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The study of existing agroforestry and socio-economic analysis on adoption of agroforestry practices

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Abstract

On-farm tree production has the potential to be important for livelihood strategies and forest conservation, but it varies widely depending on local conditions. For conducting the experiment a total number of 150 respondents was randomly selected and face to face interview were taken with family heads or available senior members, as well as the use of a questionnaire are some of the survey sources utilized to collect relevant data. The socio-economic survey was carried out on the farmers who mainly rely on agriculture for their income and practicing agroforestry on their farmlands. The purpose of the survey is to know socio-economic value of that particular area that how the people of the village are living on that by using agroforestry model, what are the benefits they are getting and also help this study to increase the farmers that not involved yet in the agroforestry. Even though the majority of Respondents are either illiterate or education as elementary level. Only matric or post matric is about 30% but still the more likely interested to adopting new practices. 26.66% respondents were practicing agroforestry and out of 73.33% not having trees on their farm, 80% respondents had shown willingness to adopt agroforestry after knowing the benefits of agroforestry practices. It was observed that the agroforestry practices enhance the socio-economic status of farmers.

Keywords: Agroforestry, socio-economic, sustainable, agriculture

One liner: Impact on socio-economic value of that particular area, how the people of the village are living on that by using agroforestry model, what are the benefits they are getting.

Introduction

Agroforestry refers to the development and expansion of forests on farms. Practically, the agro-forestry is the planting of trees in the premises of rural houses and on vacant land to stop the strong wind flow, to prevent crop damage. The method of getting the benefits of both (of crops and trees) by planting trees and shrubs in a proper way along with crops. "By combining agro-forestry systems, a diversified beneficial health and general usage is ensured. In fact, the development of agro-forestry is the modernization of agriculture, under which on the one hand the agricultural yield is increased, and on the other hand it is ensured to be clean and protected. Agroforestry is commonly done with the goal of producing a more sustainable type of land use that can improve farm output and the well-being of rural communities. It's a low-cost approach to integrated land management that also decreases human effect on the environment. It helps to create the green economy by fostering sustainable and resilient forest management, which benefits small-scale farmers as well. Agroforestry systems are commonly based on the components' nature and arrangement, as well as ecological or socioeconomic criteria. Many of them have evolved into modern agroforestry systems, such as enhanced fallows, home gardens, park systems, and alley cropping. Agroforestry is an advanced, scientific approach to effectively utilizing the sustainability attributes and production advantages of time-tested strategies, and its evident role in sustaining crop yields, diversifying farm production, realising ecosystem functions, and ensuring environmental integrity in land use is receiving increased attention in development programmes such as climate change. Millions of farmers, especially smallholders, have amassed wisdom and adaption mechanisms through extended periods of time across a range of ecologies in order to meet their basic demands for food, nutrition, fodder, fuelwood, plant-derived medicines, monetary revenue, and other necessities. Several agroforestry systems/practices have emerged as a result of this process, many of which are now viewed as problem-solving tools. Woody perennial-based systems that promote rural industrialization and job creation; domestication of locusts; multifunctional home gardens that promote food security and diversity;

fast-growing tree-based bio-drainage plantations that ensure lowering of water tables in waterlogged areas while also producing wood, food crops, and carbon sequestration; fast-growing tree-based bio-drainage plantations that ensure lowering of water tables in waterlogged areas while also producing wood, food crops, and carbon sequestration; Agrobiodiversity-supporting tree-dominated habitats; mangrove-based aquaculture that supports livelihood, conserves biodiversity, protects shorelines from natural disasters, and mitigates climate change; and urban and peri-urban agroforestry that makes cities worth living in while also addressing waste diversion. Agroforestry, or the practice of planting trees on agricultural land, can help to protect forests by making tree products like firewood and feed more readily available to farmers, as well as restore soil fertility by reducing erosion, adding nutrients through decomposition of leaf litter and nitrification, recycling leachable nutrients, and assisting in the breakdown of nutrients in the subsoil through the use of dredging. Despite having restricted landholdings, mid hill farmers have addressed problems such as forest resource shortages by conserving or preserving trees in numerous portions of their fields together with crops for centuries (Shrestha, 1995). Despite the fact that agroforestry is a relatively new technology among technologists and extensionists, it has played an essential part in the farming system of the region for generations in various forms. Investigating local knowledge could be a powerful, efficient, and quick solution to fill up the gaps in understanding the science of agroforestry that one farming group has established. (Walker *et al.* 1995). In socio-economic analysis use to study the impact of adoption of agroforestry in economic cultural & socio-economic prospectors. Socio-economic influence the adoption also for the unused land of the farm and socio-economic also growing accordingly because government is giving more priorities to agroforestry model. As a result, agroforestry will be able to meet issues in the twenty-first century and beyond provided all governments' strategies favor its development.

