The contribution of farm woodlots to household income diversification in Kashmir Himalayas

ABSTRACT

The study investigated the household forest resource extraction and income diversification of farm woodlot land-use system in Ganderbal district of Kashmir. The study administered multi-stage random sampling technique to withdraw the sample of 163 woodlot owners from the 12 sample villages. Secondary data were collected from all the possible sources and primary data were collected through structured interviews, non-participant observations, woodlot inventories and rapid market survey. The data were analysed using descriptive statistics including frequency, mean, percentage, range and standard deviation. The study documented four types of woodlots commonly established by the smallholder farmers and the household woodlot growing stock recorded were; Poplar (17.59 m^3), Salix (21.30 m^3), Robinia (20.92 m^3) and Mixed (18.23 m^3). The woodlot resources generated annual

income of ₹ 71391.81/household (subsistence= 68.81%, cash= 31.19%); of which timber contributed the maximum share (56.99%) followed by fuel wood (16.26%), wicker (14.15%) and charcoal (12.60%). The average gross annual income was ₹ 138756.78/household which is differentiated as agriculture (20.12%), business (18.02%), woodlots (16.05%), livestock (13.24%), horticulture (10.26%), service (6.94%) and wage labour (4.03%). Nonetheless, the farm woodlot resources are the 3rd major contributor of household economy. Woodlot farming play a significant role in livelihood security in terms of subsistence consumption, cash income and safety-nets. Hence, the study confirmed that the farm woodlots are the key option for socioeconomic development, poverty reduction and livelihood security; hence, policy must be directed towards the income diversification through sustainable production/collection, extraction and commercialization of these resources.

Keywords: Income diversification; woodlots; livelihoods; forest resources; rural economy.

1. INTRODUCTION

Woodlots have been recognized undoubtedly as a valuable component of farming systems that contribute to a changeover from subsistence-oriented farming to commercial-oriented farming system [1]. The woodlot farming contributes significantly to rural livelihood diversification by providing subsistence, cash incomes, safety-net and employment opportunities at household level [2]. The international donors have funded on-farm woodlot farming jointly as one of the interventions to deal with high impoverishment and food insecurity of rural communities [3]. Woodlots secure a variety of provisioning, regulating, supporting and cultural ecosystem services which are important not only at household level but at regional, national and global level [4]. Woodlots are wide spreading economic activity in the developing countries, mainly because of the forest degradation and high livelihood dependence on natural forests, introduction, and commercialization of fast-growing trees and the consciousness of smallholder farmers on the economic returns from the plantations [5]. The private small-scale woodlot plantations constitute by far the considerable proportion of the overall tree cover that meet sizable demand of forest resources in the region [6]. They are primarily characterized by poor establishment and management practices with low productivity and negative ecological effects [7].

Growing trees at homefield in the form of farm woodlot is a traditional land-use system among rural households in Kashmir valley. A farm woodlot is a piece of land dedicated to tree planting usually located around a household or within a village [2]. A woodlot may be owned by a group of people, a home, or an individual. Hence, a woodlot is often located near or inside of a home. It is a place where the household members plant trees and has the rights over the trees planted. The members make their own management decisions [8]. Woodlots help in strengthening the local forestry sector as it includes the locals in management and diversify management strategies [9]. In Kashmir, the rural households generally, establish farm woodlots of *Populus deltoides* Bartr., *Salix alba* L., *Robinia pseudoacacia* L. as monocrop or mixed crop of several species and managed with short rotation of 10–15 years. The economic potentials of woodlots have led to expansion of plantations not only on marginal lands but

also conversion of crop lands to woodlots [10]. Woodlot plantations at smallholders' farm level is becoming dominant activity in the temperate farming system as a component of livelihood diversification option both for subsistence and income generations [11]. Woodlots resources contribute to the state consumption of construction poles, timber, firewood, charcoal, posts, industrial woods and farm implements overwhelmingly.

What UT of J&K?

With highly undulating topography, fragmented landholdings, low infrastructure and insurgency in UT of J&K, there is high risk and uncertainty to the economic activities. Globally, a number of studies have confirmed the inability of agriculture to fully support livelihood security [12-15] alone. Therefore, to reduce the effect of uncertainties on economic and social development, income diversification has gained importance. Income diversification is a strategy, which helps in economic development of a household. The strategy of diversification is a norm that makes use of various combinations of resources and assets in order to increase income. The income is used by household to meet their basic needs, raise their standard of living or welfare, and manage risk [16]. Under changing environment, most rural household avoid an extended period of dependence on only one or two sources of income [17]. A rural household with multiple income sources will experience less variability in total income than specialized households. The economic profitability and productivity of farm woodlot plantations for forest resource production has created popular acceptance of forest plantations as an attractive business for smallholder farmers in the region. However, less attention is given on the economic valuation and livelihood contribution of woodlot resources extraction among smallholder farmers. Hence, this study was intended to document the forest resource production, consumption, marketing and livelihood contribution of farm woodlots in Ganderbal district of Kashmir.

