



Diversity in traditionally existing agroforestry practices in Bastar District, Chhattisgarh

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ABSTRACT

This study was carried out with the aimed for the documentation of agro-biodiversity within traditional agroforestry systems in Bastar District (Chhattisgarh). A comprehensive investigation was conducted across fifty villages, strategically selected to encompass diverse geographical regions within the five blocks comprising the Bastar district. The study identified a total of nine prominent tree species, categorized into three primary types of agroforestry systems based on the documented components: Agri-silvicultural systems (54%), Agri-horticultural systems (16%), and Multipurpose systems (20%). These systems are deeply associated in traditional farming practices. This paper gives information on the remarkable agro-biodiversity present in Bastar's traditional agroforestry practices, highlighting the valuable coexistence of trees and agricultural in a unit of area.

Keywords: Agroforestry, agroforestry practices, Agri-silvicultural systems, Agri-horticultural systems, Bastar

KEYWORDS: Agro-biodiversity, Agroforestry, Agrisilviculture, MTU 1010, Agrisilvipasture

INTRODUCTION

Agroforestry represents a traditional land use approach extensively practiced by indigenous farmers in tropical regions. This system involves the cultivation of woody trees alongside agricultural crops and other herbaceous vegetation (Nair, 1989). The primary goal of agroforestry is to enhance both livelihoods and ecosystems. Its distinguishing features encompass productivity, sustainability, and adaptability (Atangana *et al.*, 2014). Agroforestry can be defined as "a dynamic, ecologically-based natural resources management system that, through integration of trees in agricultural landscapes, diversifies and sustains production for increased social, economic and environmental benefits" (Msuya and Kideghesho, 2012).

Chhattisgarh, located in the eastern part of India, is predominantly a tribal-based region with a total geographical area of 135,192 sq km and out of this 44.25 % of total forest area in the State (ISFR, 2021) and moreover, this Bastar region is having 65% forest of its total geographical area in the Bastar. In the state of Chhattisgarh, several multipurpose trees are commonly found in or around farmers' fields, including *Acacia nilotica*, *Butea monosperma*, *Terminalia arjuna*, *Azadirachta indica*, *Albizia procera*, *Pongamia pinnata*, *Gmelina arborea*, bamboo, and others. Furthermore, fruit-bearing trees like *Carica papaya*, *Mangifera indica*, *Citrus limon*, and *Psidium guajava* are widely cultivated along the bunds of paddy fields. In the context of the

protein bank or silvopasture system, designed to provide protein-rich fodder, trees such as *Acacia nilotica*, *Albizia lebbek*, *Azadirachta indica*, *Leucaena leucocephala*, *Gliricidia sepium*, and *Sesbania grandiflora* are intentionally planted (Jhariya *et al.*, 2015). In Bastar district, traditional and existing agroforestry practices are characterized by the combination of agricultural crops with tree species such as *Shorea robusta*, *Tectona grandis*, *Acacia* spp, *Phoenix sylvestris*, *Albizia* spp, *Leucaena leucocephala*, *Ficus racemosa*, *Cocos nucifera*, *Carica papaya*, *Musa acuminata*, *Mangifera indica*, *Anacardium occidentale*, and *Embllica officinalis* (Hemrom and Nema, 2015). Hence, looking to the above the study was valuable for understanding and potentially promoting sustainable farming practices that benefits both the livelihoods of local communities and environment.

MATERIAL AND METHOD:

The study was conducted in Bastar district of Chhattisgarh State to investigate the existing tree-crop based traditional agroforestry practices that exist in the region. The survey study aims to document traditional farming practices and examined how local farmers in Bastar integrate trees and crops in their farming practices including the types of trees and crops being grown together, the pattern of planting, and the outcomes in terms of agricultural productivity and sustainability. The study focused on specific criteria, including the Diagnostic and Design survey for tree-crop combinations, cropping systems, land holdings and planting arrangements in the study area. In overall, the prime objective of the study was to characterize the structure and assess the diversity of traditional Agroforestry systems prevalent in the district.

