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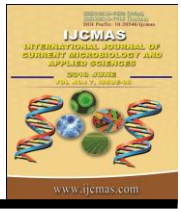

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Socioeconomic Analysis of Tribal Farmers in the Gumla District of Jharkhand from Existing Agroforestry Practices

Amar Kumar, R.B. Sah, Bijay Kumar Singh and P.R. Oraon*

Department of Silviculture and Agroforestry, Faculty of Forestry, Birsa Agricultural University, Ranchi, Jharkhand, India

**Corresponding author*

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A B S T R A C T

Agroforestry is a dynamic and sustainable land management system of deliberately growing woody perennials along with agricultural crops on farmlands to secure both tangible and intangible benefits to the farmers.It plays a vital role in conserving our natural resources, thus it is a step towards sustainable productivity. The present study is the outcome of socio-economic diagnosis of traditional agroforestry practices followed by farmers in Gumla district of Jharkhand. Among cast categories ST (92.50%) was the most dominant caste followed by GEN (5.00%) whereas minimum SC (0.83%) in the study area. The existing agroforestry practices of households adopted i.e. agrisilviculture and agrihorticulture. Total annual income of household's 37.50 percent respondents earns upto Rs. 30,001 to 60,000 followed by 22.50 percent earn Rs. 60,001 to 90,000, and minimum 6.67 percent earn more than Rs. 1, 20,000 per annum. In this area 70.00% of respondents had interested to grow forest trees on their own farm land whereas 95.00% of respondents had interested to grow horticulture trees on their own farm land whereas. Therefore traditional agroforestry systems also provides some assistance originating from traditional knowledge to the farmer and local communities in one or another way thereby ensuring livelihood options for the farmers of the district.

Introduction

Agroforestry can be defined as a dynamic, ecologically-based natural resources management system that through the integration of trees in agricultural landscapes diversifies and sustains production for increased social, economic and environmental benefits (Msuya and Kideghesho, 2012). Agroforestry system is also suitable for small holding to increase soil productivity and land sustainability. Thus agroforestry is a collective name for land use system and technology where woody perennials (tree, shrubs, palms, bamboo etc.) are deliberately used on same land management unit along with agricultural crops (Singh and Osman, 1987). Agroforestry, like multifunctional agriculture, has the objective of promoting economically, socially, and environmentally sustainable rural development (Leakey, 2012). It provides opportunities to increase the value of total production through marketing of multiple products from a given unit of land (Feldhake *et al.*, 2008). Agroforestry, which is the inclusion of woody perennials in farming

systems, has been practiced as traditional land use and livelihood option in Jharkhand state of India since time immemorial. The Jharkhand state is well known for its vast coal reserves and forest cover, which also includes the traditional agroforestry systems. The state is having 4.21 per cent of total geographical area under tree green cover in agroforestry (FSI, 2011). Among various states of Eastern India (Eastern Uttar Pradesh, Bihar, Jharkhand, Odisha, Chhattisgarh, West Bengal and Assam), Jharkhand has the highest area under wastelands/ degraded lands (14.84%), followed by Assam (11.20%) and Odisha (10.69%) (World Bank, 2007). There is a need to restore those wastelands/degraded lands through agroforestry interventions in order to supply the increasing demands of food, fuel, fodder and timber requirements of rural folks in Jharkhand. Thus agroforestry serves as one of the option to tackle the problems of resource degradations and it's over exploitation in this state.

Materials and Methods

Gumla District is situated in the southwest portion of the Jharkhand state. It is lies between 22° 35" to 23° 33" North Latitude and 84° 40" to 85° 1" East Longitude. The average temperature is about 23^0C and average annual rainfall in the district was 1400-1600 mm. Multi stage random sampling was adopted to select the households. Bishunpur block was selected randomly in the first stage. Two panchayats Banari and Chirodih were selected randomly for the study. A list of villages was prepared for each selected panchayat. Further, two villages Salam Nava Toli and Titahi from Banari panchayat and Deorangi and Champatoli from Chirodih panchayat was selected. Since data on number of households in each village were not available, a list of households in each of the selected villages was prepared by employing data collectors. From each village, thirty households were selected using simple random sampling. Thus, a total of 120 households were chosen 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. A response rate of 95% was obtained. Since data were not available on the number of households in each village, a list of households in each of the selected villages was prepared. 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

