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For further information, contact EnLiFT:

In Nepal

ForestAction Nepal
Dr Naya Sharma Paudel
Phone: +9779851015388
Email: naya@forestaction.org

In Australia

University of Adelaide
Dr Ian Nuberg
Phone: +61421144671
Email: ian.nuberg@adelaide.edu.au

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Our Cover

Timber stores and fodder collection in the Nepalese Hills. Photo by Douglas Bardsley

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Socio-ecological Monitoring to Guide Sustainable Development of Complex Agroforestry Systems

Douglas Bardsley

School of Social Sciences, University of Adelaide

Edwin Cedamon | Ian Nuberg

School of Agriculture, Food and Wine, University of Adelaide

Table of Contents

1. Introduction	1
2. Nepalese Forestry.....	1
3. Socio-ecological surveys and analysis.....	3
4. Methodology.....	5
5. Results.....	8
5.1 Key Demographic data	8
5.2 Livelihood values and income from the forest	13
5.2.1 Direct use values of the forest.....	18
5.2.2 Community forestry and food security	23
5.2.3 Indirect values of the forest	26
5.3 Respondents changing engagement with forestry activities over time	28
5.4 Forest product marketing	33
6. Governance of the forests	36
7. Discussion.....	38
8. Conclusion.....	40
References	42
Appendix 1	44

Executive Summary

New opportunities and risks are emerging for rural communities in the Nepalese mid-hills. There is a rural transition underway and even though subsistence agricultural production remains vital, local livelihoods are increasingly integrated into a financial economy. Simultaneously, there have been dramatic changes in out-migration and remittances, environmental resources and shocks and opportunities for new markets to develop. Here we outline the key findings from the first socio-ecological survey within EnLiFT-2 Activity 1.4 Monitoring and assessment of social, economic and ecological impacts of silviculture practices, to detail how communities in the Nepalese mid-hills conceptualise, manage and utilise the forest in relation to those changing circumstances.

The aim of this report is to outline the key findings from a socio-ecological survey of 600 households undertaken from October 2019 to March 2020, to identify the different types of forests and management practices and the range of values that Community Forest user Group member attribute to local forests. The Australian government has been working with the Nepali government to develop forestry in the mid-Hills of Nepal since 1966. However, as the roles that the forest plays in local socio-ecosystems change, so will the major technical activities and policy recommendations emerging from that work. While the major focus of early interventions was on erosion control and opportunities for an incipient forestry industry, the work here is suggesting that a new era of forestry development will have to focus more on the values of the forest for supporting subsistence agro-forestry systems, while targeting interventions that provide particular commercial opportunities across different communities.

Community forestry sits alongside grain and livestock production as the most important sources of livelihood amongst the surveyed respondents. Food availability and access remain a challenge for respondent households. Even though the forest remains important for supporting local subsistence activities, that does not necessarily translate to financial capital, where people appear to be more reliant on off-farm/forest activities. Retaining greenery/beauty was deemed the most important reason to be proud of the forests across all castes and education levels. By contrast, most respondents are not showing significant pride in the governance of their community forest user groups.

People with further education were more likely to be influential in planning meetings and active in forest patrols and management. Although higher levels of formal education within a household is an important indicator of greater commercial use of the forest, most respondents did not value the sale of timber highly. Rather, there is a strong recognition of forestry values for local building, fuel and agricultural resources such as mulch and fodder. People are less involved in forestry activities than they were 5 years prior to the survey, with uses of the forest to support subsistence livelihoods in particular decline. That said, many respondents stated that they were interested in investing more into their community and/or private forests and learning about new forest products in the future. Together, the results suggest that the socio-ecological survey is an important mechanism for asking targeted questions to generate data to guide policy and activities as Nepal passes through its rural transition.

1. Introduction

As new risks and opportunities arise for local communities in the Nepalese mid-hills, policy to guide future directions in forest management could be shaped by research on how local community users value their local forests. Here we outline the key findings from the first survey within Activity 1.4 *Monitoring and assessment of social and economic drivers of Community Forestry practices*, to detail how communities in the Nepalese mid-hills conceptualise, manage and utilise the forest. The report has been generated as Output 14 of EnLiFT2 to “Report on the performance of different community forestry and private forestry silviculture regimes in relation to financial, ecological and social values, including resource extraction and disaster management.” The results presented are generated from the initial major socio-ecological survey (see Bardsley et al. 2020), and the relationships between forest values, socio-ecological activities and perceptions of management are examined in relation to the socio-economic and environmental opportunities and vulnerabilities recognised by CFUGs in the mid-hills of Nepal.

