



Incorporating gender dimensions in the multi-criteria management of Homestead Agroforestry in the Kashmir Himalayas, India

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ABSTRACT: Women play a pivotal yet often underrecognized role in sustaining homestead agroforestry systems. Despite their significant contributions, they continue to face systemic barriers, such as wage disparities, limited access to resources, unfavourable working conditions, and the undervaluation of their labour, which is commonly perceived as unskilled and routine. This study aims to integrate gender perspectives into the multi-criteria management of homestead agroforestry in District Anantnag, Jammu & Kashmir. A multi-stage random sampling approach was adopted to select representative villages, blocks, and 171 households (10% sampling intensity). Primary data were gathered through structured, pre-tested interview schedules and non-participant observation, followed by analysis using descriptive and inferential statistics. Results indicated that material benefits of homestead agroforestry, such as fuelwood, food, and fodder, were rated highest by respondents, whereas non-material benefits (environmental and cultural) were considered moderately important. Approximately 70.18% of women independently managed agroforestry activities, and 52.05% were responsible for organising fruit-related inputs. In contrast, male participation in input planning was 29.24%, and joint family involvement was minimal (2.34%). Women performed nearly 70% of operational tasks (weeding, mulching, cleaning, etc.), yet men dominated income-related decision-making (76.02%), with women contributing only 12.28%. Women also exhibited strong leadership in livestock management (91.23%) and household gardening, participating actively in production (67.25%) and harvesting (50.29%). The major constraints identified were small landholdings, long gestation periods, limited technical knowledge, and the complexity of agroforestry systems. Addressing these gender-specific challenges is crucial for enhancing women's agency, ensuring equitable participation, and strengthening the overall sustainability of homestead agroforestry systems in the region.

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1. INTRODUCTION

Wood Homestead agroforestry, also known as home gardening, is an age-old, sustainable land-use practice that integrates trees, crops, and livestock around the family dwelling. This system is especially significant for resource-poor households in rural areas, offering multiple subsistence and commercial benefits. Despite the typically small size of homesteads, their number has expanded due to increasing population pressure, driving families to intensively manage every available piece of land for production. These systems

contribute substantially to food, nutrition, and energy security, while also generating income through the sale of fruits, vegetables, timber, and firewood. In India, homestead systems account for about 70% of the fruit, 40% of vegetables, 70% of timber, and 90% of firewood and bamboo production (Miah and Ahmed, 2003). A defining feature of homestead agroforestry is its reliance on family labour, with women playing a central role in maintaining the integrated crop-tree-livestock unit (Fernandes and Nair, 1986). Women manage a wide range of tasks from planting and weeding to harvesting and livestock care. Their participation has been critical in sustaining these systems across generations (Kumar and Nair, 2004). Studies have shown that women are equally productive as men when provided with equal access to resources and opportunities (Quisumbing, 1996). In fact, women represent nearly 43% of the agricultural labour force globally, with higher engagement in countries like India and Kenya (Raney *et al.*, 2011; Franzel *et al.*, 2002). Despite their vital contributions, women in agriculture and agroforestry often face

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systemic barriers, including limited land ownership, lack of access to education, credit, extension services, and decision-making roles. Cultural norms and gender-based taboos further restrict their involvement in developmental interventions, including agroforestry (Kiptot & Franzel, 2012). These challenges result in financial insecurity, restricted mobility, and underutilization of their potential in enhancing productivity and sustainability.

Women frequently endure low wages, poor working conditions, and are often overlooked in policy and planning, as their labour is wrongly perceived as unskilled and repetitive. Yet, they remain indispensable in tasks such as homestead gardening, fodder collection, nursery management, and post-harvest processing. Their empowerment is key to stabilising rural economies and promoting sustainable agricultural practices (Ankita *et al.*, 2018). Understanding the gender dimensions of homestead agroforestry is essential for designing inclusive development strategies. Highlighting women's contributions, identifying the constraints they face, and supporting their access to resources and decision-making can significantly enhance agroforestry adoption and sustainability. This study focuses on the role of women in decision-making and management of homestead agroforestry in District Anantnag, Jammu & Kashmir an area where such systems are crucial for rural livelihoods.