Demographic details of the households

The study indicated that Male headed families were found to be 90.00 % and female headed families were found 10.00 % in the Bishunpur Block. The age of the farmers ranged from 22 years to 72 years and majority of the farmers (35.83%) were between 30 and 40 years. The further view on the data in table 1 showed that in Bishunpur Block 67.50 % households were illiterate. In literate categories 13.33% households were educated at matric level and those were closely followed by 11.67 % households study at elementary education. Highly educated viz., intermediate level household was only 4.17% and 3.33% at college level. Similar pattern in respect to literacy of households was observed in the sample surveyed. According to Boateng (2008) reported high level of literacy rate is likely to increase technical efficiency but decrease conservatism. Therefore, the findings of the present study indicate hindrance in adopting agroforestry but they can maintain or

retain the existing trees on farms. Rahman *et al.,* (2008) found that agroforestry and non-agroforestry farmers do not differ greatly in terms of general educational level in *Litchi chinensis* based agroforestry in North Bangladesh and concluded that lack of general education cannot explain the very low adoption rates of agroforestry. A further perusal of data indicated that all the cast categories were present in Bishunpur Block. Among these cast categories, ST (92.50%) was the most dominant caste followed by GEN (5.00%) whereas SC (0.83%) was minimum.

Among villages, similar pattern was observed here also ST households were found dominant in all the villages whereas SC family was found to be the least dominant as only one SC family was found in the sample surveyed. In the study area 86.65 percent households reside in kuchcha house. The living standard of household depends largely on household's income. Majority of the households in the study area are unemployed and for their livelihood they depend on farming and that too on marginal and small farm holdings. Improvement in existing agroforestry practices can bring prosperity in their lives. A perusal of the table indicated that in the Bishunpur Block, nuclear family was found to be the highest family type (80.83%) whereas joint family was the lowest family type (19.17%). The majority of households were having family members five to seven (47.50%) or up to four (45.83%). Households having above eight family members were quite low (6.67%) in the block.

A further view on the data in table showed that majority of households (54.17%) was unemployed. Households with one employed person were 37.50 percent. Remaining households (8.33%) were having with two employed persons (Glover *et al.,* 2013; Himshikha, 2016; Thakur *et al.,* 2018).

Occupational profile of households

The occupation profile of the household is divided into two groups i.e. primary and secondary. The primary occupation has been divided into three group, namely farming, government and business, Secondary occupation has been also divided into three group namely private job, agricultural labour and construction worker. The occupational profile of household i.e. primary and secondary occupation of the study areas is given in Table 2. A study indicated that in the almost all households (99.17%) were engaged in farming. It is necessary to mention that no household was engaged in government job. In perusal of data it can be arrived that farming was the main occupation the households. A further study with respect to secondary occupation it is indicated that 38.33 percent households worked as agricultural labour and 26.67 percent households were engaged in construction works and only 14.17 percent were engaged in private job. The substantial additional income obtained from these activities could be used to finance farming activities. This is an incentive to agroforestry adoption and its subsequent impact on the living standards of rural farming households. According to Sood (2005) wealth status is one of the factors that cushion the risk of adoption of any innovation, and total household annual income is one of the indicators of wealth status of farmers. Higher household income is expected to increase the risk-bearing capacity of smallholder farmers' decision making and the willingness to wait for the returns from long term investment such as trees (Sood, 2006).

Households' status of livestock

The livestock and poultry are very important aspect for upliftment of livelihoods of the rural people. The livestock reared by farmers includes cow, buffalo, goats and poultry which

are represented in Table 3. Perusal of data indicated that 87.50% respondents had cow followed by 85.83% had goats and poultry, and 05.83% respondents had buffalo. Among the livestock and poultry, the interest of possessing buffalo by respondents was very low. The animals contribute to the household in diverse ways. Animals provide source of food for the farmers and their household and are also reared for using in agriculture cultivation on own farm as well as to hire out for raising income.

Number of households engaged in income generation from livestock

The number of households engaged in income generation from livestock and poultry at household level are represented in Table 4. The study of respondents of selected villages indicated that 85.83 % household rear goats. Similarly, 75.83 % respondents were engaged in poultry, whereas 70.83 % were engaged in dairy for their livelihood and income generation. Almost all respondents accepted that they engaged in more than one source of livelihood and income generation at household level. Livestock husbandry is a vital component of farming system in the study area.

