



## LAND MANAGEMENT SYSTEM ADOPTED BY FARMERS IN THE EASTERN REGION OF WEST SINGHBHUM DISTRICT, JHARKHAND, INDIA.

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### ABSTRACT :

Agroforestry helps to provide farmers with an effective and efficient land management system that would bring about high farm yields and revenue in a balanced ecological environment. The agroforestry is defined as “Agroforestry is a collective name for land-use systems and practices where woody perennials (trees, shrubs, bamboos etc.) are deliberately integrated to create an agro-ecosystem with crops and /or animals on the same land management unit. The integration can either be in spatial mixture or in time sequence. There must be both ecological and economic interactions between the woody and non-woody components to qualify it as agroforestry” (Kumar, and Nair, 2004).

Some of the agroforestry practices that were existing in this region are as follows:- Agrisilvicultural System, the tree species like, *Dalbergia sissoo*, *Leucaena leucocephala*, *Syzygium cumini*, *Tectona grandis*, *Artocarpus heterophyllus*, *Azadirachta indica*, *Gmelina arborea*, whereas agriculture crops grown together were *Solanum tuberosum*, *Brassica nigra*, *Triticum aestivum*, *Pisum sativum*, *Zea mays*, *Oryza sativa* and *Lycopersicon esculentum*. In Agrihorticultural system, the horticultural crops like *Capsicum annum*, *Solanum melongena*, *Lycopersicon esculentum* and *Zingiber officinale*. The tree components like *Mangifera indica*, *Carica papaya*, *Artocarpus heterophyllus*, *Psidium guajava*, *Syzygium cumini*, were integrated. In Silvipastoral system, tree species like *Dalbergia sissoo* and *Mangifera indica* were observed, whereas the grass components were *Cyperus scariosus* and *Cynodon dactylon*. In Silvihorticultural system, tree component like *Artocarpus heterophyllus*, *Azadirachta indica*, *Dalbergia sissoo*, *Gmelina arborea*, *Tectona grandis*, whereas horticultural components like, *Allium cepa*, *Zingiber officinale*, *Capsicum annum*, *Solanum tuberosum* were found.

**Keywords:** Traditional agroforestry, Agrisilvicultural, Agrihorticultural, Silvipastoral, Silvihorticultural.

### INTRODUCTION:

Jharkhand is physiographically, ecologically and geologically much diversified, which is reflected through varied land-use pattern, soil conditions, water resources and agricultural practices. The main land use system/practices is rainfed farming, while in rest of the year land is left as fallow land in most of region. The agroforestry, which includes both agricultural crops, trees and animal production system together as a science and practice, has the potential to secure the growing food insecurity, besides it provides multiple outputs such as enhance farm production, income and employment opportunities to smallholders. On the other hand, intensive agroforestry practices will ensure investment and employment opportunities to supplement income from farm (Lakra, et.al., 2018).

Agroforestry has been defined in several ways (Nair, 1989) ICRAF's current definition is a collective name for land-use systems and practices in which woody perennials are deliberately integrated with crops and/or animals on the same land-management unit either in a spatial mixture or in a temporal sequence. There are normally both ecological and economic interactions