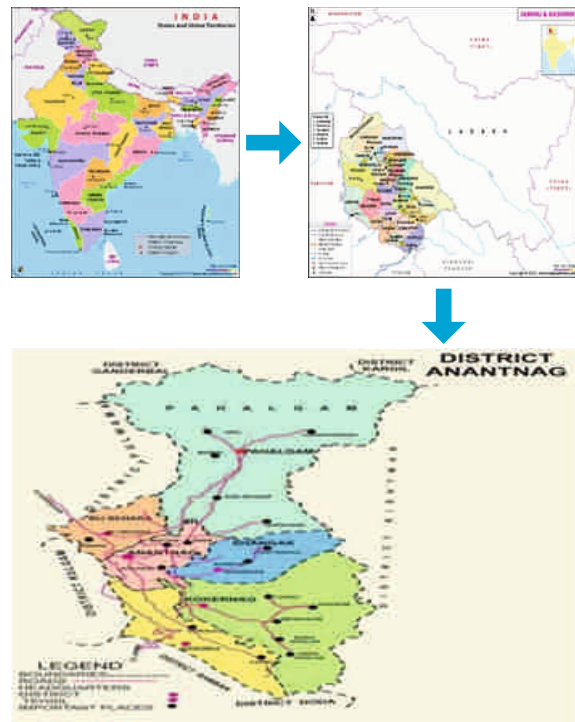
2. METHODOLOGY

The suggested study was carried out in the Jammu & Kashmir U.T district of Anantnag. Geographically, District Anantnag is located between 33.73°N 75.15°E and 33°44'N 75°09'E, and it is 1600 meters above mean sea level. The distance between it and Srinagar, the J&K summer capital, is 53 km. To the south of the region are the Pir Panjal ranges. The predominant land uses in the region are forest land with trees, groves, past fallows, ongoing fallows, permanent pastures, non-agricultural uses, and bare and useless ground. The entire area of the Anantnag district is 3,574 square kilometres (1,380 square miles). There are sixteen blocks in all. The district is 3,984 square kilometres in size and is made up of 620 settlements.

Data Collection

Sampling

The villages and respondents were chosen using a multi-stage random sampling technique (Ray and Mondol, 2004). The initial step was choosing four blocks, Khoveripora, Dachnipora, Achabal, and Vessu at random from the Anantnag district. Villages from blocks, including Nowshara, Viddy from Dachnipora block, Bonagund, Paibugh, Khairbugh, and



Location of the study area: District Anantnag of J&K

Shamsipora from Khoveripora block, Mohripora and Thajiwara from Achabal block, and Malpora from Vessu, were selected at random in the second stage. Overall, 171 households were chosen, and the sampling intensity was 10%.

Survey and inventory procedure

The current study used both qualitative and quantitative methodologies to accomplish the research's goals. Both first field surveys and secondary sources were used to gather data. Non-participant observation and organized interviews with chosen respondents were utilized as primary sources (Kumar, 2012). Whilst secondary data was gathered for households, villages, and blocks, primary data was gathered at the household level.

Ten broad classes of agroforestry values were included in the schedule for assessing how rural women perceived these values in their daily lives. A three-point continuum scale was used to determine how important each class was very important, moderately important, and least important, with scores of 3, 2, and 1, respectively as per Singha *et al.* (2006). Gender-specific information regarding whether the role was carried out by women, men, children, women + men, women + children, or women + men + children was gathered through a participative interview with the family's female members, that achieved scores of 1, 2, 3, 4, and 6, respectively in selecting components, organizing inputs, income ownership and use of produce; based on their participation in the following crucial agroforestry activities: cleaning, spot weeding,

climber cutting, pruning, lopping, plant protection techniques, fertilizer application, mulching, and planting material preparation and also determining the degree of involvement in the following essential tasks: feeding, collecting fodder, milking, hatching, treating, bathing, moving in and taking out, caring for, and fencing. The same categories acquired scores of 1, 2, 3, 5, and 6 according on the extent to which they participated in the following decision-making processes: marketing, seed production, production, harvesting, and consumption. Based on the literature, a thorough list of all possible constraints to the adoption of agroforestry by women farmers was created. A 3-point scale was used to evaluate the respondent's perception of these factors' effectiveness; scores of 3, 2, and 1 marked highly effective, moderately effective, and least effective, respectively (Islam *et al.*, 2012).