2. MATERIALS AND METHODS

2.1 Study Area

The study was undertaken in district Ganderbal of Jammu and Kashmir UT, located between 34.23°N Longitude and 74.78°E Latitude at an altitude of 1650 to 3000 meters above mean sea level (Fig. 1). The geographical area of the district is 39304 ha which is differentiated as forest (27.86%), non-agricultural use (14.65%), barren and un-cultivable land (8.04%), permanent pastures/ other grazing land (4.55%), cultivable waste land (2.48%) and net area sown (42.42%) [18]. The total human population in the district is 297446, of which 158720 are male and 138726 are female. The district has a literacy rate of 59.98%, sex ratio of 874 female per 1000 males, a family size of 6.62 and a population density of 1148/km2. Of the total population, 84.19% lives in rural region and 15.81% inhabit in urban region. The rural population has occupied 136 villages and 44831 households [19]. The site encounters both temperate and sub-alpine conditions. The average temperature ranges from 5°C to 20°C and monsoon brings more than 700 mm of rainfall.

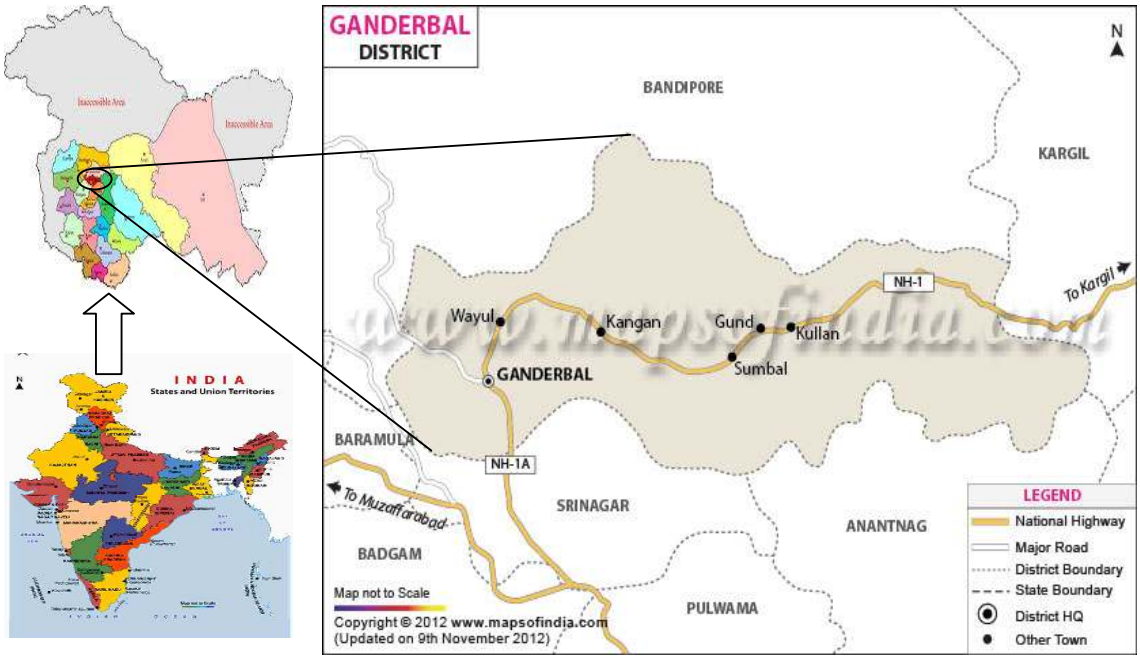

Fig. 1. Location map of the study area

2.2 Sampling Technique

Multi-stage random sampling technique [20] was applied to select the blocks, villages and farm woodlots. In the first stage, all four blocks including Lar, Kangan, Wakura and Ganderbal were selected. In the second stage, of the 116 villages, twelve were sampled, including two (Kharani-Hama and Watal-Bagh) from Lar block, four (Gund-Ari, Drag-Tang, Tang-Chatir and Kij-Parah) from Kangan block, three (Lati-Waza, Gamwara and Koka-Gund) from Wakura block and another three (Kasti-pora, Chapper-Gund and Ghat) from Ganderbal block. In the third stage, all the 163 farm woodlots were selected from the sample villages.