To accomplish this, the entire Bastar district was divided into five blocks, and within each block, five villages were randomly chosen for traditional tree-crop based agroforestry studies over the past three consecutive years from June 2017 to August 2020. Primary and secondary data were collected from various agroforestry practices and different categories of fields. The assessment of agroforestry practices and land use patterns followed standard criteria, considering the composition of various traditional agroforestry components. These criteria were evaluated and enumerated based on the NRCAF India standardization of Agroforestry tree ideotypes. Additionally, Agroforestry practices were identified in accordance with the standardization of tree-crop combinations (Nair, 1985).

RESULT AND DISCUSSION:

The study on the existing tree-crop combinations used as traditional Agroforestry practices revealed the existence and prevalent in the Bastar region. It revealed the presence of numerous traditional existing agroforestry systems scattered throughout Bastar. During the study, five out of the seven blocks in Bastar district were selected for research purposes due to the presence of Agroforestry systems in those areas. A total of 50 fields from 50 villages were identified, and the district as a whole had an 82% irrigation facility availability, with Tokapal block showing 100% irrigation coverage. Out of the 50 surveyed existing traditional agroforestry fields, 25 were specifically selected for the controlled environmental study conditions (Table1).

The study revealed that the among all the documented existing traditional agroforestry practices in the area, the study identified three major types based on the components involved: Agri-silvicultural (54%), Agri-horticultural (16%), and Multipurpose (20%) systems, all of which were deeply rooted in traditional practices (Fig.1). During the survey, it became evident that Agri-silviculture systems were the most widely chosen by

local farmers in traditional agroforestry fields. In particular, Jagdalpur block had a 70% adoption rate, while Laundiguda and Bastar blocks both had a 60% adoption rate (Fig.2).

Fig (1): Type of Agroforestry practices documented during the period of study in the Bastar district (in %)

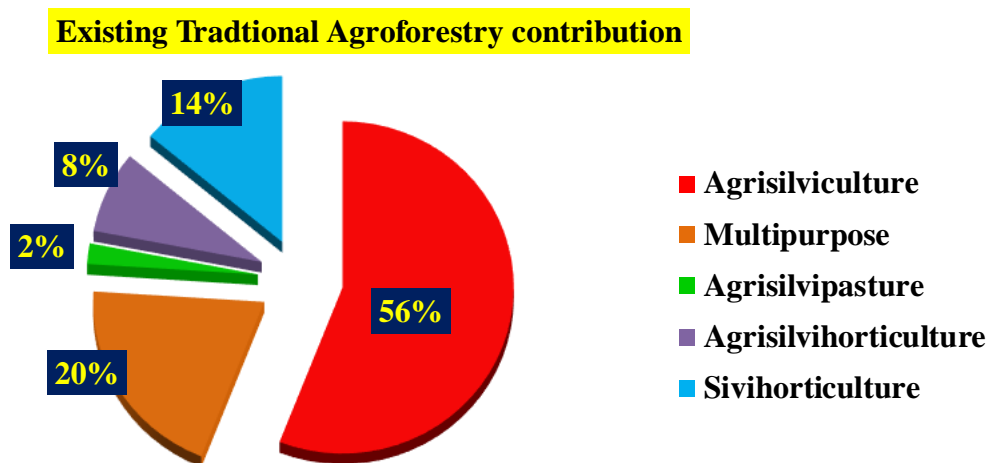


Fig (2): Agroforestry practices documented in different blocks during the period of study in the Bastar district (in %)