Data analysis

The observations on various parameters were statistically analysed on MS Excel for meaningful interpretation using following statistical devices as per Snedecor and Cochran (1967).

Frequency (f)

The frequency (f) is used to denote how often a class or group response or character occurs.

Percentage (%)

Percentages are used to simplify and decrease the numbers in the standard for a base equal to 100.

Mean (x)

The mean has been determined by the equation

$$\bar{x} = \frac{\sum fx}{N}$$

where,

\bar{x} = mean of scores

Σ = summation

f = frequency of the class

x = class value or midpoint of the class interval

N = number of observations

Standard deviation (S.D.)

The square root of the mean of the squared deviations of the value of the individual from their mean is known as standard deviation and is denoted by σ . It is determined using the formula:

$$\sigma = \sqrt{\frac{\sum (X-x)^2 fx}{N}}$$

Where,

σ = population standard deviation

Σ = summation

\bar{x} = population mean

x = each value from the population

N = size of the population

3. RESULTS AND DISCUSSIONS

Women's perception in homestead agroforestry

Most respondents (85.38%) identified the productive values (MS, 2.85) as the most significant in Table 1, which presents the interpretation of the agroforestry values by local women. This is accurate since the productive values of homestead agroforestry allow rural people to independently meet their basic needs for food, vegetables, fuel, fodder, fruits, fiber, and other necessities. Economic values (MS, 2.83) were placed second and as the most significant by the vast majority of respondents (83.04%). This is primarily agroforestry's financial benefits—such as increased family income, employment opportunities, improved animal ownership, extra income, reduced agriculture costs, etc. reduce the demand on rural population's subsistence resources. The human values (MS, 2.74), which form the basis of agroforestry, were considered the most important factor by most respondents (75.43%). This may be clarified by the fact that human values have a direct impact on the development of education, employment knowledge, and skills in rural communities, as well as the accessibility of information, people's health and nutrition, and other factors. Agroforestry's social values (MS, 2.44) were ranked fourth by the respondents, who also found that they were very important (53.22%) and important (37.43%). This aligns with variations in eating patterns, communication exposure, migration tracking, and occupations, among other factors. The respondents rated the protective values of agroforestry (MS, 2.42) as most important (52.63%) and significant (36.85%), placing them in fifth place. The intangible advantages of agroforestry, such as decreased rates of pests and illnesses, erosion prevention, soil and water conservation, and flood management, are what led to these ratings. Because of their socioeconomic and life-supporting effects on rural communities, agroforestry's productive, economic, human, social, and protective services were given higher ratings; this is consistent with the findings of previous researchers Kareemulla *et al.* (2009) and Bijalwan *et al.* (2011).

Regarding the recreational values (religious ceremonies, landscape enhancement, artistic venue creation, religious sacrifices, entertainment opportunities, propitiation of gods, sports, hunting, etc.) and ecological values (carbon sequestration, pollution reduction, biodiversity conservation, protection of wildlife habitat, groundwater recharge, reduction in dependency on natural forests, climate changes, etc.), cultural values (preservation of regional customs, traditions, festivals, taboos,

folklore, customary recipes, etc.) Spiritual values (preservation of spirituals, values, beliefs, and customary rites) and organizational values (rights or claims, friends, kin, support from trade or professional associations; families, communities, committees, businesses, voluntary organizations, political claims, etc.) are the benefits that agroforestry provides to rural populations. The ranks assigned were 6 to 10, corresponding to the fact that most respondents reported moderate perceptions, with MS ranging from 2.27 to 1.97. The explanation for this might be that the values of agroforestry are non-instrumental and intangible, which makes it challenging for rural communities to comprehend their importance.