2.3 Data Collection and Analysis

Data were collected from both secondary sources and primary field survey. The village level data on land use classification and land holding pattern were collected from secondary sources including line departmental records, village records, census reports, institutional technical reports, and national informatics centre (NIC). The data were collected on the basis of structured interviews, non-participant observation, woodlot inventories, and rapid market survey. The interview schedule was structured based on relevant studies, preliminary survey, and dialog with experts and consultation with knowledgeable people. The interview covered household issues relevant to their socio-economy, woodlot characteristics, resources collected /produced households' involvement in production /collection /marketing, collection/annum, consumption/annum, sale of forest resources, rate, and income (₹). The non-participant observation involved the data collection through personal watching, recording, and inspecting the behaviours in normal situations.

The woodlot inventories were carried out for the entire 163 woodlots to study the plantation's stand structure, composition, spatial distribution, and characteristics [4]. Diameter at breast height (dbh) for

woodlot trees was measured using diameter tapes at 1.37 m above ground. Total height of the trees was measured using clinometers. The volume of individual trees was estimated using the formula, V = (π x dbh^2 x H x 0.5)/40000, where V is the volume of tree bole (m3), dbh is the diameter at breast height (cm) and H is the tree height (m). A form factor of 0.5 was applied to each tree in order to account for the taper effect of diameter and height measurements on tree volume [21-22]. The standing volume per hectare was determined by extrapolating the total tree volume of the farm woodlot in hectare basis. The data were analysed by the simple descriptive statistics viz., frequency (f), percentage (%), average (x) range, and standard deviation [23] on MS Excel software. The monetary values of the woodlot resources were estimated by a periodical market survey of the locality. Income is defined as the return for the labour and capital that a household owns utilised in self-employment or business activities (for example, wage labour) or sold in a market. Total household income is the sum of cash income and subsistence income. Subsistence income is defined as the value of products consumed directly by the household or given away to friends and relatives [24].

3. RESULTS AND DISCUSSION

3.1 Household Characteristics of Woodlot Owners

The socioeconomic characteristics of the woodlot owners (Table 1) indicated that most of the families were headed by middle-aged (mean value, 40.95) and low literate people (mean score, 2.79). Most of the sample families had large sized families (mean score, 1.82) and labor force of one worker (mean score, 0.22). Majority of the families had membership of at least one social organization (0.22). They owned marginal size of land (mean score, 1.36), medium herd size (mean score, 3.47) and medium wealth status (mean score, 22.90). The main occupation was cultivation (mean score, 3.18) and the average gross annual income earned from different livelihood sources was ₹ 13,8,751.20 in the sample households. The mean distance from forest was 6.20 kms and the people visited the forest occasionally (mean score, 1.37). The households possessed on an average 0.18 hectares of land area under trees. Generally, the people had mean urban closeness of 12.06 km and they seldom accessed alternative forestry sources like road side plantations, community forestry, pasture land or village woodlots.

The dominance of middle-aged family heads in woodlot resource production is attributed to the fact that these people are relatively more innovative, experienced, enthusiastic, and laborious than the elder and youngsters. Low literacy among the rural people reflects low socio-economic status, scarcity of educational amenities, high livelihood concerns, and unawareness towards schooling. People's low levels of interest and willingness to form alliances with social groups are the main cause of their low levels of social participation. The perception that children are a family's most valuable asset and can increase household income, as well as a lack of knowledge about family planning, may be responsible for the prevalence of large-sized families. Moreover, having big families contributes to the high family labour force. Because of neo-local and primary family structures in rural communities that led

land disintegration from generation to generation and within married family members, marginal farms account for the majority of farms. Families with marginal farm land are unable to generate ample earnings for their households. To support the agriculture and generate additional earnings the livestock rearing was preferred as the most important subsidiary occupation. Although, the families possessed numerous varieties of traditional, crude and low-cost household physical wealth items but the overall scenario was unsatisfactory. Poverty, low socio-economy, illiteracy, unawareness and lack of exposure are the main reasons for such grousing wealth situations.