Materials and Methods

Geographical & Physiography situation of the block

Fatuha is located at Ganga & Punpun confluence. Fatuha's soil is excellent since it is drained by several rivers, including the Ganga & punpun. It is in the lower reaches of the Ganga basin, with a typical humid Monsoon climate. Fatuha block is very close to the capital city of Bihar, Patna and the Patna district has 23 blocks, Fatuha is one of them. There are 15 panchayat and 84 villages in the block & the area of block is about 135 sq. km. The area of forest cover in the state is 7305 sq. km.

Climate, Rainfall, Agriculture & Irrigation practices

The climate in the Patna district is rather dramatic in character, being quite hot in the summer & quite freezing in the winter. The month of January is the coldest. The temperature begins to rise in March and reaches its highest point in May. Rain begins in mid-June and continues until mid-September. The district's average annual rainfall is roughly 1076 mm. Rice, Maize, Wheat, Gram, Sugarcane, and Jute are the most important crops in the district. It's alkaline in nature, with a pH range of 6 to 8. In areas with low to medium nutritional status, soils are primarily sandy loam with clay loam.

Socio-economic profile of block

The block is largely based on Agriculture, business, textile & household animals. Fatuha is a major industrial Centre in Bihar, with an industrial district that produces agricultural tractors, scooters, and other goods. Paddy is the main crop of Fatuha, however during the rabbi season, potatoes and tomatoes are also grown. Traditional agricultural inputs are used in Fatuha. The usage of high yielding varieties and hybrid seeds, as well as artificial fertilizers and pesticides, has progressively increased throughout the region. There is a huge economical support in this area, i.e. MNREGA, a central sponsored scheme, under this 100 days of employment is given to the beneficiaries.

Site selection and sampling procedure

In 1st stage, the Fatuha block was chosen randomly out of 23 blocks of Patna district. After that randomly 5 panchayat were selected for the analysis and from each panchayat 2 villages selected for study purpose, so there are 10 villages and I've collected data from 15 households in each village. Thus the sample size is 150. For data collection, the data was taken face to face interview with household heads or available senior members, as well as the use of a questionnaire, are some of the survey sources utilized to collect relevant data.

Results and Discussion

Demographic status

At the time of study to the view of demographic structure, it was found male headed family was much more than female and the percentage of female head was only 14.66%. The farmers in this study ranged in age from 24 to 71 years old, with the majority (48%) falling between the ages of 40 and 60. Only 8.66% of the respondents were over 60. During the survey, we got to see that the people of our younger generation, they understand the meaning of agro-forestry better, their education is better than old farmers and understand how to use new technology & their benefits also know that planting trees is very important in our life. The further view on the data revealed that in Fatuha block 37.33% households were illiterate. In literate group 25.33% households were educated at matric level and 32.00% households were literate below matric *viz.* study at primary or middle school education. Highly educated *viz.* college level household were only 05.33%. While analyzing the housing status, 92% of households in the study region live in pucca houses, with a substantial number of households receiving government assistance like PM Awas Yojna is a government-sponsored scheme.

Family structure

Data revealed that the nuclear family was the most common family type in the Fatuha Block (70.00%), while joint family was the only 30.00%. The data of total number of members in family shows that in the Fatuha Block, the majority of households had up to four (38.66%) or five to eight family members (36.00%). In the block, the percentage of households with more than eight individuals was lower (25.33%) and the majority of them were unemployed. This indicates that agroforestry or tree planting in croplands in the area has the potential to be adopted/implemented.

Occupational profile of block

Following a review of the data, it was observed that farming was the primary source of revenue for households in the

research area. Farming was practiced by practically all households in the Fatuha Block (70.66%). It's worth noting that just a small percentage of the household's members worked for the government, private sector, or in business.

Only 16% worked in the private sector, business, or in government service. According to the data, 22.66% of households worked as agricultural labourers and also involved in construction work.