The aim of this report is to outline the key findings from a major baseline socio-ecological survey of different types of forests and management practices and the range of values that household respondents attribute to local forests to indicate how such sophisticated local data could be used to guide forestry policy and practice. We briefly introduce the context of the work in relation to Nepalese forestry systems and explain the importance of understanding that socio-ecological context at local scales to inform policy development. To achieve that goal, the roles of socio-ecological surveys are introduced prior to the specific methodology used to generate data for this report. The results are organised in a step-wise manner. Initially we present key demographic data, and then describe how respondents are valuing the forest through their direct uses, links to food security and indirect values. The important point that many respondents are reducing their activities in the forest is described. Respondent perceptions of opportunities for forest product marketing and governance activities are outlined, prior to a discussion of the implications of the results for forest policy and practice.

2. Nepalese Forestry

Agriculture and forest development policies have focused on achieving particular goals, within particular places at particular times. For forestry, those goals have at times been to manage the forest for timber production or biodiversity or erosion control, but policy has not always ensured that local goals and aspirations can be maximised within broader societal goals. As a result, while the targeting of forest management for particular goals has generated particular successes, the focus of external support mechanisms has, at times, led to an historical neglect of local socio-ecosystems. Such an approach to forest management was justified, in part, by the need for immediate interventions to generate hazard management benefits within short periods of time. Now, the new socio-economic, environmental and governance situations in Nepal suggest that more sophisticated policy will now need to evolve to provide opportunities for local communities to manage their local forests for their own benefit.

The Australian government has been working with the Nepali government to develop forestry in the mid-Hills of Nepal since 1966 (Nuberg et al. 2019). The value of *Pinus* species to quickly protect denuded slopes and generate timber in marginal soils were recognised and there was a particular promotion of plantings of that genus across the landscape over the subsequent decades (Bajracharya

1983). While that led to excellent outcomes for diminishing problems with erosion and landslides, and generating agro-forestry systems that are vital for timber, crop and livestock production in difficult terrain, the approach also generated issues with forest management, water resource and ecosystem change. Although community forestry was integrated into policy as early as the 1970s (Pokharel et al. 2015), the Nepali Government introduced the Forest Act 1993 and associated Forest Regulations, 1995 to expand forest governance at the community level through Community Forestry User Groups (CFUGs), with planning oversight by District Forest Officers (Nuberg et al. 2019). The goal of that policy has been, in part, the provision of nationally owned forests for community use and protection to better assist access by poorer households (Thoms 2008). The CFUGs have also been shown to be good environmental stewards, guiding management to ensure improvements in ecosystem, land and biodiversity management (Paudyel et al. 2017). Now however, as communities aim to devise operational plans and undertake actions to best manage the forest, they must confront a range of local forestry challenges, as well as broader issues such as socio-economic and demographic change in the Nepali mid-hills, climate change and a new range of governance directives (Fox 2018). Due to that local social and ecological complexity, management approaches must increasingly be tailored to meet the particular local needs of communities in conjunction with the risks and opportunities generated by external drivers (Satyal et al. 2017).

The situation of small landholders in the mid-hills of Nepal has changed dramatically from the situation of the 1960s and '70s, and even the last twenty years represents a period of a dramatic increase in exogenous risks. There is a general trend in the de-valuing of agriculture as a source of livelihoods, partly because agriculture on small allotments is no longer providing for household needs either through subsistence or commercial production, but also there are growing opportunities for alternative non-agricultural livelihood pathways in the Nepalese mid-hills. During that period, the farmers of the mid-hills have experienced:

- A change in governance arrangements from a monarchy to a Republic, with key governance arrangements still in development;
- A rapidly changing rural economy;
- A period of increased out-migration both from the mid-hills to the cities and the Tarai, but also increasingly targeted economic labour migration of younger males to work internationally in India, but also to the Middle-east in large numbers (Bhawana et al. 2017; Oldekop et al. 2018; Chaudhary et al. 2020);
- Climate change impacts, particularly more variable rainfall and storms and floods;
- More recently, Covid is having significant impacts on Nepal, both directly through the disease impacts, but also indirectly through the disturbance of livelihoods (Basnyat et al 2020).

To achieve reflexive development interventions that are appropriate for meeting national, regional and local goals, knowledge of local conditions must be built into the research and decision-making processes that lead to specific outcomes for different communities. The multi-local decision-making of the CFUGs could assist such outcomes if given the opportunity to respond to local concerns. The broad analysis of local perceptions of the forest and its management presented here provides a complementary tool that could assist CFUGs to identify pathways that are uniquely appropriate to their particular situations.

