

Original Research Article

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Survey of Existing Farming System and Agroforestry Practices in the Lohardaga District, Jharkhand, India

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ABSTRACT

Agroforestry has been recognized as one of the important systems for supporting the livelihoods of rural farmers. Maximum number of male population was 55.05% female population was 44.95% in survey area. Maximum age class 30-40 (48.75%) followed by age class 40 – 50 (23.75%), maximum 51.25% of respondents belong to medium size family followed by 35.00% in small size family. Maximum 65% of respondents were scheduled tribe followed by 28.75% in backward caste, maximum 32.50% of respondents were under Rs. 3001-5000 monthly income followed by 30.00%, maximum 50.00% of respondents was 1-2 ha land holding followed by 37.50% in 2-4 ha. In Agrisilviculture system found tree crop like *Artocarpus heterophyllus*, *Azadirachta indica*, *Dalbergia sissoo*, *Gmelina arborea*, *Leucaena leucocephala*, *Melia azedarach*, *Syzygium cumini*, *Tectona grandis* and agriculture crop like *Triticum aestivum*, *Brassica nigra* *Pisum sativum*, *Zea mays*, *Oryza sativa*, *Solanum tuberosum*, *Lycopersicon esculentum*. In agrihorticulture system grow tree like *Artocarpus heterophyllus*, *Litchi chinensis*, *Mangifera indica*, *Syzygium cumini* and agriculture crop like *Lycopersicon esculentum*, *Solanum melongena*, *Zingiber officinale*, *Capsicum annum*, *Colocasia schott*. Different agroforestry practices fulfilled the demand of rural households and extra income sources. However, only few households adopted high income based agroforestry activities. It should be extended to all households and need to be supported by government.

Keywords

Agroforestry,
Agrisilvicultural,
Agrohorticultural,
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Introduction

Agroforestry is an age old practice followed by every rural household for supporting their local needs which also maintains the microclimate and aesthetic of the surrounds. Agroforestry focuses on the wide range of

trees grown on farms and other rural areas. Among these are fertilizer trees for land regeneration, soil health and food security; fruit trees for nutrition; fodder trees for livestock; timber and energy trees for shelter and fuel wood; medicinal trees to cure diseases and trees for minor products viz.

gums, resins, or latex products, Many of these trees are multipurpose, providing a range of benefits. Scientific agroforestry emphasized for increase in the productivity from unit area by incorporation of tree components in intensive agricultural practices like agrisilviculture, agrihorticulture, Silvo-pastural, agrisilvihorticulture, etc. these practices by and large applied to large farm holding but small land holders are interested in home garden type model which is most primitive and followed in all around the tropics (Leakey 1996). According Forest Survey of India (2013), the forest cover in the country is 6,96,898 km², constituting 21.23% of its total geographical area. Out of this, dense forest constitutes 2.54% and open forest 8.99%. The forest cover is the hilly district is only 38.34% compared with the desired 66% area. India is estimated to have between 14,224 million and 24,602 million trees outside forests spread over an equivalent area of 17 million ha (Singh and Pandey, 2011). The national agriculture policy (2000) emphasized the role of agroforestry for efficient nutrient cycling, nitrogen fixation, and organic matter addition and for improving drainage and underlining the need for diversification by promoting integrated and holistic development of rainfed area on watershed basis through involvement community tegument biomass production through agroforestry and farm forestry. Agroforestry system involves basically three processes of growth, management and interactions. Growth relates to trees, crops, pastures and animals; while management refers to the effective and efficient use of climate, water, soil, plants and animals as the case may be. Interactions on the other hand refer to the tree-crop, tree-pasture, and tree-animal associations. Furthermore, when the growth of trees is combined with cultivation and sometimes with animals, it provides an essential part of an agricultural system which facilitates both productive and protective

functions (Young, 1989).

Materials and Methods

Lohardaga District is situated in the southwest portion of the Jharkhand state. It is lies at 23° 21' 0" North, 84° 48' 0" East longitude. The general climate of the region is sub-tropical and annual average temperature is 23 °C the highest temperature goes to 42 °C in summer and lowest of 8 °C in winter. The site receives annual rainfall of 1000 to 1600 mm. The mean relative humidity is about 76.28% in the area. The monsoon breaks out in the middle of June and last till mid October. Multi stage random sampling was adopted to select the households. Bhandra block was selected randomly in the first stage. Four panchayats were selected randomly for the study. A list of villages was prepared for each selected panchayat. From each village, twenty households were selected using simple random sampling. Thus, a total of 80 households were selected for the purpose of this study. Each village was visited before administering the questionnaires. Interviews were conducted during the evenings (near dinner time) and early mornings, for farmers who were available only during these times. The questionnaire was then finalized on the basis of validity, suggestions, corrections and comment of the research supervisor and experts. A few modifications and reduction in the number of questions were done taking cognizance of time constraints of the interview.