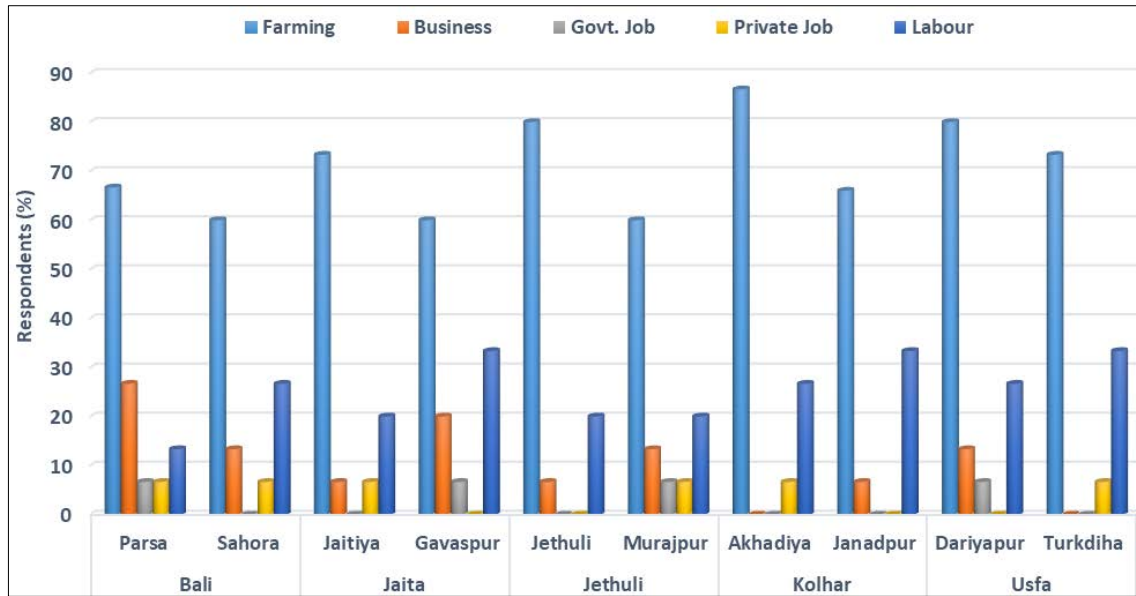


Fig 1: Occupational profiles of households

Land holding details

According to the respondents' land holding sizes, 52.00% of respondents had between 1-4 acre land holdings, with just 10.66% having more than 4 acre land holdings. It's worth noting that 22.00% of respondents are landless, while 15.33%

respondents own farms ranging from 0 to 1 acre. As a result, the majority of households in the research region had tiny farm holdings. The type of agroforestry practices used and their adoption are largely determined by the size of the farm.

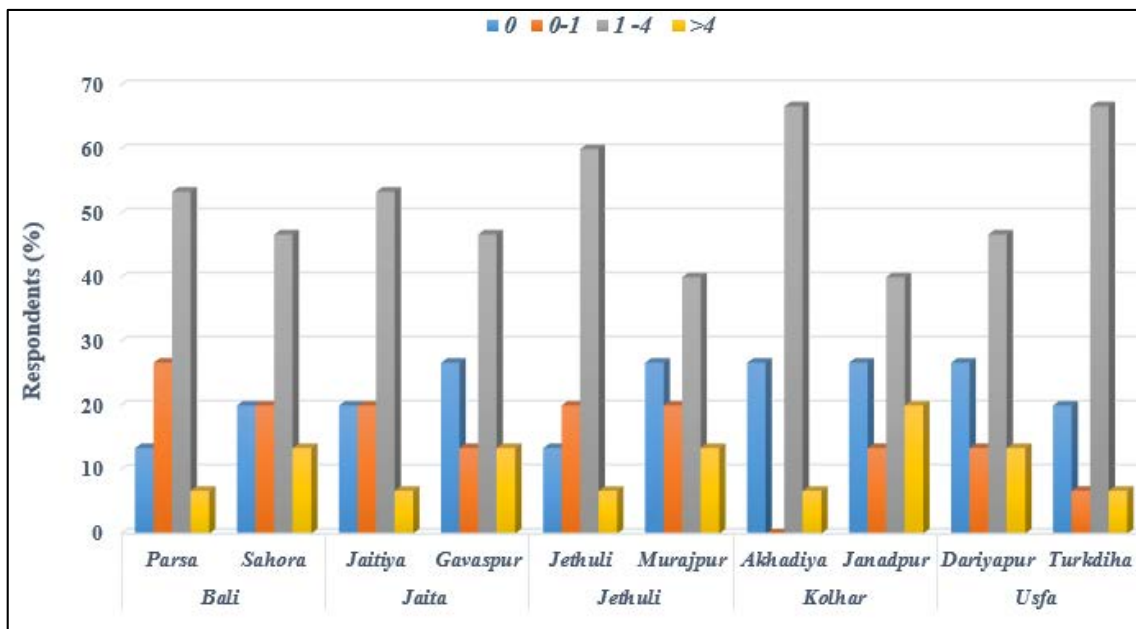


Fig 2: Land holding (in acre) of households

Existing agroforestry practices of households

According to the research data, 26.66% of respondents had trees on their farm, whereas 73.33% of households do not have trees on their farm. A closer look at the data on types of

agroforestry methods revealed that 11.33% of families had trees on the homestead and in the orchard, 12.66% had trees on field bunds, and just 2.00% had trees on fields (In between crops).