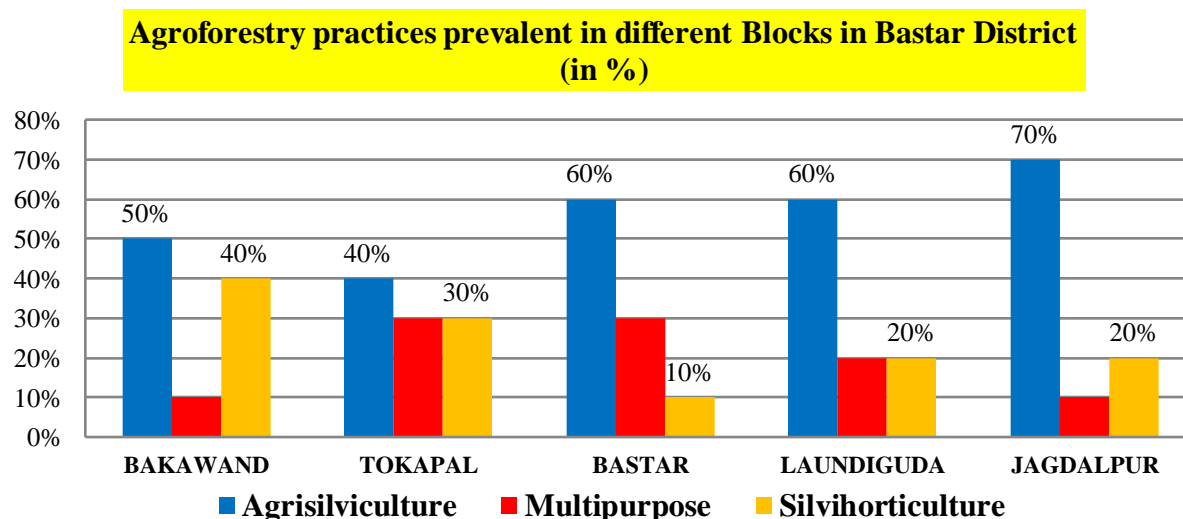


Table (1): Details of the Systems observed in the surveyed Traditional Agroforestry fields for the Assessment of Existing Agroforestry Practices in the Bastar district (C.G.).

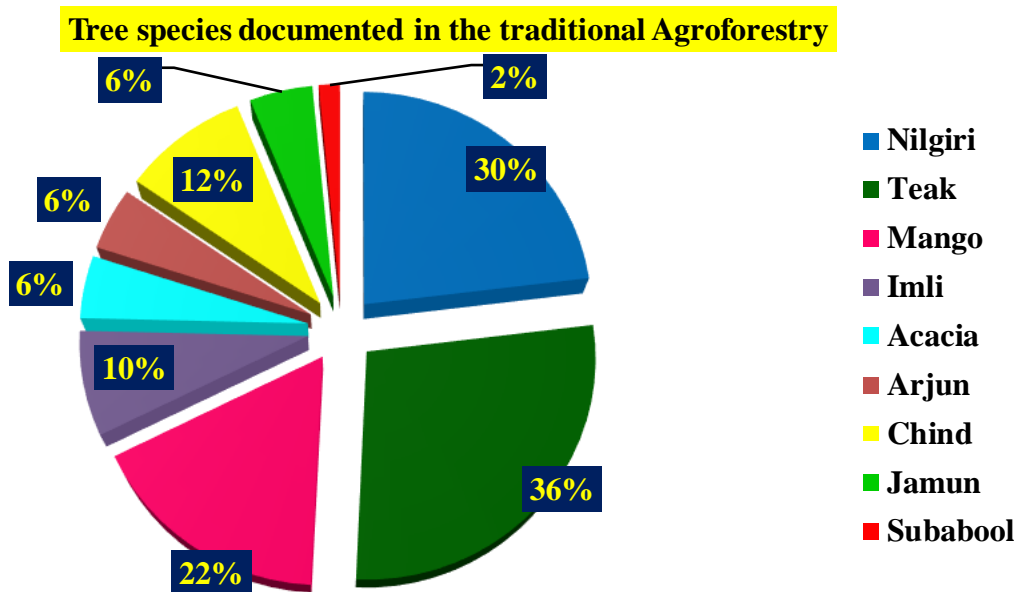
Field No.	Block	System Irrigation	System Components		System AF Practices
			Crop Species	Tree Species	
1	Bakawand	Irrigated	Rice	Imli	Agrisilviculture
2	Bakawand	Irrigated	Rice	Nilgiri	Agrisilviculture
3	Bakawand	Irrigated	Rice	Chind	Multipurpose
4	Bakawand	Irrigated	Rice	Teak	Agrisilviculture
5	Bakawand	Irrigated	Rice	Teak/Acacia	Agrisilviculture
6	Bakawand	Irrigated	Rice	Acacia	Agrisilvipasture
7	Bakawand	Irrigated	Rice	Teak/Mango	Agrisilvihorticulture
8	Bakawand	Irrigated	Rice	Teak/Mango	Silvihorticulture
9	Bakawand	NA	Rice	Nilgiri	Agrisilviculture
10	Bakawand	NA	Rice	Nilgiri/Mango	Silvihorticulture
11	Tokapal	Irrigated	Rice	Nilgiri	Agrisilviculture
12	Tokapal	Irrigated	Rice	Teak	Agrisilviculture
13	Tokapal	Irrigated	Rice	Munga/Imli	Multipurpose
14	Tokapal	Irrigated	Rice	Teak	Agrisilviculture
15	Tokapal	Irrigated	Rice	Teak/Mango	Agrisilvihorticulture
16	Tokapal	Irrigated	Rice	Nilgiri/Mango	Agrisilvihorticulture