3. Socio-ecological surveys and analysis

There is a long heritage of assessment of the projected impacts of a development on a place or community and a range of monitoring and assessment tools are available to generate information to assess projects or other interventions, to monitor change and determine research or policy goals. Some will be more formal, dependant on scientific or survey data that are generated or held in relation to key environmental and social criteria. Those approaches inform environmental and social impact assessments and are often strongly tied to broader policy settings, using data generally managed by the state or large corporations, focussing on large-scale social, economic or environmental trends, which can discount local or regional complexity (Waylen et al. 2019). Rarely do they combine social and ecological data into a single methodological approach that prioritises the understanding of local complexity, and yet as we outline here, socio-ecological surveys can be used to generate important arguments to support forest management and governance.

A socio-ecological research approach aims to recognise and prioritise the understanding of the interactions between the local social and ecological systems, particularly as interventions are applied in remote, regional or otherwise marginal places or communities (Nightingale 2003; Bardsley and Wiseman 2016). For that reason, the approach is applied widely, but not uniquely, in the developing world, where sophisticated socio-cultural relationships with local environments still dominate many local social actions and processes in relation to local environments, and those relationships provide key frameworks for individual and collaborative thought and action (Berkes et al. 2008; Dukes et al. 2011). If the relationships between human and non-human actors can be understood there are opportunities to support positive aspects of those relationships or identify potential or experienced deficiencies and conflicts so they could be rectified to manage risks or exploit opportunities (Kolinjivadi et al. 2015; Pandey and Bardsley 2015; Morgans et al. 2017; Bhattarai et al. 2021). For example, community goals may correspond or conflict with individual goals in relation to the forest; or, on other hand, policy or management plans may be based on assumptions that are either supported or revealed to be less than valid once the socio-ecosystem is better understood. Both the formal, policy driven approaches to guide and support socio-ecosystems and the opportunities for less formal monitoring and action can be researched and applied independently or simultaneously through socio-ecological research (Waylen et al. 2019; Castro-Arce and Vanclay 2020; Lam et al. 2020), but it is the latter that we are mostly concerned about here. The approach aims to develop understanding of the perceptions and management of the forest, and particularly the influence local social diversity has over perceptions of the forest and both individual and community activities in the Nepalese Mid-hills. More specifically, the monitoring activity aims to integrate and inform understanding of the four major project domains within the broader EnLiFT2 project, namely community forest, private forests, forest industry and natural resource management sectors (Figure 1).

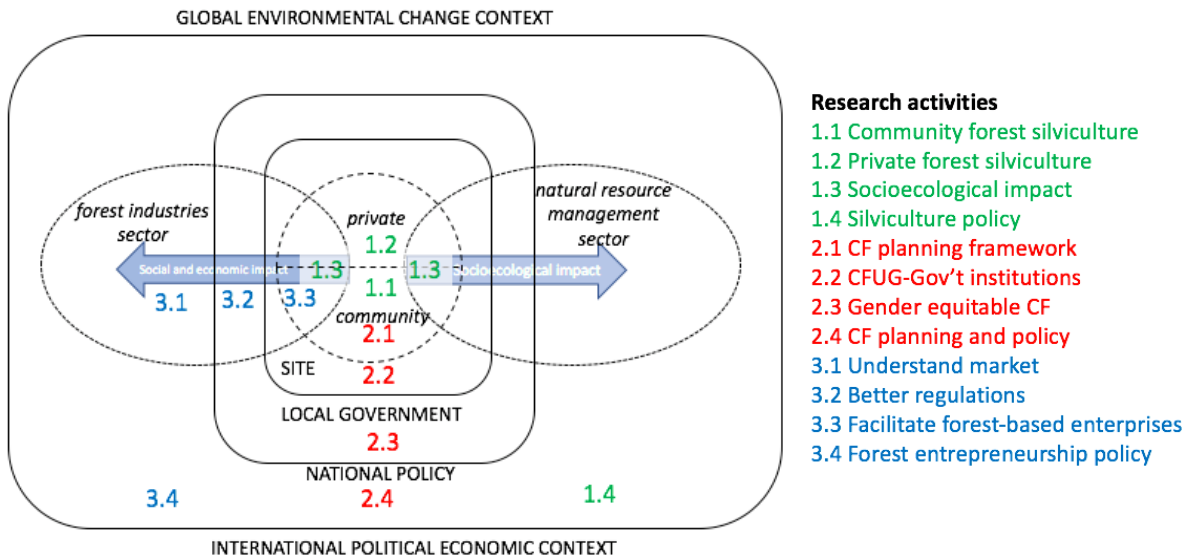


Figure 1. A conceptual framework for EnLiFT-2 showing how the socio-ecological research (Activity 1.3) aims to assist integration of the different research activities (NOTE: Activity 1.3 is renumbered as Activity 1.4 due to project restructure following mid-term review)