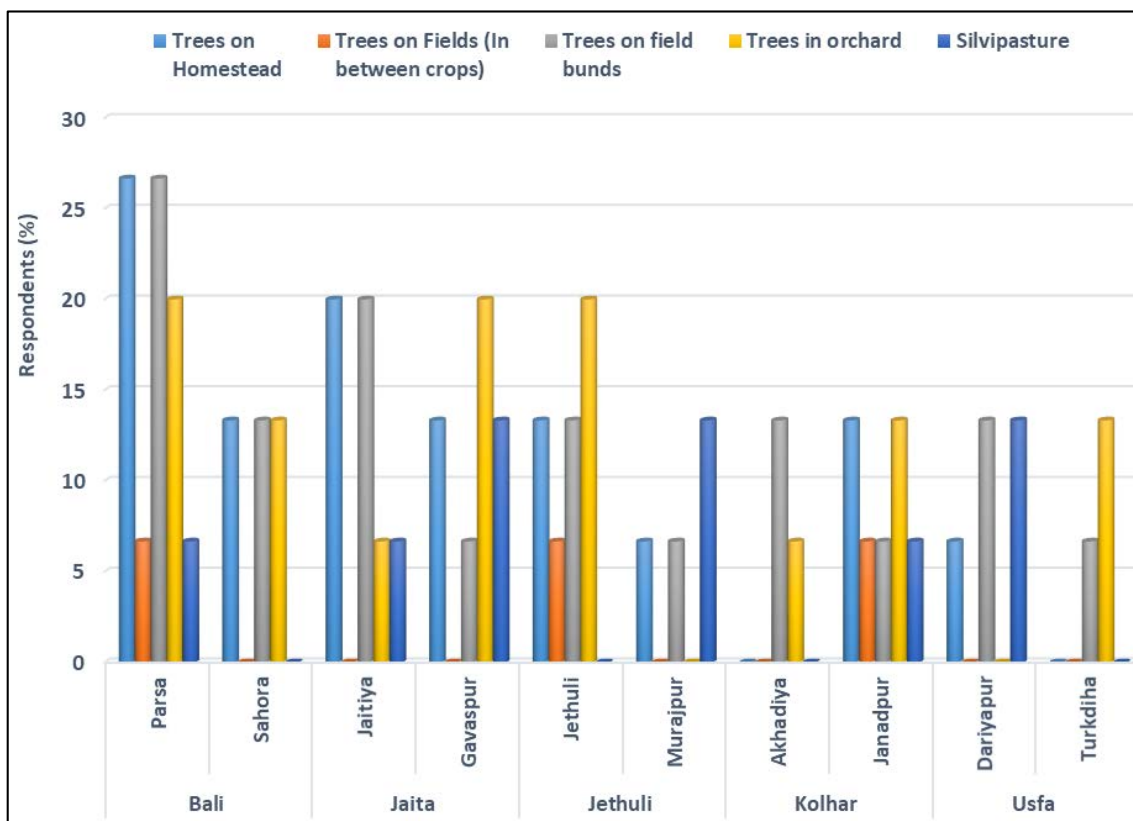


Fig 3: Status of trees grown in agroforestry practices

Households’ annual income from the farm practices

According to data on annual revenue from agriculture produce, 32.66% of respondents had incomes between ₹30,000- ₹60,000 or above ₹60000, while 12.66% had incomes up to ₹30,000. It’s worth noting that agriculture was the main source of occupation of the majority of the households. Further examination of the data on horticultural produce income revealed that the 8.00% of respondents had

an annual income of up to ₹10,000. Similarly, just 5.00% of households profit from agroforestry crops. 2.00% of respondents earn less than ₹5000 per year, 2.66% earn between ₹5000 -₹10,000 per year, and only 2.00% earn more than ₹10,000 per year. Hence, 26.66% of respondents make up to ₹40,000 per year from farm practices, 29.33% earn between ₹40,000 -₹80,000 per year and 24.66% earn more than ₹80,000 per year.