Results and Discussion

Socioeconomic profile

The Socioeconomic study of the area is shown in Table 1. The table indicated that the maximum number of male population was 55.05% female population was 44.95% in survey area. Maximum age class 30-40

(48.75%) followed by age class 40 – 50 (23.75%), maximum 51.25% of respondents belong to medium size family followed by 35.00% in small size family. The reading the size of family reveals that majority of small and medium families have been observed indication a clear cut dominance of small and medium families among respondents confirming the report of Bisaliah (1995), Ranjan *et al.*, (2017), Thakur *et al.*, (2018) and Kumar *et al.*, (2018). Medium size of family is indicated that the tribals have a tendency to live in nuclear family as also reported by Sachidananda (1979) and Srivastava (1982). Kutcha type of house was found maximum (66.25%) followed by Mixed house type (27.5%), maximum 33.75% of respondents was intermediate followed by 26.25% in high school. The literacy status of people residing in the research area are literate or having elementary level education. In Bangladesh 44% of all house hold heads are literate and also mention that high literacy level, strongly correlated with use of more services it also indicate and eliminates of empowerment and awareness Rasid (2002). Maximum 65% of respondents were scheduled tribe followed by 28.75% in backward caste, maximum 32.50% of respondents was under Rs. 3001-5000 monthly income followed by 30.00%, maximum 50.00% of respondents was 1-2 ha land holding followed by 37.50% in 2-4 ha. Dwivedi *et al.*, (2007) the marginal farmers had an average land holding of 0.71 ha, the small farmer had a land holding of 3.14 ha while the medium to large farmer holding size was 3.46 ha thus the overall holding size of the sample farmers in Aligarh district was 1.52 ha. Chauhan and Ingle (1988) studied the role of farm forestry in Akola district of Vidharba region (Maharashtra) and reported that majority of farmers have small landholding, none of the small and marginal farmers had adopted farm or agroforestry (Marwar *et al.*, 1993). In Ranchi district the average land holding of the farmers ranges between 2.79 to 3.75 acres in

all surveyed village (Jha and Ranjan, 1993). Saxena (1996) reported in North West India 52% of the large farmers (those owning more than 2.5 ha.) 17.5% of the small farmers (owning between 0.5 and 2.5 ha) and 5% of tiny farmers (with less than 0.5 ha) planted trees on their farm under agroforestry concept. Singh and Dagar (1996) have presented survey of agroforestry system undertaking in the Mussorie hills near Dehradun (U.P.). About 80% of landholdings were < 1ha, 15% were 1 - 2.5 ha and 5% were 2.5 - 10 ha. The systems identified were agrisilviculture, agri-horticultural, agrisilvihorticultural, silvi-pastoral and homesteads. This finding supports the present finding become percentage of small landholding are more than large landholding. Maximum 68.75% of respondents were their own source and minimum was 31.25% were purchased from markets. Similarly, Dwivedi *et al.*, (2007) the majority of farmers (50.6%) farm trees where a prime source of fuel wood and hence they protected the same in Western Uttar Pradesh and in the Bastar region of Chhattisgarh fulfilling the all basic requirement from agroforestry practices like food, fodder and fuel etc. and also getting extra benefit or income (Hemrom and Nema, 2015).

Maximum 96.25% of mode of cattle feeding was both stall feeding and grazing and minimum was 3.75% were only grazing, maximum 60% of respondents were mixed crop followed by inter crop 22.5%. According to Hemrom and Nema (2015) agroforestry can be seen in all part of Bastar region of Chhattisgarh.

The farmers are planting trees inside and outside their farm and practices many agroforestry practices like boundary plantation, hedge row and intercropping etc. Similar result find in Zaman *et al.*, 2010, Ranjan *et al.*, 2017, Kumar *et al.*, 2018, Kumari *et al.*, 2018 and Thakur *et al.*, 2018.