It provides both goods and services in the form of food, dung and other products. A major output of cattle production that goes to farmland is dung as farmyard manure which contributes a major source for maintaining soil fertility in the study area. Buffaloes and cows are kept mainly for milk and manure production; oxen for draught power and manure; and goats for meat and cash income. Commonly, goats are grazed all-round the year. Cows and oxen are grazed all-round the year to fulfil the demand of animal feed. Cows, goats and oxen are generally grazed in forest and shrub land as well as on private land. Cows and oxen are stall-fed only during fallow and rain free period. Livestock husbandry practice of stall-feeding is achieved by providing grass, weed, and herbaceous fodder, tree leaf fodder collected from agricultural lands and community forests in the livestock sheds.

Households' annual income

The revenue generated from agriculture produce, horticulture produce, agro forestry produce and livestock by the respondents is shown in table 5. An examination of data of annual income from agriculture produce indicated that 55.83 % of respondents had income group under Rs. 20,001-40,000 followed by 41.67 % respondents had income upto Rs. 20,000 and 2.50 % of respondents had income more than Rs. 40,000. It is quite interesting to note the primary occupation of the most of the respondents was agriculture but, only 2.50 % respondents had annual income from agriculture above Rs. 40,000. Likewise, only 5.83 % households earn money from agroforestry produce. Out of this, 3.33 % respondents earn upto Rs. 5000, 1.67 percent respondents earn from Rs. 5,001 to 10,000 and only 0.83% earn above than Rs.10,000 per annum. Similarly, 67.67 % households earn money from livestock component. Out of this, 29.17 % respondents earn upto Rs. 15,001 to 25,000, 19.17% earn upto Rs. 15,000 and only 18.33 % earn more than Rs. 25,000 per annum. Likewise, in total annual household's income from farm practices 50.00% respondents earn upto Rs. 30,001 to 60,000 followed by 35.83% earn upto Rs. 30,000 and only 14.17% earn more than Rs. 60,000 per annum. It is established fact that households' income depends on farm size and components. If farm size and components increase then farmers' income also increases. Accordingly farmers can earn more money from selling diversified forest, agriculture and livestock products which leads to a sustainable life with high social status.

Table.1 Demographic details of the households

Details of the Household		Total (N=120)	(%)
Gender	Male	108	90.00
	Female	12	10.00
Age Profile	20-30	15	12.50
	30-40	43	35.83
	40-50	21	17.50
	50-60	29	24.17
	Above 60	12	10.00
Literacy	Illiterate	81	67.50
	Elementry	14	11.67
	Matric	16	13.33
	Intermediate	5	04.17
	College	04	03.33
Caste	GEN	06	5.00
	OBC	02	1.67
	SC	01	0.83
	ST	111	92.50
House Type	Kuchcha	104	86.65
	Mixed	15	12.50
	Pucca	01	00.83
Type of Family	Nuclear	97	80.83
	Joint	23	19.17
Total No. of Family Member	Up to 4	55	45.83
	5 to 7	57	47.50
	Above 8	08	6.67
No. of person employed from family	00	65	54.17
	01	45	37.5
	02	10	08.33

Table.2 Occupational profile of households

Occupation		Total (N=120)	(%)
Primary	Farming including agroforestry	118	99. 17
	Government Job	00	00.00
	Business	01	0.83
Secondary	Private Job	17#	14.17
	Agricultural Labour	46#	38.33
	Construction Worker	32#	26.67
# Multiple Answer			

Table.3 Households' status of livestock

Livestock and poultry	Total (N=120)	(%)
Cow	105#	87.50
Buffalo	07#	05.83
Goats	103#	85.83
Poultry	103#	85.83
# Multiple answer		

Table.4 Number of households engaged in income generation from livestock

Source	Total (N=120)	(%)
Dairy	85#	70.83
Goatery	103#	85.83
Poultry	91#	75.83
# Multiple answer		