Agriculture is the backbone of the economy. Hence, the largest numbers of rural households are engaged mainly in crop production for cash income, subsistence and food security. The families occupied in other economic activities, including livestock production, petty shops, trade, cottage industries, horticulture, etc., were also doing agriculture as their secondary occupation. The average annual income among the sampled families was inadequate because the contributions of the core livelihood sources to household annual income are very low. Probable reasons for such low gross annual income might be dominance of marginal farmers or petty businessmen, lack of scientific know-how, low crop production, scarce irrigation avenues, conventional tools and implements, monoculture cropping, inadequate fertility of soil and unpredictable climate that accumulate insignificant earnings to rural households [25-27].

The proximity to the forests has clear-cut impact in the magnitude of extraction and consumption of fuel wood, fodder, and small timber [28]. The close vicinity to forests, medium income, low literacy rate, high livestock fodder requirements and dependence on traditional ovens are some of the contributory reasons for such frequently visit to forests. Poor households were highly dependent on the forests for fuel wood, fodder, timber and other NTFPs in order to sustain their day-to-day livelihoods. The size of land holding had a positive and significant association with the adoption of woodlot systems as reported by various studies [29]. Community forests or woodlots and other alternative forest resources provide the closest and most feasible alternative to forest resources especially during harsh weather like winter etc. hence, the dependence on the alternative forest resources is equally high as on the forests as they are supplementary to forests. The rural-urban stratification has a strong association with the quantity of woodlot resource like fuelwood extraction and consumption among the households [9]. Hence, the higher the urban closeness of the households the lesser will be extraction and consumption of woodlot resources and vice-versa.

Table 1. Household characteristics of woodlot farmers (N=163)

Variables	Explanation	Measurement description	Mean	Std. Deviation	Min	Max
Age	Age of household head in years	Number of years lived by the respondent	40.95	9.70	20	65
Education	Household head undergone in education	Illiterate= 0, Below primary= 1, Primary=2, Middle=3, High school=4, Intermediate=5, Graduate & above=6	2.79	1.42	0	6
Family size	No. of family	2 = >5 members, 1 = < 5	1.82	0.39	1	2

	members in a household	members				
Family Labour	No. of workers in a household	4 = >3 workers, 3 = 3 workers, 2 = 2 workers, 1 = 1 worker	0.22	0.51	0	2
Farm size	Land area under household management	4 = large (> 4.0 ha), 3 = medium (2.1 to 4.0 ha), 2 = small (1.1 to 2.0 ha), 1 = marginal (up to 1.0 ha), 0 = landless	1.36	0.74	1	4
Social Membership	Membership of household head in organizations	No participation=0, Membership of 1 organization=1, Membership of > 1 organization=2, Office bearer=3, Public leader= 4	0.22	0.51	0	2
Livestock possession	No. of livestock owned by the household	3 = >10 livestock, 2 = 6 to 10 livestock, 1 = <5 livestock, 0 = no livestock	3.47	3.15	0	14
Main occupation	Occupation in which an individual is engaged for six months or more in a year	6 = any other, 5 = service, 4 = business, 3 = cultivation, 2 = caste occupation, 1 = wage labor	3.18	1.31	1	6
Wealth status	Relative position of households in the community in respect of wealth/ physical assets	>30 = rich, 16-30 = medium, up to 15= poor	22.90	6.13	13	34
Annual income (X_{10})	Household income earned by all the on- farm and off-farm sources	₹/annum	13875 1.20	177443.50	252 73.5 0	21102 75.75
Proximity to forest (X_{11})	Households distance to forest	Kms	6.20	6.82	0.5	25
Frequency of forest visits (X_{12})	Households visit to forest daily/weekly/ monthly/fortnightly/ half yearly or yearly	3= very frequently, 2= frequently, 1= occasionally, 0=never	1.37	0.89	0	3
Forest resource possession (X_{13})	Households land area under trees	Area in hectares	0.18	0.24	0.02 5	1.25
Access to alternative forestry sources	Households access to wastelands, road side plantations, Canal bank, River side plantations, Community forestry, Village woodlots and pasture land	3=Most often, 2=Often, 1= Seldom, 0=Never	0.24	0.65	0	4
Urban closeness (X_{15})	Households distance to urban areas	kms	12.06	5.86	5	22