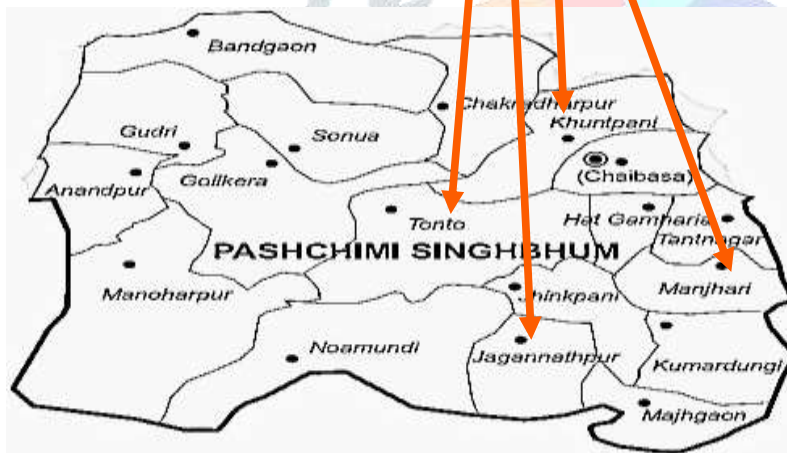
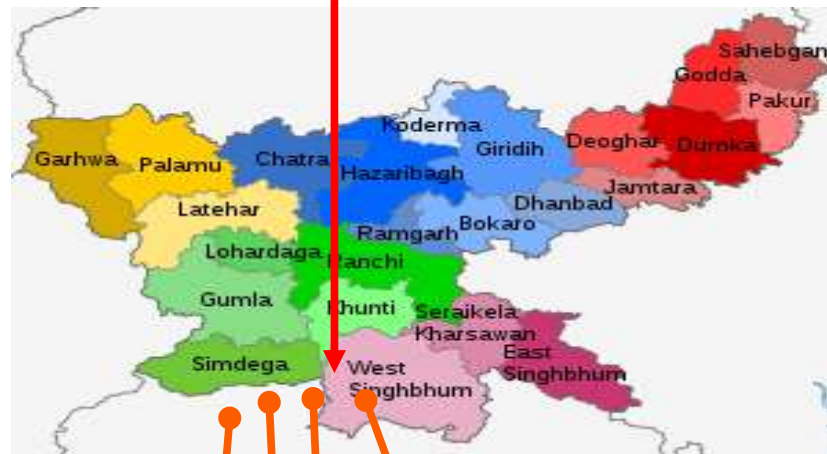
between the woody and non-woody components in agroforestry. This definition has served well and helped agroforestry to become recognized as a branch of agricultural science in its own right (Sanchez, 1995).

The agroforestry practices falls into two groups (a) sequential, such as fallows, and (b) simultaneous, such as alley-cropping (Cooper *et.al.*, 1996). However, Nair (1993) have categorized 18 different agroforestry practices have having each an infinite number of variations. Thus, at the moment, agroforestry is viewed as a set of stand-alone technologies that together form various land-use systems in which trees are sequentially or simultaneously integrated with crops and/or livestock. Agroforestry is generally practiced with the intention of developing a more sustainable form of land use that can improve farm productivity and the welfare of the rural community.

#### **DESCRIPTION OF THE STUDY AREA:**

West Singhbhum of Jharkhand State, which are located between 21°58' and 23°36' North latitude and 85°0' 86°54' East longitude. The West Singhbhum district is situated at a height of 244 meter above the sea level and has an area of 5351.41 Km<sup>2</sup>. The district is bounded on North by district, on the East by Saraikela-Kharsawan district, on the South by Keonjhar, Mayurbhanj and Sundargarh districts of Orissa and on the West by Simdega and Sundargarh district of in Orissa.





**SAMPLING PROCEDURE:**

The study employed a multi-stage sampling procedure. At first, one district i.e., WEST SINGHBHUM was purposely selected to participate for the study purpose. The eastern region of West Singhbhum district was selected for Socio-economic survey. Therefore, a questionnaire was designed to interview the 320 respondents.

**MATERIALS AND METHODS :**

In the present study data have been collected from eight villages of West Singhbhum district of Jharkhand State. Four blocks were selected from West Singhbhum district and from each block four villages and from each village twenty households were selected. In this way from each village 20 households were related for study as per following details:

$$1 \text{ District} \times 4 \text{ Block} \times 4 \text{ Village} \times 20 \text{ Household} = 320 \text{ Total no. of respondents}$$

Table 1: List of selected Blocks and Villages

Sl.No.	Name of selected blocks	Name of selected villages
1	KHUNTPANI	MATKOBEDA PANDRASALI UPARLOTA KENDULOTA
2	JAGGANATHPUR	BADANANDA JINTUGARA MONGRA TODANGHATU
3	MANJHARI	ROLADIH GITILPI DOKATA LOMJORI
4	TONTO	NIMDIH SANKUCHIYA RAMPUSI CHALGI

The study is based on survey of 20 randomly selected household practicing agroforestry from each village with the help of a questionnaire specially designed and pretested for the interviewing the socio-economic survey. Multi-stage random sampling technique was used to select four blocks namely Khuntpani, Jagganathpur, Manjhari and Tonto and from each block four villages and from each villages 20 respondents or households were selected for the observation. The data related to agroforestry practices were derived from 20 farmers.