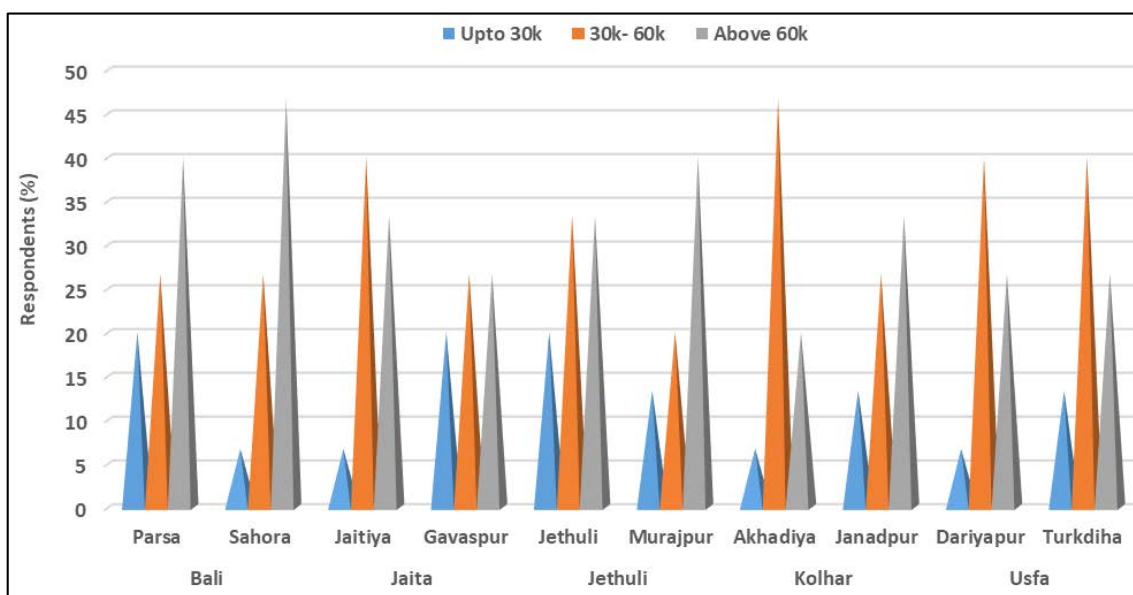


Fig 4: Annual income from Agriculture

Households’ annual income other than farm practices

The income from sources other than farming is divided into government employees, private jobs, businesses, and wages. A review of the data revealed that about 2.5% of the

respondents worked for the government. A few respondents had a private job with a salary of up to ₹1,00,000, 8% were self-employed, and approximately 25% of respondents work as labourers and earn up to ₹50,000 in compensation.

Households' total annual income

The total income includes the revenue generated from different farm practices and off farm income earned by the working person of the household. As per data, 42.00% of

respondents earn up to ₹50,000 per year, 38.00% earn ₹50,000 to ₹1, 00,000 per year, and just 20.00% earn more than ₹1, 00,000 per year.