3.2 Growing Stock of Woodlots in the Study Area

Table 2 indicated that the tree density ranged from 26.10 per household to 26.69 per household in the surveyed locality. The tree diameter ranged from 15.36 cm to 17.21 cm, the tree height ranged from 10.54 m to 11.40 m, the basal area ranged from 0.23 m^2/household to 0.28 m^2/household and the wood volume ranged from 17.59 m^3/household to 20.92 m^3/ household in the sampled woodlots. The study documented four types of woodlots commonly established in the locality by the smallholder farmers. The plantations were established either as monoculture or poly-culture. Generally, the dominant tree species preferred for monoculture woodlot plantations were *Populus deltoides*, *P. nigra*, *Salix alba*, *S. triandra* and *Robinia pseudoacacia* whereas the polyculture plantation included

cultivation of mixed species of *Morus alba*, *Ulmus villosa*, *Aesculus indica* and *Ailanthus altissima*. The choice of species plantation is influenced by numerous social, psychological, communicative, and biophysical aspects that are specific to adoption of monoculture or mixed woodlots, and allocation of land for plantations [30]. The choice of trees for woodlot farming is dependent on a variety of factors ranging from economic gain, subsistence consumption, safety net functions, land security, soil and water conservation, micro-climatic modification, climate shelter, preservation of rural heritage and traditions, risk coping intervention, and ability to integrate well with other economies [31]. The main purposes for establishing woodlots in Kashmir are the production of wood for roofing, fuel wood and charcoal, fodder, leaf litter, fruit boxes, cricket bats, plywood, wicker crafts, construction, ladders, and poles for wooden fences [32].

Table 2. Growing stocks of different woodlots in the sample households (N=163)

Woodlots	Tree density (No./hh)	Tree diameter (cm)	Tree height (m)	Basal area (m^2/hh)	Volume (m^3/hh)
Poplar	26.10	16.35	10.86	0.26	17.59
Salix	26.69	15.36	10.54	0.23	21.30
Robinia	26.39	17.21	11.40	0.26	20.92
Mixed	26.33	17.20	11.40	0.28	18.23

hh=household

3.3 Economic Valuation of Woodlot Resources

The results (Table 3) indicated that the extraction and marketing of woodlot resources fetched a total income of ₹ 11636866/annum (subsistence= 68.81%, cash= 31.19%) @ ₹ 71391.81/household/annum. Of the average household annual woodlot income, timber fetched the maximum share (56.99%) followed by fuel wood (16.26%), wicker (14.15%) and charcoal (12.60%) (Fi. 2). Tree browses and leaf litter were extracted only for household consumption not for sale. The resources collected from woodlots are used mainly for household self-consumption while a small portion is sold for income earnings. Timbers and fuel wood collected from woodlots play a vital role in household economy and energy security. The timber collected from woodlots were mainly consumed for building houses and repairing, huts, and fences, domestic furnishings, agricultural tools, scaffolding, ladders, electric/telephone props, etc. Hence, timber fetches a handsome return to the sellers after rotational harvesting. Therefore, the timbers and fuel woods are collected and sold in considerable quantity. Wicker handicraft is a prominent forest resources-based cottage industry that fetched substantial earnings among the sample households. As livestock production is an important subsidiary occupation among the sample households; hence, fodder and tree browse is an integral forest resource that is collected/ produced, consumed, and sold by the local people. There is high demand of fuel wood in rural households in Kashmir. Fuelwood is mostly used for cooking, room and water heating and at cottage industries [33]. Harvesting and selling of woodlot resources is the main income component in rural families in Kashmir Himalaya. The woodlot resources provide both subsistence and cash income, which contributes substantially to household livelihood and energy

security. The studies [34-36] across the globe have emphasized the potential role of household tree resources in meeting the food, livelihood, and health security besides cash income and safety net functions.

Table 3. Economic value of woodlot resources extracted in the sample households (N=163)

Tree resource	Sale (t/year)	Subsistence income (₹/year)	Cash income (₹/year)	Total income (₹/year)
Fuel wood	98.35	1737540	590100.00	2327640
Tree browses	0.00	0.00	0.00	0.00
Timber$^{\Delta}$	1034.32	3271240	2068640.00	5339880
Charcoal	45.76	2998000	457600.00	3455600
Wicker	4.11	0.00	513750.00	513750
Leaf litter	0.00	0.00	0.00	0.00
Total	-	8006780.00	3630085.50	11636866
Average	-	49121.34	22270.46	71391.81

