicine
19	Elande	*Mimusops elengi* L.	Sapotaceae	Native	Boundry planting	Fruits are edible
20	Tadasalu	*Grewia tiliaefolia* Vahl.	Tiliaceae	Native	Boundry planting	Fruits are edible
21	Halasu	*Artocarpus heterophyllus*	Moraceae	Native	Scattered planting in estate, Home garden	Fruits are edible, Food, Chips
22	Hebbalasu	*Artocarpus hirsutus*	Moraceae	Native	Scattered planting in estate	Fruits are edible
	Hatti	*Ficus resimosa* L.	Moraceae	Native	Scattered planting in estate	Fruits are edible
23	Kotte	*Ziziphus mauritiana* Lamk.	Rhamnaceae	Native	Scattered planting in estate	Fruits are edible
24	Mango	*Mangifera indica*	Anacardiacae	Native	Boundry planting, Scattered planting, Home garden, block plantation	Fruits are edible, Juice, Pickle
25	Tare	*Terminalia bellarica*	Combretaceae	Native	Scattered planting in estate	Fruits are edible and Medicine
26	Nimbe	*Citrus limon* Burm.f.	Rutaceae	Native	Home garden	Juice, Pickle and Medicine
27	Kuntu nerale	*Syzygium caryophyllatum*	Myrtaceae	Native	Scattered planting in estate	Fruits are edible
28	Parangi	*Carica papaya* L.	Caricaceae	Exotic	Home garden	Fruits are edible and used to make squash
29	Bilimbi	*Averrhoa bilimbi* L.	Oxalidaceae	Exotic	Home garden	Used to make pickle
30	Geru	*Anacardium occidentale* L.	Anacardiaceae	Exotic	Home garden	Fruits are edible and used to make wine
31	Sapota	*Achras zapota* (L.) P. Royen	Sapotaceae	Exotic	Scattered planting in estate and plantation	Fruits are edible and used to make squash
32	Ramphala	*Annona squamosa* L.	Annonaceae	Exotic	Home garden	Fruits are edible
33	Sitaphala	*Annona reticulate* L.	Annonaceae	Exotic	Home garden	Fruits are edible
34	Guava	*Psidium guajava* L.	Myrtaceae	Exotic	Home garden	Fruits are edible, used to make squash and juice
35	Hybrid nerale	*Syzygium aquam*	Myrtaceae	Exotic	Home garden	Fruits are edible
36	Jambu nerale	*Syzygium jambos* (L.) Alston	Myrtaceae	Exotic	Home garden	Fruits are edible
37	Dalimbe	*Punica granatum* L.	Punicaceae	Exotic	Home garden	Fruits are edible
38	Malayan apple	*Syzygium samarangense*	Myrtaceae	Exotic	Home garden	Fruits are edible
39	Singapoor cherry	*Muntingia calabura* L.	Muntingiaceae	Exotic	Home garden	Fruits are edible

Conclusion

Coffee agroforestry systems of Kodagu are still a rich repository of tropical fruit tree genetic resources although non-native species (exotic) are occupying quickly in coffee agroforestry systems and home gardens. Single species shade trees of coffee, monocropping such as *Grewilia, Erithrina etc.* also contribute to the rarity of native traditional fruit trees in coffee based landscapes. Loss of local varieties from the coffee agroforestry systems and home gardens also leads to the loss of indigenous knowledge associated with it. We discuss the patterns of diversity and on-farm conservation of traditional fruit tree verities.

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