17	Tokapal	Irrigated	Rice	Nilgiri / Mango	Agrisilviculture
18	Tokapal	Irrigated	Rice	Teak/jamun	Agrisilvihorticulture
19	Tokapal	Irrigated	Rice	Chind	Multipurpose
20	Tokapal	Irrigated	Rice	Chind	Multipurpose
21	Bastar	Irrigated	Rice	Acacia	Agrisilviculture
22	Bastar	Irrigated	Rice	Arjun	Agrisilviculture
23	Bastar	Irrigated	Rice	Chind	Multipurpose
24	Bastar	Irrigated	Rice	Teak	Agrisilviculture
25	Bastar	Irrigated	Rice	Teak/Mango	Silvihorticulture
26	Bastar	Irrigated	Rice	Nilgiri	Agrisilviculture
27	Bastar	Irrigated	Rice	Teak/Mango	Silvihorticulture
28	Bastar	Irrigated	Rice	Nilgiri/Teak	Agrisilviculture
29	Bastar	NA	Rice	Acacia	Agrisilviculture
30	Bastar	NA	Rice	Chind	Multipurpose
31	Bastar	Irrigated	Rice	Teak	Multipurpose
32	Laundiguda	Irrigated	Rice	Chind	Multipurpose
33	Laundiguda	Irrigated	Rice	Arjun	Multipurpose
34	Laundiguda	Irrigated	Rice	Teak/Arjun	Agrisilviculture
35	Laundiguda	Irrigated	Rice	Jamun	Silvihorticulture
36	Laundiguda	Irrigated	Rice	Nilgiri	Agrisilviculture
37	Laundiguda	Irrigated	Rice	Nilgiri	Agrisilviculture
38	Laundiguda	Irrigated	Rice	Teak/Jamun	Agrisilviculture
39	Laundiguda	NA	Rice	Teak	Agrisilviculture
40	Laundiguda	NA	Rice	Nilgiri	Agrisilviculture
41	Jagdapur	Irrigated	Rice	Teak	Agrisilviculture
42	Jagdapur	Irrigated	Rice	Nilgiri	Agrisilviculture
43	Jagdapur	Irrigated	Rice	Mango/Imli	Multipurpose
44	Jagdapur	Irrigated	Rice	Mango	Silvihortipasture
45	Jagdapur	NA	Rice	Mango	Silvihorticulture
46	Jagdapur	Irrigated	Rice	Nilgiri	Agrisilviculture
47	Jagdapur	Irrigated	Rice	Nilgiri	Agrisilviculture
48	Jagdapur	NA	Rice	Nilgiri/Subabul	Agrisilviculture
49	Jagdapur	NA	Rice	Teak	Agrisilviculture
50	Jagdapur	Irrigated	Rice	Acacia/Teak	Agrisilviculture