Note: $\Delta = m^3$

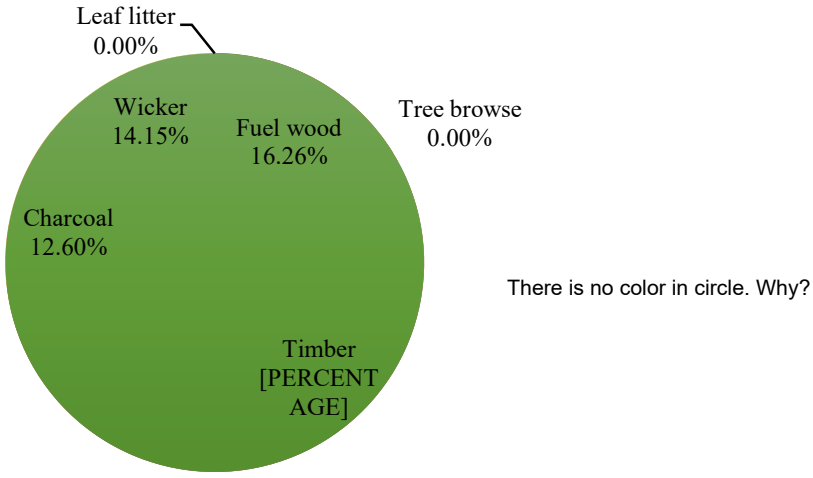

Fig 2. Income composition by different woodlot resources in sample households

3.4 Livelihood Sources and Contribution of Woodlots to Household Income Diversification

The annual gross income including all non-farm and farm income sources was ₹ 138756.78/household/annum in the sample households (Table 4). Agricultural income contributed the major share (20.12%) which was followed by business (18.02%), woodlots (16.05%), livestock (13.24%), horticulture (10.26%), service (6.94%) and wage labour (4.03%) (Fig. 3). Hence, the woodlot resources are the third major contributor of rural household economy (Figure 3). Income diversification refers to the rise in income sources or the balance between the household's various sources of income. For rural households, income diversification is becoming an increasingly crucial strategy to reduce the vulnerability of the households to imminent agrarian crisis [37]. The total income of a rural household with many revenue sources will fluctuate less than that of specialised households. Families with a wider variety of income sources are in a better position than those with fewer sources of income. The number of earning activities and the distribution across quantities from each component change as income diversification increases.

Table 4. Household income diversification by woodlot resources (N=163)

Livelihood sources	Total income (₹/annum)	Mean income (₹/annum)	Standard Error
Agriculture	4550611.85	27917.86	1048.92
Horticulture	2320540.64	14236.45	534.88
Livestock	2994537.82	18371.4	690.26
Forest resources	2564808.07	15735.02	591.18
Business	4075647.40	25003.97	939.43
Service	1569644.45	9629.72	361.86
Wage labour	911479.41	5591.9	210.09
Woodlots	3630085.50	22270.46	836.74
Total	22617355.14	138756.78	5213.26

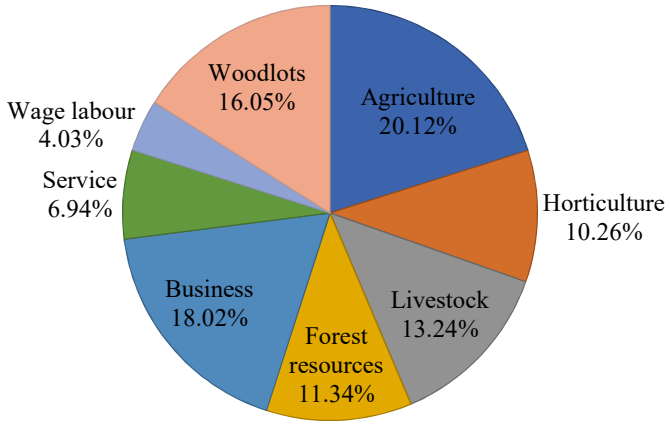

Fig 3. Income shares (%) by different livelihood sources in sample households

The study confirmed that the woodlot resources are a dominant constituent of rural economy since it accounts significant share in the total households' income. The production/collection of woodlot resources is the prominent livelihood intervention for survival, currency, and safety net since the alternative sources are lacking in rural Kashmir. In several households, the production/collection of resources through woodlot is just their complementary livelihood source on a part-time basis. Likewise, the woodlot resources are used by all categories of people in the society, whether poor or wealthy, literate or illiterate, rural or urban. However, the income accrual through the woodlot products is rather little but the involvement in the activities is a matter of self-respect, honour, and self-reliance. The income earned from the woodlot resources are spent to secure domestic basic needs in terms of children's education, healthcare expenditures, wedding expenses, agricultural investments, assets for entrepreneurial activities, savings as safety nets and others [34-35, 38-39].