## RESULTS AND DISCUSSION:

### 1. Land holding of studied villages from four blocks of West Singhbhum District :-

The data on the land holding from four blocks Jagganathpur, Khuntpani, Manjhari and Tonto has been shown in Table 2. Persual of data has indicated that in Jagganathpur block 87.50% of farmers having self-owned land, followed by 7.50% i.e., leased for cultivation and 5% in leased to other for cultivation. In Khuntpani block, the data has indicated that 90% of respondents have self-owned land followed by 5% to both leased for cultivation and leased to other for cultivation respectively. Similarly in Majhari block, 85% of farmers having self owned land followed by 8.75% for leased for cultivation and 6.25% for leased to other for cultivation. Similarly, in Tonto block 82.50% of respondents have self-owned land followed by 6.25% and 11.25% for leased for cultivation and leased to other for cultivation respectively.

It was also observed from table 2, that majority of the land holding respondents under West Singhbhum district belong to self-owned i.e., 86% followed by both approximately 7% to the framers having land leased for cultivation and leased to other for cultivation respectively.

Table 2: Land holding of studied villages from four blocks of West Singhbhum District

S. No.	Land holding	JAGGANATHPUR		KHUNTPANI		MANJHARI		TONTO		TOTAL	%
		f	%	f	%	f	%	f	%		
1	Self-owned	70	87.50	72	90.00	68	85.00	66	82.50	276	86.25
2	Leased for cultivation	6	7.50	4	5.00	7	8.75	5	6.25	22	6.87
3	Leased to other for cultivation	4	5.00	4	5.00	5	6.25	9	11.25	22	6.87

## 2. Existing Agroforestry Practices in the four studied blocks of Eastern region of West Singhbhum district :-

The existing agroforestry practices observed in all four studied block has been shown in Table 3. Persual of data has indicated that the existing agroforestry practices based on tree species and agricultural crop combination were mainly grouped into following systems. Besides these agroforestry related farm practices, farmers are also planting bamboo in and around of their houses and in homestead garden.

### a. Agrihorticultural System

### b. Agrisilvicultural System

### c. Silvipastoral System

### d. Silvihorticultural System

In **Agrihorticultural system**, the horticultural crops were *Solanum melongena*, *Zingiber officinale*, *Capsicum annum*, and *Lycopersicon esculentum*, while horticultural tree component were represented by *Artocarpus heterophyllus*, *Mangifera indica*, *Syzygium cumini*, *Carica papaya*, *Psidium guajava*.

In **Agrisilvicultural system**, two components were tree and agriculture crops. The tree species (woody perennials) were *Artocarpus heterophyllus*, *Azadirachta indica*, *Dalbergia sissoo*, *Gmelina arborea*, *Leucaena leucocephala*, *Syzygium cumini*, *Tectona grandis*, whereas agriculture crops grown were *Triticum aestivum*, *Brassica nigra*, *Pisum sativum*, *Zea mays*, *Oryza sativa*, *Solanum tuberosum* and *Lycopersicon esculentum*.

In **Silvihorticultural system**, tree component were represented by *Artocarpus heterophyllus*, *Azadirachta indica*, *Dalbergia sissoo*, *Gmelina arborea*, *Tectona grandis*, whereas *Solanum tuberosum*, *Allium cepa*, *Capsicum annum*, *Zingiber officinale*, were found integrated with tree species representing horticultural components.

In **Silvipastoral system**, presence of scattered tree species like *Dalbergia sissoo* and *Mangifera indica* were observed, whereas grass component was represented by wild grasses like *Cynodon dactylon*, *Cyperus scariosus*.

The common tree species was *Dalbergia sissoo* in **Agrisilvicultural**, **Silvihorticultural** and **Silvipastoral system**, whereas *Artocarpus heterophyllus* and *Mangifera indica* were grown as most common fruit bearing trees in **agrihorticulture** and **silvihorticultural system**.