The data on presented in the Fig (1) the distribution of various agroforestry practices as a percentage of the total. Agrisilviculture is the most prevalent agroforestry practice, accounting for 54% of the total. It involves integrating crops with trees, primarily for timber production. Multipurpose agroforestry practices make up 20% of the total and serve diverse purposes, including timber, fruit cultivation, and fodder. Agrisilvipasture, combining livestock grazing with crops and trees, is relatively rare at 2%. Agrisilvihorticulture, focusing on crop-tree combinations for fruit production, is practiced at a moderate level, representing 10%. Silvihorticulture, contributing 16% to the total, places a greater emphasis on tree cultivation within agroforestry systems.

The study identified nine tree species from seven families and nine genera. Among these, Teak (36%) and Nilgiri (30%) were the most commonly planted tree species, while Subabool (2%) was the least prevalent in the traditional Agroforestry systems examined within the agricultural fields of the Bastar (Fig.3).

Fig (3): Tree species in existing traditional agroforestry fields documented during the period of study in the bastar district (%).



The local people of the area, who were observed and documented, found to be aware of the nutritious properties of some important plant species; hence they cultivated these plants in their farms. The irrigation system of each practice which is pivotal in system formation is described in. The important feature of the recorded traditional agroforestry practices of Bastar district is the presence of MTU 1010 rice crop variety in the studied agriculture fields. It was also noted that farmers widely hold tree on the bund plantation pattern. The comprehensive exploration of traditional agroforestry practices and their components emphasizes the prevalence of agroforestry in Bastar, representing that farmers consider it both suitable and profitable for their agricultural accomplishment.

Agrisilviculture System

A total of 27 fields were documented having the Agrisilviculture system during the course of investigation. Among the woody perennial, the tree species like Teak (*Tectona grandis*), Nilgiri (*Eucalyptus tereticornis*), Acacia (*Acacia nilotica*) and Arjun (*Terminalia arjuna*) were commonly recorded species on field bunds in the Bastar district along with the paddy crop during the period of study.

Agrisilvipasture

In this system, trees coexist with pasture and/or animals on the same piece of land. During the study, single field employing the Agrisilvipasture system was documented. Subabool stands out as the most favoured tree species within the Agrisilvipasture system in the Bastar district.

Agrisilvihorticulture

Within this system, trees are cultivated primarily for the purpose of fruit production. Jamun and Mango were the most preferred Agrisilvihorticulture tree species documented in the Bastar district.

Multipurpose

During the investigation, a total of 10 fields documented with this multipurpose system. Chind (*Phoenix sylvestris*) and Imli (*Tamarindus indica*) were identified as the predominant tree species used for the multipurpose within the Bastar district. Chind (*Phoenix sylvestris*) was cultivated for the purpose of extracting intoxicating sap, which is collected by making an incision in the inflorescence of the tree and is consumed

locally by tribals in the Bastar district. Imli (*Tamarindus indica*) on the other hand, was valued for its fruits and kernels, typically sold in the local markets (mandis) of the district. In this practice, trees are raised for its diverse purposes including the production of edible fruit, fruit pulp, fuelwood, timber and traditional medicine.

CONCLUSION

The study showed that the Agrisilviculture practices dominates in the existing traditional agroforestry practices, followed by silvihorticulture and multipurpose systems. Agrisilvipasture and Agrisilvihorticulture were less common in the study area. These tree-crop traditional practices emphasize the diversity of agroforestry approaches and provide insight into farmers' preferences for sustainable land use in the studied area.

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