4. CONCLUSION

The study led to conclude that the woodlots play a crucial role in rural livelihoods by providing various resources such as timber, fuel wood, wicker, tree browse, wicker, leaf litter and charcoal for domestic use. The income generated from sale of the above resources contributes substantially to the

gross annual income besides acting as safety net in cases of emergency. The study revealed that the woodlot resources are the third major contributor of rural household economy after agriculture and business**.** Such livelihood contributions of woodlots resources must be given due recognition in rural developmental schemes and land-use prioritizations to harmonize socio-economic development, poverty alleviation and livelihood security of the local communities. Further, the potential opportunities for economic diversification through value addition of woodlot resources, fortunate marketing, and better commercialization should be explored. Moreover, capacity building and skill development of stakeholders on production of valuable forest resources, sustainable harvesting, value addition and commercialization should be strengthened.

REFERENCES

1. Buyinza M, Banana AY, Nabanoga G, Ntakimanye A. Farmers' adoption of rotational woodlot technology in Kigorobya sub-county of Hoima District, Western Uganda. Ethnobotany Research & Applications. 2008; 6(1): 107-115.
2. Gizachew K. Expansion of Eucalypt woodlot and its factors in Cheha district, Southern Ethiopia. World Scientific News. 2017; 66: 163-180.
3. Kiyingi I, Edriss A, Phiri M, Buyinza M, Agaba H. The impact of farm forestry on poverty alleviation and food security in Uganda. Journal of Sustainable Development. 2016; 9(1): 150-163.
4. Singunda WT. Economic contribution of private woodlots to the economy of Mufindi district, Tanzania. M.Sc. Forestry Dissertation. Sokoine University of Agriculture, Morogoro, Tanzania. 2010.
5. Dessie AB, Abtew AA, Koye AD. Determinants of the production and commercial values of Eucalyptus woodlot products in Wogera District, Northern Ethiopia. Environmental System Research. 2019; 8:4. https://doi.org/10.1186/s40068-019-0132-6
6. Tadesse W, Gezahegne A, Tesema T, Shibabaw B, Tefera B, Kassa H. Enhancing the role of forestry in building climate resilient green economy in Ethiopia. Strategy for scaling up effective forest management practices in Amahara regional state with particular emphasis on smallholder plantations. CIFOR, Addis Ababa. 2015.
7. Lemeneh M, Kassa H. Re-greening Ethiopia: history, challenges, and lessons. Forests. 2014; 5: 1896–1909

8. Zoysa MD, Inoue M. Farmers' woodlots management and sustainable livelihood development: A case study in Southern Sri Lanka. Environment and Ecology Research. 2016; 4(2): 88-98.
9. Ndayambaje JD, Heijman WJM, Mohren GMJ. Farm woodlots in rural Rwanda: purposes and determinants. Agroforestry System. 2013; 87: 797– 814.
10. Raja A, Islam MA, Masoodi TH, Khan PA, Wani AA, Gatoo AA, Maqbool S. Woodlot farming by smallholder farmers in Ganderbal district of Kashmir, India. Journal of Applied and Natural Science. 2021; 13(2): 752-759. DOI: https://doi.org/10.31018/jans.v13i2.2714
11. Raja A. Stand characteristics, wood production and livelihood contribution of household woodlots in Ganderbal district of Kashmir. Ph.D. Thesis (Unpublished). Sher-e-Kashmir University of Agricultural Sciences & Technology of Kashmir, Srinagar, Jammu and Kashmir. 2022.
12. Samal CK. Remittances and Sustainable Livelihoods in Semi-arid Areas. Asia-Pacific Development Journal. 2006; 13(2): 73-92.
13. Shukla ND, Shukla KC. Scope and Limitations of Crop Diversification in Indian Agriculture, Agricultural Situation in India. 2007; 64(8): 357-365.
14. Shylendra HS. Environmental Rehabilitation and Livelihood Impact: Emerging Trends from Ethiopia and Gujarat. Economic and Political Weekly. 2002; 37(31): 3286-3292.
15. Unni J. Diversification of Economic Activities and Non-Agricultural Employment in Rural Gujarat. Economic and Political Weekly. 1996; 31(33): 2243-2251.
16. Niehof A. The significance of diversification for rural livelihood systems. Food Policy. 2004; 29: 321–338
17. Ellis F. Rural Household and Diversify in Developing Countries; Oxford University Press: Oxford, UK, 2000; 1–15.
18. Anonymous. Directorate of Economics and Statistics, District Statistics and Evaluation Office. Ganderbal. 2011.
19. Census of India. A - 5 State Primary Census Abstract. India. 2011.
20. Ray GL, Mondol S. Research methods in social sciences and extension education, Kalyani Publishers, New Delhi, India. 2004.
21. Newbould P. Methods for estimating the primary production of forests. IBP Handbook no. 2. Blackwell Scientific Productions. Oxford: Oxford University Press Inc. 1967.
22. Opuni-Frimpong E, Opoku SM, Storer AJ, Burton AJ, Yeboah D. Productivity, pest tolerance and carbon sequestration of *Khaya grandifoliola* in the dry semi-deciduous forest of Ghana: a comparison in pure stands and mixed stands. New Forests. 2013**;** 44(6): 863–879.
23. Snedecor GW and Cochran WG. Statistical Methods. Iowa State University Press, Ames, Iowa. 1967.