Women's role in selecting components, organizing inputs, income ownership & uses of produce

According to the results shown in Table 2, 70.18% of women select the homestead agroforestry component by itself, while 8.18% do so in conjunction with males. Every management activity involved both men and women, however there was a notable difference in the percentage of men who engaged in species selection and plantation (17.54%). These findings were consistent with those of Parihaar *et al.* (2015) who found that eighty percent of respondents said that

women grew and cared for the bulk of the vegetables in their home gardens. In line with our findings, men accounted for only 18% of the total role, while children made up only 2%. Additionally, Table 2, showed that 52.05% of women organized contributions, compared to 29.24% of males alone, 14.62% of women and men together, and a little amount of roughly 2.34% of women and children. The result appears to be in line with Halbrendt *et al.* (2014), who found that under traditional farming methods, men performed 46.9% of all labor while women completed 53.1%; under improved farming methods, a similar trend persisted, with men performing 46.0% of all labor and women 54.0%. Although women are restricted in markets and trade, 76.02% of men are involved in income ownership, according to the table's data analysis. Despite being the main proponents of household agroforestry, women have limited access to markets for their own produce. The findings were consistent with Gebrehiwot *et al.* (2018), who found that males often make decisions on almost any topic without first consulting their family because of cultural attitudes that give them the right to do so. Because they have easier access to resources and are the owners of things like money, houses, land, and

Table 1. Women's perception in homestead agroforestry of sample households (N=171)

Agroforestry values	Perception			Mean Score	Rank order
	Highly important	Moderately important	Least important		
Productive	146 (85.38)	25 (14.62)	00	2.85	1
Protective	90 (52.63)	63 (36.85)	18 (10.52)	2.42	5
Social	91 (53.22)	64 (37.43)	16 (9.35)	2.44	4
Economic	142 (83.04)	29 (16.96)	00 (0.00)	2.83	2
Human	129 (75.43)	40 (23.39)	2 (1.18)	2.74	3
Ecological	75 (43.86)	66 (38.6)	30 (17.54)	2.26	6
Cultural	59 (34.5)	54 (31.58)	58 (33.92)	2.00	8
Recreational	41 (23.98)	91 (53.22)	39 (22.8)	2.01	7
Spiritual	54 (31.58)	58 (33.92)	59 (34.50)	1.97	10
Organizational	54 (31.58)	60 (35.09)	57 (33.33)	1.98	9

Figures in parentheses indicate percentages

Table 2. Women's role in selecting components, organizing inputs, income ownership & uses of produce

S.No.	Role	Selecting components	Organizing inputs	Income ownership & use of produce
1.	Women	120 (70.18)	89 (52.05)	21 (12.28)
2.	Men	30 (17.54)	50 (29.24)	130(76.02)
3.	Children	0	0	0
4.	Women + Children	3 (1.75)	3 (1.75)	0
5.	Women + Men	14 (8.18)	25 (14.62)	20 (11.7)
6.	Women + Men + Children	4 (2.34)	4 (2.34)	0

animals, men are encouraged to take risks and make decisions.

Link between the homestead agroforestry and women's role

Approximately 70% of women engaged in activities such as spot weeding, cleaning, plant protection measures, and mulching, according to the results in Table 3. Additionally, Table 3, showed that all men were performing homestead agroforestry tasks such lopping, root trimming, and climber cutting. It is clear that when it comes to home garden maintenance, men and women share duties. The habit of women caring for their home gardens is widespread in settled societies worldwide. There is ample evidence that women play a significant role in the maintenance and cultivation of household gardens. These include choices about which species to use, how to use therapeutic plants, how to choose seeds, how to store and manage pests, and how people gather fuel wood.

The findings were consistent with those of Halbrendt *et al.* (2014), seeding and transplanting were mostly

considered women's tasks in the past due to outdated farming methods; however, with the implementation of better procedures, the effort was distributed more fairly between men and women. According to Gebrehiwot *et al.* (2018), women grow and process fruits, vegetables, dairy products, and distribute food in traditional household gardens, whereas males till, cultivate, and trade cash crops at wholesale prices. According to Maharjan *et al.* (2012), more than 80% of women work in agriculture in some regions of Nepal, yet they are only marginally involved in the application of fertilizer and pesticides.