Table.5 Households' annual income

Farm practices		Total (N=120)	(%)
Agriculture (Rs.)	Up to 20000	50	41.67
	20001 to 40000	67	55.83
	Above 40000	03	2.50
Horticulture Produce (Rs.)	Up to 5000	01	0.83
	5001 to 10000	06	5.00
	Above 10000	10	8.33
AF Produce (Rs.)	Up to 5000	04	3.33
	5001 to 10000	02	1.67
	Above 10000	01	0.83
Live-Stock (Rs.)	Up to 15000	23	19.17
	15001 to 25000	35	29.17
	Above 25000	22	18.33
Total (Rs.)	Up to 30000	43	35.83
	30001 to 60000	60	50.00
	Above 60000	17	14.17
Households' Off-farm income			
Govt. Employee (Rs.)	Up to 50000	00	0.00
	50001 to 100000	00	0.00
	Above 100000	00	0.00
Private Job (Rs.)	Upto 50000	07	5.83
	50001 to 100000	08	6.67
Wages (Rs.)	Up to 50000	30	25.00
	50001 to 100000	04	3.33
	Up to 100000	01	0.83
	Above 100000	01	0.83
Total (Rs.)	Up to 50000	38	31.67
	50001 to 100000	12	10.00
	Above 100000	02	1.67
Households' total annual income			
Up to 30000		25	20.83
30001 to 60000		45	37.50
60001 to 90000		27	22.50
90001 to 120000		15	12.50
Above 120000		08	6.67

Table.6 Tree species in agroforestry systems

Sl. No.	Agroforestry systems	Tree Species
1.	Agrisilviculture system	*Acacia auriculiformis, Melia azadirachta, Bamboo spp., Gmelina arborea, Madhuca indica, Moringa oleifera, Azadirachta indica, Butea monosperma, Shorea robusta, Bombax ceiba, Dalbergia sissoo, Tectona grandis and Laucaena leucocephala*
2.	Agrihorticulture system	*Ziziphus mauritiana, Psidium guajava, Syzygium cumini, Artocarpus heterophyllus, Diospyros melanoxylon, Litchi chinensis, Carica papaya and Mangifera indica*

Table.7 Preference of forest trees and horticulture tree species

Common name	Botanical Name	Total Point	(%)
Forest tree species			
Sissoo	*Dalbergia sissoo*	292	26.24
Gamhar	*Gmelina arborea*	253	22.73
Teak	*Tectona grandis*	221	19.86
Akashi	*Acacia auriculiformis*	128	11.50
Subabool	*Laucaena leucocephala*	087	7.82
Moringa	*Moringa oleifera*	069	6.20
Mahua	*Madhuca indica*	063	5.66
Horticulture tree species			
Mango	*Mangifera indica*	560	34.11
Guava	*Psidium guajava*	383	23.33
Banana	*Musa paradisiaca*	222	13.52
Kathal	*Artocarpus heterophyllus*	149	9.08
Litchi	*Litchi chinensis*	142	8.65
Papaya	*Carica papaya*	099	6.03
Ber	*Ziziphus mauritiana*	087	5.30

Table.8 Respondents' willingness to grow forest trees and horticulture trees species on their farm in future

Forest Trees	Household No. (%)				
	Salam Nava Toli (n=30)	**Titahi (n=30)**	**Deorangi (n=30)**	**Champa Toli (n=30)**	**Total (N=120)**
Yes	23 (76.67)	24 (80.00)	20 (66.67)	17 (56.67)	84 (70.00))
No	07 (23.33)	06 (20.00)	10 (33.33)	13 (43.33)	36 (30.00)
Horticulture trees					
Yes	28 (93.33)	29 (96.67)	29 (96.67)	28 (93.33)	114 (95.00)
No	02 (06.67)	01 (03.33)	01 (03.33)	02 (06.67)	06 (05.00)
Figure in parentheses indicate percentage of the respective parameters					

Similarly, literature also finds that farm size is significantly positively related to farmers' income (Safa, 2005; Chakraborty *et al.,* 2015).

Total annual household's income 37.50% respondents earn upto Rs. 30,001 to 60,000 followed by 22.50 % earn Rs. 60,001 to 90,000 and only 6.67 percent earn more than Rs. 1, 20,000 per annum.

Similarly McGinty *et al.,* (2006) observed that average annual income of farmers significantly contributes to farmers' intentions to adopt or maintain agroforestry.