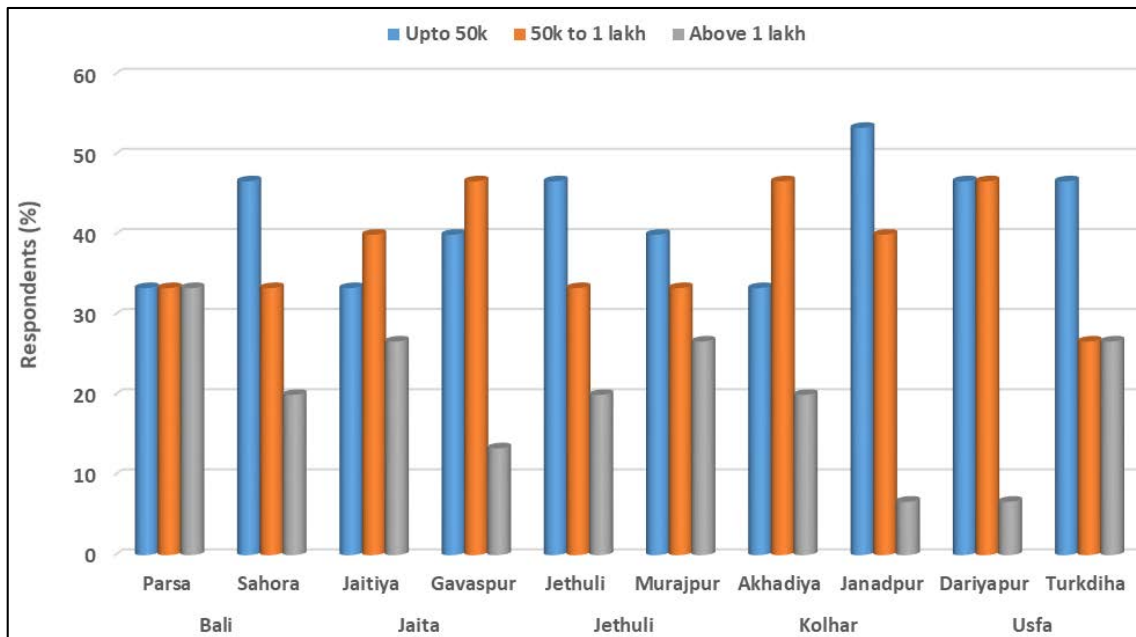


Fig 5: Households' total annual income

Table 1: Demographic details of the household

		Household No. (%)												
Panchayat		Village			Gender			Age		Literacy			Home-Type	
		Male	Female	20-40	40-60	Above 60	Illiterate	Non-matric	Matric	Post-Matric	Kachcha	Pucca		
Bali	Parsa	12 (80.00)	3 (20.00)	10 (66.66)	4 (26.66)	1 (6.66)	3 (20.00)	5 (33.33)	6 (40.00)	1 (6.66)	2 (13.33)	13 (86.66)		
	Sahora	13 (86.66)	2 (13.33)	8 (53.33)	6 (40.00)	1 (6.66)	5 (33.33)	3 (20.00)	5 (33.33)	2 (13.33)	1 (6.66)	14 (93.33)		
Jaita	Jaitiya	14 (93.33)	1 (6.66)	7 (46.66)	7 (46.66)	1 (6.66)	4 (26.66)	6 (40.00)	3 (20.00)	2 (13.33)	0	15 (100)		
	Gavaspur	13 (86.66)	2 (13.33)	5 (33.33)	8 (53.33)	2 (13.33)	8 (53.33)	4 (26.66)	3 (20.00)	0	2 (13.33)	13 (86.66)		
Jethuli	Jethuli	14 (93.33)	1 (6.66)	4 (26.66)	9 (60.00)	2 (13.33)	5 (33.33)	8 (53.33)	2 (13.33)	0	1 (6.66)	14 (93.33)		
	Murajpur	12 (80.00)	3 (20.00)	6 (40.00)	7 (46.66)	2 (13.33)	6 (40.00)	4 (26.66)	4 (26.66)	1 (6.66)	1 (6.66)	14 (93.33)		
Kolhar	Akhadiya	11 (73.33)	4 (26.66)	7 (46.66)	7 (46.66)	1 (6.66)	8 (53.33)	4 (26.66)	3 (20.00)	0	2 (13.33)	13 (86.66)		
	Janadpur	14 (93.33)	1 (6.66)	5 (33.33)	9 (60.00)	1 (6.66)	3 (20.00)	2 (13.33)	9 (60.00)	1 (6.66)	0	15 (100)		
Usfa	Dariyapur	13 (86.66)	2 (13.33)	8 (53.33)	7 (46.66)	0	5 (33.33)	8 (53.33)	2 (13.33)	0	2 (13.33)	13 (86.66)		
	Turkdiha	12 (80.00)	3 (20.00)	5 (33.33)	8 (53.33)	2 (13.33)	9 (60.00)	4 (26.66)	1 (6.66)	1 (6.66)	1 (6.66)	14 (93.33)		
Total (N=150)		128 (85.33)	22 (14.66)	65 (43.33)	72 (48.00)	13 (8.66)	56 (37.33)	48 (32.00)	38 (25.33)	8 (5.33)	12 (8.00)	138 (92.00)		

Table 2: Households' annual income from the farm practices

		Household No. (%)														
Farm practices		Agriculture (₹)			Horticulture Produce (₹)			AF Produce (₹)			Live-Stock (₹)			Total (₹)		
		Upto 30k	30k-60k	Above 60k	Upto 10k	10k - 15k	Above 15k	Upto 5k	5k - 10k	Above 10k	Upto 15k	15k - 25k	Above 25k	Upto 40k	40k - 80k	Above 80k
Bali	Parsa	3 (20.00)	4 (26.66)	6 (40.00)	2 (13.33)	1 (6.66)	1 (6.66)	0	1 (6.66)	1 (6.66)	1 (6.66)	3 (20.00)	4 (26.66)	4 (26.66)	6 (40.00)	4 (26.66)
	Sahora	1 (6.66)	4 (26.66)	7 (46.66)	2 (13.33)	1 (6.66)	0	1 (6.66)	0	0	1 (6.66)	1 (6.66)	0	5 (33.33)	5 (33.33)	2 (13.33)
Jaita	Jaitiya	1	6	5	2	1	0	1	1	0	1	2	1	3	5	4 (26.66)