Livestock is the leading component in homestead agroforestry

According to Table 4, 71.03% of the female respondents were involved in both milking and bathing, and the majority of them roughly 87.58% were involved in egg collection and breed improvement through the local hatching process. Similar results were discovered in a research by Maarse (1995), who stated that women do the majority

Table 3. Relationship between Homestead Agroforestry and Changes in Women's Roles

S.No.	Role	Spot Weeding	Cleaning	Climber Cutting	Pruning	Lopping	Plant protection Measures	Application of fertilizer	Mulching	Preparation of planting Material
1	Women	120 (70.18)	104 (60.82)				130 (76.02)	73 (42.79)	21 1(70.76)	86 (56.29)
2	Men	35 (20.47)	40 (23.39)	171 (100)	171 (100)	171 (100)	15 (8.77)	82 (47.95)	27 (15.79)	60 (35.09)
3	Children	0 (0.00)	0				0	0	0	0
4	Women+ Children	5 (2.92)	5 (2.92)				7 (4.1)	10 (5.85)	0	0
5	Women+ Men	11 (6.43)	22 (12.87)				19 (11.11)	6 (3.51)	23 (13.45)	25 (14.62)
6	Women+ Men+ Children	0 (0.00)	0 (0.00)				0	0	0	0

Table 4: Women's Participation in Livestock and Poultry Rearing under Homestead Agroforestry Systems

S.No	Role	Feeding	Fodder	Milking	Hatching	Treatment	Bathing	Taking in and out	Care taking	Fencing
1	Women	77 (53.1)	80 (55.17)	103 (71.03)	127 (87.58)	100 (68.96)	103 (71.03)	92 (63.45)	93 (64.13)	14 (9.66)
2	Men	40 (27.58)	18 (12.41)	24 (16.56)	3 (2.07)	25 (17.24)	23 (15.86)	16 (11.03)	34 (23.45)	97 (66.89)
3	Children	0	0	0	0	0	0	0	0	0
4	Women+ Children	7 (4.83)	8 (5.52)	0	5 (3.45)	4 (2.76)	6 (4.84)	7 (4.83)	3 (2.07)	7 (4.83)
5	Women+ Men	17 (11.73)	34 (23.45)	18 (12.41)	10 (6.9)	12 (8.26)	13 (8.97)	25 (17.24)	9 (6.21)	23 (15.86)
6	Women+ Men+ Children	4 (2.76)	5 (3.45)	0	0	4 (2.76)	0	5 (3.45)	6 (4.14)	4 (2.76)

of the labor in duties like feeding animals, milking, spreading manure, gathering water, and even selling milk, because the farmhouse is given special credit for its agroforestry efforts. In a study carried out in a particular area of the Gazipur district, Nahar (2008) discovered that rural women consistently participate at a high level in all homestead chores, including cultivating vegetables, goats, and poultry. This is quite positive. Her analysis makes it abundantly evident that rural women in our nation are the ones that engage in these kinds of activities the most.

Women's participation in decision making process

Many female respondents (91.23%) independently participate in decisions about seed production, according to the results in Table 4.16. The findings also revealed that women and men collaborated on decisions related to production, consumption, and harvesting at rates of 67.25%, 70.76%, and 50.29%, respectively. It has been observed that most of the work in home gardens in rural Anantnag was done by women. Women make better choices than males when it comes to homesteading hobbies.

Saraguro women also established and managed family gardens, chose what to plant, and made decisions on how to use the fruit, according to Finerman and

Sackett (2003). According to a study conducted in the Nanital district by Bargali (2015), women are mostly in charge of using home garden products. Of the respondents to the home garden survey, 33% stated that men make most of the decisions regarding the use of the products, whilst 67% stated that women do.

Problems related to women's participation in homestead agroforestry

With a mean score of 2.9, the results in Table 6, showed that the largest obstacle faced by the female respondents was their lower landholding. The results were consistent with those of Sharma (2008), who concluded that the main reason married children had lesser holdings was due to the transfer of land from one generation to the next, followed by a long gestation period in order to produce a satisfactory return (2.85). It is common for traders in villages to make money off of the money given to the residents and rising prices. This explains why native areas experience delays in cash payments. Lack of technical know-how (2.84) was ranked third because it's conceivable that just a few location-specific technologies were established, and that most technological communications were developed purely from research conducted at local research stations. Agroforestry's complexity (2.81)

Table 5: Women participation in decision making process of sample households (N=171)