In Bastar region observed by Hemrom and Nema (2015) that people are practicing different agroforestry systems viz. **Agrisilviculture** combined with *Shorea robusta*, *Tectona grandis*, *Acacia spp.*, and in **Agrisilvipasture** tree species were *Albizia spp.*, *Leucena leucocephala*, *Ficus racemosa* etc. In **agrihorticultural** practices with many fruit trees and multipurpose tree like *Cocos nucifera*, *Carica papaya*, *Musa acuminata*, *Mangifera indica*, *Anacardium occidentale*, *Embilica officinalis* etc. were integrated while in **homegarden** spp. like *Dalbergia latifolia*, *Mangifera indica*, *Leucena leucocephala*, *Artocarpus heterophyllus*, *Anacardium occidentale* etc. had been observed.

In Manipur, under different agroforestry practices the agriculture crops like *Cajanas cajan*, *Vigna unguiculate* are grown with fodder grasses *Pemphis purpureum*, *Teosinte changing* etc, and the tree spp. are *Parkia roxburghii*, *Alnus nephalensis*, *Albizia lebbeck*, *Artocarpus heterophyllus*, *Ficus* etc. (Singh et al., 1996).

**Table3: Existing Agroforestry Practices in four studied blocks of Eastern region of West**

**Singhbhum district**

Sl. no.	Agroforestry Practices	Woody Component		Non - Woody component	
		Forest tree spp.	Horticultural Spp.	Agricultural crops	Grass Spp.
1	Agrisilvicultural	<i>Artocarpus heterophyllus</i> , <i>Azadirachta indica</i> , <i>Dalbergia sissoo</i> , <i>Gmelina arborea</i> , <i>Leucaena leucocephala</i> , <i>Syzygium cumini</i> , <i>Tectona grandis</i>	-----	<i>Triticum aestivum</i> , <i>Brassica nigra</i> <i>Pisum sativum</i> , <i>Zea mays</i> , <i>Oryza sativa</i> , <i>Solanum tuberosum</i>	-----

2	Agrihorticultural	-----	<i>Artocarpus heterophyllus</i> , <i>Mangifera indica</i> , <i>Syzygium cumini</i> , <i>Carica papaya</i> , <i>Psidium guajava</i> .	<i>Solanum melongena</i> , <i>Zingiber officinale</i>	-----
3	Silvipastoral	<i>Dalbergia sissoo</i> , <i>Bamboo spp.</i> ( <i>Dendrocalamus strictus</i> , <i>Bambusa spp.</i> )	-----	-----	<i>Cynodon actylon</i>
4	Silvihorticultural	<i>Artocarpus heterophyllus</i> , <i>Mangifera indica</i> , <i>Azadirachta indica</i> , <i>Dalbergia sissoo</i> , <i>Gmelina arborea</i> , <i>Syzygium cumini</i> , <i>Tectona grandis</i> .	<i>Solanum tuberosum</i> , <i>Allium cepa</i> , <i>Capsicum annum</i> , <i>Zingiber officinale</i> .	-----	-----

#### CONCLUSIONS:

The eastern region of West Singhbhum district interest and adoption of agroforestry was found as one of the alternative way of land management practices to enhance the income from their existing land resource by most of the respondents. The agroforestry practices adopted in West Singhbhum district were Agrihorticulture, Agrisilviculture, Silvihorticulture and Silviculture. In agrihorticulture the fruit trees like *Mangifera indica*, *Artocarpus heterophyllus* and *Carica papaya* etc. are associated, while in agrisilviculture some timber species like, *Gmelina arborea*, *Dalbergia sissoo* and *Artocarpus heterophyllus* etc. are integrated. Under Silvihorticulture the fruit trees and timber trees like *Artocarpus heterophyllus*, *Mangifera indica*, *Azadirachta indica*, *Dalbergia sissoo*, *Gmelina arborea*, *Syzygium cumini*, and *Tectona grandis* were practiced, while Silviculture system trees like *Dalbergia sissoo*, *Bamboo spp.* are noticed. The preferred agricultural crops were in kharif season paddy, maize and in rabi season wheat, pea whereas, vegetables crops are chilli, ginger, tomato etc. in this way adoption of agroforestry was found as one of the alternative way of land management practices to enhance income from their existing land resource by most of the respondents.

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