		(6.66)	(40.00)	(33.33)	(13.33)	(6.66)		(6.66)	(6.66)		(6.66)	(13.33)	(6.66)	(20.00)	(33.33)	
Jethuli	Gavaspur	3 (20.00)	4 (26.66)	4 (26.66)	1 (6.66)	0	2 (13.3)	0	1 (6.66)	0	2 (13.3)	1 (6.66)	3 (20.00)	3 (20.00)	6 (40.00)	3 (20.00)
	Jethuli	3 (20.00)	5 (33.33)	5 (33.33)	2 (13.33)	1 (6.66)	1 (6.66)	0	0	1 (6.66)	0	1 (6.66)	2 (13.33)	4 (26.66)	4 (26.66)	5 (33.33)
	Murajpur	2 (13.33)	3 (20.00)	6 (40.00)	1 (6.66)	0	0	1 (6.66)	0	0	0	2 (13.33)	2 (13.33)	5 (33.33)	3 (20.00)	4 (40.00)
Kolhar	Akhadiya	1 (6.66)	7 (46.66)	3 (20.00)	1 (6.66)	0	0	0	0	0	0	4 (26.66)	3 (20.00)	2 (13.33)	5 (33.33)	5 (33.33)
	Janadpur	2 (13.33)	4 (26.66)	5 (33.33)	0	2 (13.3)	0	0	1 (6.66)	0	0	1 (6.66)	1 (6.66)	5 (33.33)	3 (20.00)	4 (26.66)
Usfa	Dariyapur	1 (6.66)	6 (40.00)	4 (26.66)	0	0	0	0	0	1 (6.66)	0	3 (20.00)	1 (6.66)	5 (33.33)	3 (20.00)	3 (20.00)
	Turkdiha	2 (13.33)	6 (40.00)	4 (26.66)	1 (6.66)	0	0	0	0	0	1 (6.66)	2 (13.33)	2 (13.33)	4 (26.66)	5 (33.33)	3 (20.00)
Total (N=150)		19 (12.66)	49 (32.66)	49 (32.66)	12 (8.00)	6 (4.00)	4 (2.66)	3 (2.00)	4 (2.66)	3 (2.00)	6 (4.00)	20 (13.33)	19 (12.66)	40 (26.66)	44 (29.33)	37 (24.66)

Table 3: Family Structure of households

Panchayat	Village	Household No. (%)							
		Type of Family		Total No. of Family Member			No. of working person in family		
		Nuclear	Joint	Up to 4	5 to 8	Above 8	1	2	Above 2
Bali	Parsa	8 (53.33)	7 (46.66)	3 (20.00)	6 (40.00)	6 (40.00)	7 (46.66)	8 (53.33)	0
	Sahora	10 (66.66)	5 (33.33)	4 (26.66)	8 (53.33)	3 (20.00)	9 (60.00)	6 (40.00)	0
Jaita	Jaitiya	11 (73.33)	4 (26.66)	3 (20.00)	7 (46.66)	5 (33.33)	7 (46.66)	7 (46.66)	1 (6.66)
	Gavaspur	9 (60.00)	6 (40.00)	5 (33.33)	4 (26.66)	6 (40.00)	6 (40.00)	8 (53.33)	1 (6.66)
Jethuli	Jethuli	12 (80.00)	3 (20.00)	6 (40.00)	5 (33.33)	4 (26.66)	9 (60.00)	5 (33.33)	1 (6.66)
	Murajpur	11 (73.33)	4 (26.66)	9 (60.00)	4 (26.66)	2 (13.33)	10 (66.66)	5 (33.33)	0
Kolhar	Akhadiya	13 (86.66)	2 (13.33)	7 (46.66)	7 (46.66)	1 (6.66)	11 (73.33)	4 (26.66)	0
	Janadpur	8 (53.33)	7 (46.66)	6 (40.00)	3 (20.00)	6 (40.00)	4 (26.66)	9 (60.00)	2 (13.33)
Usfa	Dariyapur	9 (60.00)	6 (40.00)	7 (46.66)	4 (26.66)	4 (26.66)	7 (46.66)	6 (40.00)	2 (13.33)
	Turkdiha	14 (93.33)	1 (6.66)	8 (53.33)	6 (40.00)	1 (6.66)	12 (80.00)	3 (20.00)	0
Total (N=150)		105 (70.00)	45 (30.00)	58 (38.66)	54 (36.00)	38 (25.33)	82 (54.66)	61 (40.66)	7 (4.66)

Table 4: Occupational profile of households

Panchayat	Village	Households No. (%)				
		Farming	Business	Govt. Job	Private Job	Labour
Bali	Parsa	10* (66.66)	4* (26.66)	1 (6.66)	1 (6.66)	2 (13.33)
	Sahora	9* (60.00)	2* (13.33)	0	1 (6.66)	4 (26.66)
Jaita	Jaitiya	11* (73.33)	1* (6.66)	0	1 (6.66)	3 (20.00)
	Gavaspur	9* (60.00)	3* (20.00)	1 (6.66)	0	5 (33.33)
Jethuli	Jethuli	12* (80.00)	1* (6.66)	0	0	3 (20.00)
	Murajpur	9* (60.00)	2* (13.33)	1 (6.66)	(6.66)	3 (20.00)
Kolhar	Akhadiya	13* (86.66)	0	0	1 (6.66)	4 (26.66)
	Janadpur	10* (66.00)	1* (6.66)	0	0	5 (33.33)
Usfa	Dariyapur	12* (80.00)	2* (13.33)	1 (6.66)	0	4 (26.66)
	Turkdiha	11* (73.33)	0	0	1 (6.66)	5 (33.33)
Total (N=150)		106* (70.66)	16* (10.66)	4 (2.66)	6 (4.00)	34 (22.66)