S.No.	Role	Production decision	Harvesting	Consumption	Seed production	Marketing
1.	Women	41 (23.98)	47(27.49)	26(15.21)	156(91.23)	21 (12.28)
2.	Men	15 (8.77)	38 (22.22)	24 (14.03)	3 (1.75)	130(76.02)
3.	Children	0	0	0	0	0
4.	Women + Children	0	0	0	0	0
5.	Women + Men	115 (67.25)	86 (50.29)	121 (70.76)	12 (7.02)	20 (11.7)
6.	Women + Men + Children	0	0	0	0	0

Table 6 Constraints related to women's participation in homestead agroforestry of sample households (N=171)

S.No.	Constraints	Effectiveness in non-adoption of agroforestry practices			Mean Score	Rank
		Highly effective	Moderately effective	Least effective		
		Score '3'	Score '2'	Score '1'		
1.	Complexity of agroforestry practices	143 (83.62)	24 (14.03)	4 (2.35)	2.81	IV
2.	Smaller size of land holdings	154 (90.05)	17 (9.95)	-	2.9	I
3.	Ignorance of people towards agroforestry practices	128 (74.85)	30 (17.55)	13 (7.6)	2.67	VI
4.	Inadequacy of publicity and extension activities	117 (68.42)	37 (21.63)	17 (9.95)	2.58	VII
5.	Marketing problems of products	135 (78.95)	26 (15.2)	10 (5.85)	2.73	V
6.	Legal constraints	109 (63.74)	38 (22.22)	24 (14.04)	2.49	VIII
7.	Long gestation period for fetching handsome return	148 (86.54)	21 (12.28)	2 (1.18)	2.85	II
8.	Lack of technical know	148 (86.54)	20 (11.7)	3 (1.76)	2.84	III
9.	Uncertainty or easy accessibility of forest products	77 (45.03)	52 (30.41)	42 (24.56)	2.21	X
10.	Lack of incentives	100 (58.48)	41 (23.97)	30 (17.55)	2.4	IX

came up at number four because it demonstrated how the intricate design of the technologies recommended by agricultural experts made it challenging for individuals to adhere to practices. Product marketing issues (2.73) came in fifth place; this could be because village residents sell their produce to dealers rapidly without having a space to store it, which prevents them from getting information about market conditions and updates. In the work of Meganathan *et al.* (2010), the primary marketing restrictions were determined to be the sample tribal farmer's limited bargaining power and the exploitation of middlemen. Sixth place went to ignorance about agroforestry (2.67), while the women adopters' personal issues were illiteracy and lack of desire. The eighth restraint was the insufficiency of publicity and extension efforts (2.58). The cause was attributed to poor extension services, which were followed by unclear training which was thought to be a significant extension limitation. Lack of incentives or subsidies (2.4) and legal restrictions (2.49) were ranked eighth and ninth, respectively. According to the locals, the lack of credit to implement agroforestry practices was a less effective barrier. Easy access to forest resources was the least effective limitation, receiving a mean score of 2.21, and scored in tenth place. The findings were consistent with those of Kokate and Subrahmanyam (2006) and Raut (2006).

4. CONCLUSION

The study highlights the important role that women play in home gardening and agroforestry, handling a variety of responsibilities and making important decisions for their households. Fruit production, hatching, milking, and basic homestead maintenance are among the many tasks that women perform. In particular, in-home gardening, where 91.23% of choices are made by women after consulting family members, they are responsible for organizing supplies and overseeing crucial agroforestry features. Women share decision-making authority over product production (67.25%), harvesting (50.29%), and consuming (70.76%). Despite their active participation in the community, women face several obstacles that hinder their success and efficacy. Despite their active participation, women say that the biggest barrier to their success is their small landholdings. The long gestation period for agroforestry returns, a lack of technical expertise, the intricacy of agroforestry systems, and issues with product marketing are further obstacles. These difficulties show that in order to increase women's involvement in and benefits from agroforestry products, better support networks and technical

training are required. A significant gender disparity in income control is also revealed by the study. Even though women contribute significantly to production, only 12.28% of them own the money made from their endeavors, with men making the majority of the decisions (76.02%). This indicates a significant discrepancy in the economic empowerment of women in the area.

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