Tree species in different agroforestry system

Tree species is found in different agroforestry system is shown in table 6. The data indicated that tree species found in agrisilviculture system *Acacia auriculiformis, Melia azadirachta, Bamboo spp., Gmelina arborea, Madhuca indica, Moringa oleifera, Azadirachta indica, Butea monosperma, Shorea robusta, Bombax ceiba, Dalbergia sissoo, Tectona grandis* and *Laucaena leucocephala* where as in agrihorticulture system *Ziziphus mauritiana, Psidium guajava, Syzygium cumini, Artocarpus heterophyllus, Diospyros melanoxylon, Litchi chinensis, Carica papaya* and *Mangifera indica.* Similar findings observed in different districts of Jharkhand (Oraon *et al.,* 2005, Hemrom and Nema 2015, Singh *et al.,* 2017, Singh and Oraon 2017, Lakra *et al.,* 2018).

Preference of forest trees and horticulture tree species

For first 1st preference five points was given, for 2nd four points, for 3rd three points and likewise for 4th two points and for 5th one point was given to the preferred species. After calculating the willingness points of prefer horticulture tree species on their own farm land, the preference of horticulture tree species were found. The preferred forest trees are *Madhuca indica, Gmelina arborea, Tectona grandis, Acacia auriculiformis, Laucaena leucocephala, Moringa oleifera and Dalbergia sissoo*. The data indicated that *Dalbergia sissoo* (26.24 %) was the first preference by the respondents followed by *Gmelina arborea* (22.73 %), *Tectona grandis* (19.86 %), *Acacia auriculiformis* (11.50 %), *Leucaena leucocephala* (7.82 %).

Whereas, horticultural species the preference given by the respondents like *Carica papaya, Litchi chinensis, Artocarpus heterophyllus, Ziziphus mauritiana, Musa paradisiacal, Psidium guajava* and *Mangifera indica.* The data indicated that mango (34.11 %) was the first preference of the respondents followed by Guava (23.33 %), Banana (13.52 %), Kathal (9.08 %) and Litchi (8.65 %). Jamil (2003) reported that the farmers highly preferred *Dalbergia sissoo* and *Acacia nilotica* for planting on their farms on account of better economic value, quality timber, fuel wood and fodder (Table 7).

Hemrom and Nema (2015) found similary in Agrisilvicuture system the combinations of trees like *Shorea robusta, Tectona grandis, Acacia spp, Phoenix sylvestris etc* and in horticultural species like in agri-horti-silviculture system the fruit trees *Cocos nucifera, Caraya papaya, Musa acuminate, Mangifera indica, Anacardium ocidentale,Embellica officinalis*. The tree species were *Artocarpus heterophyllus, Azadirachta indica, Dalbergia sissoo, Gmelina arborea, Leucaena leucocephala, Melia azadarech, Syzygium cumini* and *Tectona grandis* and in horticultural tree are *Artocarpus heterophyllus, Litchi chinensis, Mangifera indica* and *Syzygium cumini* (Oraon *et al.,* 2005, Singh *et al.,* 2017, Singh and Oraon 2017, Lakra *et al.,* 2018).

Respondents' willingness to grow forest trees and horticulture trees species on their farm in future

The willingness to grow forest trees and horticulture trees on farm land is shown in the table 8. Data indicated that 70.00% of respondents had interested to grow forest trees on their own farm land whereas 30.00% of the respondents had not agree to grow forest trees on their farm due to shortage of land and also shading effects on field crops. Whereas 95.00% of respondents had interested to grow horticulture trees on their own farm land whereas 5.00% of the respondents had not agreed to grow horticulture trees on their farm land.

Farmers in the study area are having sufficient farming experience, but few farmers are having adequate knowledge in agroforestry. The contribution of the trees in the farming systems certainly added to the diversity dimension by way of income and employment to the farm households besides fulfilling the requirement of wood. Income of households from the sale of agroforestry produce contributes only 2.41 percent to total annual income which indicative of enormous potential of improvement in existing agroforestry practices prevalent in the study area.

Therefore, social and economic conditions of the farmers should be taken into account to design for adoption of agroforestry by the farmers. Further, the traditional form of agroforestry plays a specific role in the livelihood and income generation of households and this should also be kept in mind while formulating an appropriate agroforestry system for farmers. Hence, planned expansion of agroforestry including improvement in existing agroforestry practices is advocated for overall socio-economic development of the farmers.

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