



Bottlenecks in Adoption of Agroforestry Practices in Jammu Division of Jammu and Kashmir

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ABSTRACT

Agro-forestry is an excellent medium of land utilization for obtaining the maximum output. In both irrigated and rain-fed environments, agroforestry is practised to produce food, fuel, fodder, timber, fertiliser, and fibre. It also contributes to nutritional and ecological security, supports livelihoods, reduces poverty, and encourages resilient and productive cropping and farming environments. Adoption of different practices of agroforestry systems is very much crucial for sustaining the livelihood of resource poor farmers particularly in rainfed area. The present study was carried out in 10 blocks of Jammu district of Jammu and Kashmir in 2018 to identify different bottlenecks encountered by farmers in adoption of different agro-forestry practices. Multistage random sampling method was used for selection of 160 respondents from study area. The results show lack of awareness, lack of structural market and lack of interactions with respective governmental organizations were the major bottlenecks in adoption of different agro-forestry practices for sustainable livelihood generation.

INTRODUCTION

Agro-forestry is a strategy of sustainable land use that grows food crops (annuals), tree crops (perennials), and/or animals on the same plot of land in order to maintain or improve overall yields, either alternately or at the same time, using management practices that suit the social and cultural characteristics of the local people and the economic and ecological condition of the area (Chundawat & Gautam, 1993). It has been well documented that agro-forestry systems can address major land-use problems of rainfed farming and a great deal can be accomplished by improving the indigenous systems. Agro-forestry can play crucial role in food security by overcoming numerous challenges including climate change. Due to increase in temperature agriculture production is expected to decline by 2050 in Himalaya region and will lead food insecurity (Bharat et al., 2022; Chouksey et al., 2021). Most of the research results obtained from studies regarding contribution

of agroforestry in food security are largely location-specific (Nair & Dagar, 1991). Until the 1990s, agro-forestry research in developing countries, were primarily concerned with factors of livelihood, like the contribution to household economy (Arnold & Dewees, 1998; Garforth et al., 1999) and profitability relative to agriculture (Srivastava & Pant, 1979; Shekhawat et al., 1988; Ngambeki, 1985; Doyle et al., 1986; Anderson et al., 1988). Potentiality of agro-forestry systems has been well documented and accepted in mitigating global climate change (Verchot et al., 2007). Adoption of different practices of agro-forestry systems is very much crucial for sustaining the livelihood of resource poor farmers. Islam et al., (2015) expressed higher preference for fuel wood, fodder, vegetable, fruit, and timber while moderate or low preferences were observed for medicine, cottage industry/handicrafts etc. Extent of agro-forestry adoption was found to have increased significantly with increasing crop diversification and agricultural production. The need for a holistic approach to

agro-forestry development by integrating agro-forestry programs into other economic and agricultural development programs was highlighted by Sood (2006). Agroforestry is one of the best land use management practices which provide both tangible (Das et al., 2016; Das et al., 2017; Das et al., 2019; Sarkar et al., 2017) and non-tangible benefits (Sarkar, 2019a). In order to meet the increased demand for food, fruits, fuel wood, fodder, bio-fuel, bio-energy, timber and other ecological services, it is necessary to increase total productivity per unit area of land (Sarkar et al., 2017; Sarkar, 2019a; Sarkar, 2019b).

There are some important conditions (Nair, 1993) under which agro-forestry systems can be taken up such as subsistence farming, degraded soils, shortage of fuel, fodder and small timber land-tenure constraints, low capital and high labour. Therefore it necessitates to follow new strategies for the rain-fed ecosystem for maximum utilization of forest resources. The study diagnosed different bottlenecks encountered by farmers in adoption of traditional agro-forestry practices which would help in designing strategies to encourage agro-forestry adoption for sustainable livelihood generation.