Table.1 Socioeconomic profile

Component	F	%
Population		
Male	311	55.05
Femal	254	44.95
Age class		
20 - 30	11	13.75
30 - 40	39	48.75
40 - 50	19	23.75
50 - 60	11	13.75
Size of Family		
Small	28	35.00
Medium	41	51.25
Large	11	13.75
House type		
Kutchha	53	66.25
Mixed	22	27.5
Pucca	5	6.25
Education attainment		
Illiterate	8	10
Elementary	15	18.75
High school	21	26.25
Intermediate	27	33.75
College	9	11.25
Social class		
Scheduled tribe	52	65.00
Backward caste	23	28.75
General	5	6.25
Monthly income		
1001 - 3000	24	30.00
3001 - 5000	26	32.50
5001 - 7000	20	25.00
7001 - 9000	10	12.50
Land size		
Below 1 ha	5	6.25
1 to 2 ha	40	50
2 to 4 ha	30	37.5
4 to 10 ha	5	6.25
Source of fodder and fuel		
Own source	55	68.75
Purchase source	25	31.25
Mode of feeding cattle		

Stall feeding	0	0.00
Grazing only	3	3.75
Both	77	96.25
Cropping pattern		
Sole crop	14	17.5
Mixed crop	48	60
inter crop	18	22.5

Table.2 Socioeconomic profile

Component	F (n= 80)	%
Occupation		
Agriculture	80#	100
Labour	32#	40
Private job	8#	10
Construction work	12#	15
Other if any	16#	20
Land use practices		
Agriculture	80#	100
Horticulture	19#	23.75
Agroforestry	37#	46.25
Fallow	53#	66.25
Other purpose	34#	42.5
Multiple answer #		

Table.3 Soil properties of different land use practices

S.N.	Treatment	pH	O C (%)	Nitrogen	Phosphorus	Potash
1.	Agrisilvicultural	6.20	0.423	255.27	17.24	243.22
2.	Agrihorticultural	6.10	0.386	236.09	14.79	238.70
3.	Silvipasture	6.13	0.304	216.03	15.78	223.02
4.	Homegarden	6.18	0.420	251.03	15.25	238.48
5.	Sole tree	6.10	0.332	209.54	15.93	204.02
6.	Sole crop	6.10	0.442	256.29	20.06	255.58
7.	Barren land	5.47	0.258	177.190	10.45	185.37
	SE m ±	0.058	0.011	5.046	0.036	4.780
	CD at 5%	0.172	0.034	15.107	1.078	14.313
	CV %	1.906	6.195	4.411	4.605	4.203

Table.4 Tree and agriculture crop combination in Agroforestry System

Agroforestry system	Tree species	Agricultural crop
Agrisilviculture System	<i>Artocarpus heterophyllus, Azadirachta indica, Dalbergia sissoo, Gmelina arborea, Leucaena leucocephala, Melia azedarech, Syzygium cumini, Tectona grandis</i>	<i>Triticum aestivum, Brassica nigra Pisum sativum, Zea mays, Oryza sativa, Solanum tuberosum, Lycopersicon esculentum</i>
Agrihorticulture System	<i>Artocarpus heterophyllus, Litchi chinensis, Mangifera indica, Syzygium cumini</i>	<i>Lycopersicon esculentum, Solanum melongena, Zingiber officinale, Capsicum annum, Colocasia schott</i>
Silvipasture system	<i>Dalbergia sissoo and Mangifera indica</i>	<i>Cynodon dactylon and Cyperus scariosus</i>
Homegarden system	<i>Artocarpus heterophyllus, Azadirachta indica, Dalbergia sissoo, Gmelina arborea, Litchi chinensis, Mangifera indica, Syzygium cumini and Tectona grandis</i>	<i>Solanum tuberosum, Allium cepa, Solanum melongena, Capsicum annum, Zingiber officinale Colocasia schott, Lycopersicon esculentum and Zea mays</i>

The data has indicated in the Table 2 the respondents of all Bhandra were engaged in Agriculture (100%). Besides agriculture, the respondents are engaged in labour (40%), private job (10%), constructions work (15%) and other (20%). As per Behr and Lee (2004) approximately 25% of these households in Periyar Tiger Reserve Kerala also engaged in off-farm activities. The number of working people engaged in business and government service profession was found very few. The study has indicated that in all the respondents of all Panchayats were engaged in agriculture (100%). Besides agriculture, the respondents are engaged in horticulture (23.75%), agroforestry (46.25%), fallow land (66.25%), and in other purpose (42.5%). Almost similar observation had been reported by Rasid (2002) in Bangladesh indicated that involvement in agriculture in most household's are the primary occupation found in observation about 63% of household depend on one form of agriculture or another ranging from agriculture producing crops on their own land to selling labour for agriculture, 59% of occasionally poor household depend upon agriculture production on their own land, 23% depend on a combination of production from

their own land and sharecropping, while 44% of the always poor household work primarily as agriculture labourers in Bangladesh. Similar study has been carried out by Saxena (1996) in North West India, where he has noticed 52% large farmer (more than 2.5 ha), 17% small farmers (between 0.5 - 2.5 ha) and tiny farmer (less than 0.5 ha) planted trees on their farm under agroforestry concept. Similar result finds in Zaman *et al.*, 2010, Islam *et al.*, 2012, Kumar *et al.*, 2018 and Thakur *et al.*, 2018.