24. Hogarth NJ, Belcher B, Campbell B, Stacey N. The Role of Forest-Related Income in Household Economies and Rural Livelihoods in the Border-Region of Southern China. World Development. 2013; 43: 111–123.
25. Kabir ME, Webb EI. Productivity and suitability analysis of social forestry woodlot species in Dhaka Forest Division, Bangladesh. Forest Ecology and Management. 2005; 212: 243-252.
26. Freedman RL. Indigenous wild food plants in home gardens: Improving health and income, with the assistance of agricultural extension. International Journal of Agricultural Extension. 2015; 3(1): 63 71.
27. Gbedomon C, Fandohan AB, Salako VK, Idohou AFR, Kakai RG, Assogbadjo AE. Factors affecting home gardens ownership, diversity, and structure: A case study from Benin. Journal of Ethno biology and Ethno Medicine. 2015; 11(56): 2–15.
28. Sapkota IP, Odén PC. Household characteristics and dependency on community forests in Terai of Nepal. Internat. Journal of Social Forestry. 2008; 1(2): 123-144.
29. Hingi OS. Organization of Smallholder Tree Growers, Support Organizations, Linkages and Implications for Woodlots Performance: The Case of Mufindi District, Tanzania. Institute of International Forestry and Forest Products Professorship of Tropical Forestry. Faculty of Environmental sciences, Tropical Forestry and Management Tanzania. 2018.
30. Islam MA, Qaisar KN, Bhat GM. Indigenous knowledge in traditional agroforestry systems of Kashmir valley: Current challenges and future opportunities. International Journal of Forestry and Crop Improvement. 2017; 8(1): 68–77.
31. Meijer SS, Catacutan D, Sileshi GW, Nieuwenhuis M. Tree planting by smallholder farmers in Malawi: using the theory of planned behaviour to examine the relationship between attitudes and behaviour. Journal of Environmental Psychology. 2015; 43: 1–12.
32. Islam MA, Sofi PA, Bhat GM, Wani AA, Gatoo AA, Singh A, Malik AR. Prediction of agroforestry adoption among farming communities of Kashmir valley, India: a logistic regression approach. Journal of Applied and Natural Science. 2016; 8(4): 2133-2140.
33. Islam MA, Banyal R, Masoodi NA, Masoodi TH, Gangoo SA, Sharma LK. Status of Fuelwood Extraction and Consumption in Rural North Kashmir: A Case Study. The Indian Forester. 2011; 137(11): 1265-1268.
34. Kebebew Z, Garedew W, Debela A. Understanding home garden in household food security strategy: Case study around Jimma, Southwestern Ethiopia. Research Journal of Applied Sciences. 2011; 6(1): 38–43.
35. Islam S, Miah Q, Habib M. Diversity of fruit and timber tree species in the coastal homesteads of southern Bangladesh. Journal of Asiatic Society Bangladesh. 2013; 39(1): 83–94.

36. Nath TK, Aziz N, Inoue M. Contribution of Homestead Forests to Rural Economy and Climate Change Mitigation: A Study from the Ecologically Critical Area of Cox's Bazar-Teknaf Peninsula, Bangladesh. Springer. 2014; 13(2): 66–73.
37. Haque J, Barua NA. Income Diversification as a Strategy for Agrarian Crises Management: A Case Study of Assam. Indian Journal of Economics and Development. 2021; 83: 9
38. Darcha G, Birhane E, Abadi N. Woody species diversity in Oxytenanthera abyssinica based homestead agroforestry systems of serako, Northern Ethiopia. Journal of Natural Sciences Research. 2015; 5(9): 18–26.
39. Regassa R. Useful plant species diversity in home gardens and its contribution to household food security in Hawassa city, Ethiopia. African Journal of Plant Science. 2016; 10(10): 211–233.