METHODOLOGY

The study was carried out in Jammu district of Jammu and Kashmir UT during 2018-19. Multistage random sampling technique was adopted for selection of blocks, villages and respondents. Jammu district has 20 blocks, out of these 10 blocks namely Chowki-Chowrah, Akhnoor, Nagrota, Dansal, Marh, Mathwar, Khour, Kharah-balli, Mandal Phallian and Kot-bhalwal were selected for study purpose. This stage was also purposive as these 10 blocks have majority of rainfed area. Two villages were taken from each block consisting 20 villages from 10 blocks for the present study. 08 farmers/ households were selected randomly as respondents from each selected village, thus making an aggregate sample of 160 respondents for reporting the constraints encountered by farmers in adoption of different agro-forestry practices. Jammu district is divided into four agricultural sub-divisions namely Akhnoor, Marh, Dansal and Miran Sahib. Sampled farmers were further categorized into three sub-divisions namely

Akhnoor, Marh and Dansal because all our sampled farmers belonged to these three agricultural sub-division. Moreover administrative set up of State Agricultural Department of Jammu and Kashmir at field level is divided into different sub-divisions and dissemination of new agricultural technology is managed primarily at sub-division level. Keeping this in view, data collected were analyzed at sub-division level. Well-designed interview schedule was used for collection of data. Interview schedule was prepared by consulting with experts of agro-forestry discipline and reviewing relevant literature. Pretesting was also done on non-sampled respondents for finalizing the Interview schedule. Group discussion conducted with key-informants in each village before carrying out the main survey to get a broader idea about socio economic condition and forest resource use of villagers. A list of households in each of the selected villages was prepared by panchayat leaders of that village and random number technique was employed for selection of households. Descriptive statistics and ANOVA test was applied for drawing the inferences.

RESULTS AND DISCUSSION

Overall mean age of the respondents was 51 years. The difference in the mean age of respondents in three sub divisions was not significant ($F=0.641$, $P=0.528$). Overall formal education in study area was 6.80 years (± 2.86). The difference in the mean education level of respondents of all three sub divisions was not statistically significant ($F=0.097$, $P=0.907$). Overall average land holding in study area was 0.07 hectare. The difference in the average operational land holdings of all three sub divisions was statistically non significant ($F=0.631$, $P=0.469$) as shown by result of ANOVA test so applied. Overall mean farming experience of respondents in Jammu district was 30 years (± 11.13). The difference in the average farming experience of respondents was not significant in three sub-divisions under study ($t=-1.892$, $p=0.060$). In study area overall only 8 percent respondents had membership in social organizations. Overall in the study area only 42 per cent had extension contacts.

The results presented in Table 1 indicated that only 29, 27, and 25 per cent of the respondents were practicing agriculture as

Table 1. Occupation status of respondents

Occupation	Agriculture sub division			Overall percentage N=(160)
	Akhnoor (n=80)	Dansal (n=48)	Marh (n=32)	
Agriculture as main occupation	28.8	27.1	25	27.5
Agriculture as a subsidiary occupation	71.2	72.9	75	72.5
On-farm source of income of respondent farmer				
Agriculture	28.8	27.1	25	27.5
Both on-farm and off- farm source of income				
Agri + Govt service	5	8.3	12.5	8.6
Agri + MGNREGA	33.8	29.2	28.1	30.3
Agri + Business	6.3	8.3	9.4	8
Agri + Labour	10	6.3	9.4	8.5
Agri + Pvt service	13.8	16.7	15.6	15.3
Agri + cattle rearing	2.5	4.2	0	2.2
Household's source of livelihood				
Households solely depending upon agriculture	18	20	17	18
Households having other economic activities	82	80	83	82

their primary source of livelihood in Akhnoor, Dansal and Marh sub divisions respectively. On an average 28 per cent respondents had agriculture as their main occupation in the district. The results further revealed that respondents from 73 per cent households had other sources of income also which includes Agri + labour (8.5%), Agri+ govt. service (8%), Agri+ Business (8%), Agri + Pvt service (15.3 %), Agri + cattle rearing (2.2%) and Agri + MGNREGA (30.3%). As long as household's source of livelihood was concerned only 18 per cent were dependent solely on agriculture for their income. Results indicate that farmers have diversified their source of income.

The results on major agricultural crops and the associated woody perennials presented in Table indicates the list of species of major agricultural crops in *Kharif* and *Rabi* and major woody perennials identified in the study area. These species significantly contribute in different components of existing agro-forestry systems in study area. Woody perennials were classified on the basis of their common use by respondents. Data presented in Table 2 observed that mostly the cereal crops were dominant, fruit trees comprised of sub-tropical fruits, the timber species included *Dalbergia sissoo*, *Eucalyptus* spp, *Toona ciliata* and *Pinus roxburghii* whereas, the fodder tree species included *Albizia lebbeck*, *Lucenea lucocephala*, *Grevia optiva*, and *Butea monosperma* dominantly. Sampled farmers also reported that concerned government agencies promote planting of fruit and fodder tree species besides crop production every year particularly in rainfed

area for enhancing the income of farmers and same findings also reported by study conducted by Tariq et al., (2022).