* indicates multiple responses

Table 5: Agroforestry practices of households

Agroforestry practices		Household No. (%)						
		Households having trees on their farm		Types of Agroforestry Practices				
		Having trees	Not having trees	Trees on Homestead	Trees on Fields (In between crops)	Trees on field bunds	Trees in orchard	Silvipasture
Bali	Parsa	7 (46.66)	8 (53.33)	4* (26.66)	1* (6.66)	4* (26.66)	3* (20.00)	1* (6.66)
	Sahora	4 (26.66)	11 (73.33)	2* (13.33)	0	2* (13.33)	2* (13.33)	0
Jaita	Jaitiya	4 (26.66)	11 (73.33)	3* (20.00)	0	3* (20.00)	1* (6.66)	1* (6.66)
	Gavaspur	5 (33.33)	10 (66.66)	2* (13.33)	0	1* (6.66)	3* (20.00)	2* (13.33)
Jethuli	Jethuli	6 (40.00)	9 (60.00)	2* (13.33)	1* (6.66)	2* (13.33)	3* (20.00)	0
	Murajpur	3 (20.00)	12 (80.00)	1* (6.66)	0	1* (6.66)	0	2* (13.33)
Kolhar	Akhadiya	2 (13.33)	13 (86.66)	0	0	2* (13.33)	1* (6.66)	0
	Janadpur	4 (26.66)	11 (73.33)	2* (13.33)	1* (6.66)	1* (6.66)	2* (13.33)	1* (6.66)

Usfa	Dariyapur	3 (20.00)	12 (80.00)	1* (6.66)	0	2* (13.33)	0	2* (13.33)
	Turkdiha	2 (13.33)	13 (86.66)	0	0	1* (6.66)	2* (13.33)	0
Total (N=150)		40 (26.66)	110 (73.33)	17* (11.33)	3* (2.00)	19* (12.66)	17* (11.33)	9* (6.00)

* indicates multiple responses

Table 6: Households' total annual income

Total Annual Household income (₹)		Household No. (%)		
		Upto 50k	50k to 1 lakh	Above 1 lakh
Bali	Parsa	5 (33.33)	5 (33.33)	5 (33.33)
	Sahora	7 (46.66)	5 (33.33)	3 (20.00)
Jaita	Jaitiya	5 (33.33)	6 (40.00)	4 (26.66)
	Gavaspur	6 (40.00)	7 (46.66)	2 (13.33)
Jethuli	Jethuli	7 (46.66)	5 (33.33)	3 (20.00)
	Murajpur	6 (40.00)	5 (33.33)	4 (26.66)
Kolhar	Akhadiya	5 (33.33)	7 (46.66)	3 (20.00)
	Janadpur	8 (53.33)	6 (40.00)	1 (6.66)
Usfa	Dariyapur	7 (46.66)	7 (46.66)	1 (6.66)
	Turkdiha	7 (46.66)	4 (26.66)	4 (26.66)
Total (N=150)		63 (42.00)	57 (38.00)	30 (20.00)

Conclusion

In the study area, majority of the respondents were of middle age, illiterate, unemployed and had a low income. Most of them depends on farming for their livelihood. With respect to land holding, majority of the farmers were either marginal or small farmers. In the study area four agroforestry practices are widespread. The following are listed in order of the number of households practicing, these are: Trees on Field bunds which is practiced by the majority households, trees on Homestead and trees in orchard, Silvi-pasture and trees scattered in agricultural fields (in between crops). Income of households from the sale of agroforestry produce contributes only 6.66% to total annual income. It indicates that there is enormous opportunity of improvement in existing agroforestry practices in the study area. This study helped us better understand the Fatuha block's existing agroforestry system. It also aided farmers in comprehending the agroforestry perspective. This study not only helped with the analysis of the socioeconomic aspects that contribute to agroforestry adoption, but it also helped with the knowledge of the factors that function as a barrier to farmers adopting agroforestry. As a result, it's safe to say that the Fatuha block offers a lot of potential for agroforestry. There is a large amount of unused land that could be used for agroforestry. It will not only provide fuel, food, and timber, but it will also help to enhance soil fertility and organic content, as demonstrated in this study.

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