Soil properties of different land use practices

The soil properties obtained from different land use practices in Bhandra block is presented in Table 3. The soil properties like pH, organic contents (%), nitrogen, phosphorus and potash were analyzed under different treatment i.e. in agrisilvicultural, agrihorticultural, sole tree, sole crop and barren land. Perusal of data has indicated that the highest pH was found in agrisilvicultural system i.e. 6.2 whereas minimum pH was found in barren land i.e. 5.47. The organic content (%), nitrogen, phosphorus and potash

were found maximum in sole crop because of regular use of fertilizer in field whereas nitrogen and potash were found minimum in sole tree. The phosphorus was found minimum in agrihorticultural system whereas the organic content (%) was found minimum in barren land. Statistically organic content (%), nitrogen, phosphorus and potash were found significant at 5% among the treatments. Mishra *et al.*, (1982) have reported soil physical properties pH, nitrogen and organic carbon after four year under silvipastoral system in calcareous soil. Similarly, Sharma and Prasad (1980) found growing Sissoo trees proved to be beneficial in improving the site by increasing organic carbon and nitrogen sustainability as compared to fallow land. Growing of Sissoo in association with acable crops has been shown to providing sustainability to the traditional acable for in dry region by Subramanyam *et al.*, (1991). The beneficial effects of trees has been shown by authors such as Khonje (1989) has compared soil characteristics under agroforestry *Leucaena leucocephala*, *Gmelina arborea*, *Eucalyptus camaldulensis* and monocropping (Maize) and noticed improvement in pH or organic carbon under tree environment. Similarly, Rai *et al.*, (2001) reported higher level of organic carbon in silvipastoral system as compare to pasture alone.

Tree and agriculture crop combination in Agroforestry System

Tree and agriculture crop combination was indicated in table 4. In Agrisilviculture system found tree crop like *Artocarpus heterophyllus*, *Azadirachta indica*, *Dalbergia sissoo*, *Gmelina arborea*, *Leucaena leucocephala*, *Melia azedarach*, *Syzygium cumini*, *Tectona grandis* and agriculture crop like *Triticum aestivum*, *Brassica nigra* *Pisum sativum*, *Zea mays*, *Oryza sativa*, *Solanum tuberosum*, *Lycopersicon esculentum*. In agrihorticulture system they grow tree crop like *Artocarpus*

heterophyllus, *Litchi chinensis*, *Mangifera indica*, *Syzygium cumini* and agriculture crop like *Lycopersicon esculentum*, *Solanum melongena*, *Zingiber officinale*, *Capsicum annum*, *Colocasia schott*. In silvipasture system *Dalbergia sissoo* and *Mangifera indica*, and grasses *Cynodon dactylon* and *Cyperus scariosus* where as in homegarden system tree crop were found *Artocarpus heterophyllus*, *Azadirachta indica*, *Dalbergia sissoo*, *Gmelina arborea*, *Litchi chinensis*, *Mangifera indica*, *Syzygium cumini* and *Tectona grandis* and agricultural crop like *Solanum tuberosum*, *Allium cepa*, *Solanum melongena*, *Capsicum annum*, *Zingiber officinale* *Colocasia schott*, *Lycopersicon esculentum* and *Zea mays*. Similar study found in Hemrom and Nema, 2015, Toppo *et al.*, 2016, Lakra *et al.*, 2017, Kumar *et al.*, 2017, Singh and Oraon 2017 and Kumar *et al.*, 2018.

Traditional agroforestry systems and practices associated with them plays an important role in securing the sustainable livelihood security of the rural people of Bhandra block. Most of the people are doing agriculture and labour work in the area. Approx 50% household doing agroforestry in block. Maximum number of people having land holding size per household is 1-2 ha. They should provide scientific guidance to the farmers about suitable tree species grown on agricultural land with agricultural crops, their silvicultural operations and tree management practices along with free supply of seeds and seedlings and loan schemes for the promotion of agroforestry. Surveys are required to be conducted in Lohardaga district more awareness and training programme on scientific methods of agroforestry are required so as to increase income and employment generation at farm level. The Govt. should take proper initiative to supply credit and loan facilities to farmers and arrange training and workshop on cultivation and management of agroforestry.

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