Bottlenecks in the adoption of agro-forestry practices

Data on the bottlenecks as reported while interviewing the respondents in different sub divisions are classified under Institutional, Technical and Demographic headings and presented in Table 3. Several constraints were discussed by respondents at time of survey and personal interviews. Lack of organized structural market (82%) was the highly discussed and affecting constraint. Poor interactions with respective departments like forest department, agriculture department and other extension services also affected the development and uptake of agro-forestry systems in the study area. The study conducted by Naik et al., (2022) is in concurrence with present findings. Non availability of good quality planting materials was also highly reported by respondents because without good planting stock they were facing problems in planting of trees. The study conducted by Sarvanan & Berry, 2021 and Pathania et al., 2020 also supports the findings of present study where 80 per cent farmers reported lack of quality planting material, lack of market information and less linkage with other tree growers associations. Lacks of awareness, lack of cooperatives were also the major constraints in the study area. Hilly region and rigid terrain were constraint in Dansal and Chowki Chowrah block. Uptake of agro-forestry systems were affected by international border in Garkhal and Chowdhariwala villages.

Table 2. Major agricultural crops and woody perennials in systems

Crop	Fruit	Timber	Fodder
Maize (<i>Zea mays</i>)	Mango (<i>Mangifera indica</i>)	Talli (<i>Dalbergia sissoo</i>)	Siris (<i>Albizia lebbeck</i>)
Bajra (<i>Pennisetum glaucum</i>)	Galgal (<i>Citrus pseudolimon</i>)	Chir pine (<i>Pinus roxburghii</i>)	Lucenea (<i>Lucenea lucocephala</i>)
Sesame (<i>Sesamum indicum</i>)	Kinnow (<i>Citrus spp.</i>)	Safeda (<i>Eucalyptus grandis</i>)	Dhaman (<i>Grevia optiva</i>)
Rice (<i>Oryza sativa</i>)	Nimbu (<i>Citrus lemon</i>)	Safeda (<i>Eucalyptus tetricornis</i>)	Draink (<i>Melia azadirach</i>)
Wheat (<i>Triticum aestivum</i>)	Jamun (<i>Syzygium cumini</i>)	Kikkar (<i>Acacia nilotica</i>)	Palash (<i>Butea monosperma</i>)
Mustard (<i>Brassica nigra</i>)	Ber (<i>Ziziphus mauritiana</i>)	Bans (<i>Dendrocalamus strictus</i>)	Siris (<i>Albizia lebbeck</i>)
Chickpea (<i>Cicer arietinum</i>)	Santra (<i>Citrus sinensis</i>)	Pipal (<i>Fucus religeosa</i>)	
	Aonla (<i>Emblica officinalis</i>)	Amaltas (<i>Cassia fistula</i>)	
	Papita (<i>Carica papaya</i>)	Tuni (<i>Toona ciliata</i>)	
	Bahera (<i>Terminalia bellerica</i>)	Simbal (<i>Bombax ceiba</i>)	
	Banana (<i>Musa paradisiaca</i>)		
	Guava (<i>Psidium guajava</i>)		

Table 3. Bottlenecks in the adoption of agro-forestry practices (N=160)

Bottlenecks	Number of respondents (%)	Ranking
Institutional		
Lack of organized structural market	131 (82)	1st
Lack of cooperatives	74(46)	5th
Poor interactions with respective departments	96(60)	3rd
Technical		
Lack of awareness	104 (65)	2nd
Non availability of good quality planting material	83(52)	4th
Long gestation period/ Delayed economic returns	61(38)	6th
Demographic		
Hilly region and rigid terrain	51(32)	7th
Area near international border	19(12)	8th
Damage by wild animals	19 (12)	8th

CONCLUSION

On the basis of results it is concluded that in field conditions farmers are confronting with varied types of constraints in adoption of different agro-forestry practices. As reported lack of organized structural market and awareness about different agro-forestry practices are the main constraints. These constraints need to be addressed at the organizational level by developing suitable infrastructure. Awareness among farming community needs to be increased by explaining them the role and importance of agro-forestry in earning their livelihood and sustainable development.

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