Perceptions analysis has been an important technique for identifying key attributes of socio-ecosystems for some time. There are advantages and disadvantages of the technique. The reliance on the perceptions of actors is criticised in some quarters for being highly subjective, biased and often simply incorrect. People may perceive of something and that can be highly influential over their values and beliefs, but their understanding can be proven incorrect through scientific investigation and analysis. On the other hand, the generation of a dataset of local perceptions offers a mechanism for understanding and responding to the complexity of the local socio-ecosystem (Waylen et al. 2019). Such a holistic approach has the potential to identify risks and opportunities generated by interventions in relation to sustainable development pathways, especially where many social and ecological assumptions are made. If elements of those assumptions are incorrect or uncertain, or even appear that way to local communities, otherwise important, positive interventions will not be supported - they will not receive a social licence to be enacted. So even if local actors hold misconceptions, those misconceptions are still important for informing decisions and actions.

The understanding of local perceptions is particular important in Nepal because forests have multiple values (Gautam and Devoe 2005; Shrestha and McManus 2008). The complex social interactions with silviculture range from natural resource exploitation for timber and fuel harvesting; hunting and gathering; grazing and fertiliser for agriculture; to water and biodiversity management; mitigation of earthquake, mass earth movement, wildfire and flood hazard risk; through to opportunities for valuing nature and ecotourism. There is a growing conceptual understanding that forest management must account for such multiple values to meet local sustainable development objectives, but the different perceptions will vary according to community, place, class, socio-economic and environmental conditions (Levers et al. 2014; Innes and Tikina 2016). Good management can respond to that local complexity by generating knowledge about what people think about their forest. In such a manner, agroforestry can become an important tool for enhancing values for local communities and mitigating

potential risks, such as climatic or demographic change (Aryal et al. 2014; Pandey and Bardsley 2015). To achieve a goal of sustainable public and private silviculture, policies and practices can respond to the complex ways that different types of rural households' value and exploit the forest resource to support different local livelihood and risk mitigation objectives (Maharjan et al. 2009; Baynes et al. 2015). It was just such an approach that was applied in the Mid-hills east of Kathmandu from October 2019 to March 2020.

4. Methodology

A large (600 household) survey of household heads in target communities generated quantitative and qualitative data from a translated version of the initial baseline survey questionnaire (Appendix 1), entitled "Enhancing livelihoods from improved forest management in Nepal - Socio-ecological Questionnaire" (Bardsley et al. 2020). CFUG member households were asked to explain how they use the forest, its values and its management. The results have been analysed to examine how technical and policy support could be better targeted to assist individuals and communities to develop successful forest enterprises.

The survey was developed in a participatory manner with Nepalese colleagues. Throughout 2019, a draft questionnaire was developed involving extensive consultation with the different research groups working across EnLiFT2. An extensive week of meetings was conducted with project partner NGO ForestAction Nepal staff and associates in Kathmandu, Nepal to critically evaluate, test, revise and finalise the major questionnaire and develop the sampling procedure prior to initiation of the survey. The finalised questionnaire was further tested by ForestAction with CFUG members near Banepa, on the fringe of Kathmandu valley. Minor changes were made to the finalised version as a consequence of feedback from the initial household surveys. Ethics approval for the research was obtained in October 2019 from the University of Adelaide Human Research Ethics Committee (H-2019-203).

The administration of the survey began in late October 2019 and was completed in March 2020. Value, socio-economic, management perception and demographic data were collected quantitatively using stated values, yes/no binary questions and 1-5 Likert scale ratings. Initial contact was made with potential respondents within CFUG households via ForestAction Nepal and CFUG leaders, who requested that members participate in the survey. Participation in the survey was totally voluntary and took about 90 minutes in face-to-face interviews by participating Nepalese interlocutors. Prior to the survey questionnaire being undertaken, an information sheet was hand delivered by project staff at the initial contact. Illiterate participants were informed by asking a literate member of the household or a close relative to read the information sheet to the potential participant. Consent from participants for their participation in this project was obtained verbally by the project staff before the commencement of each interview and codes were assigned to the data to de-identify respondents.

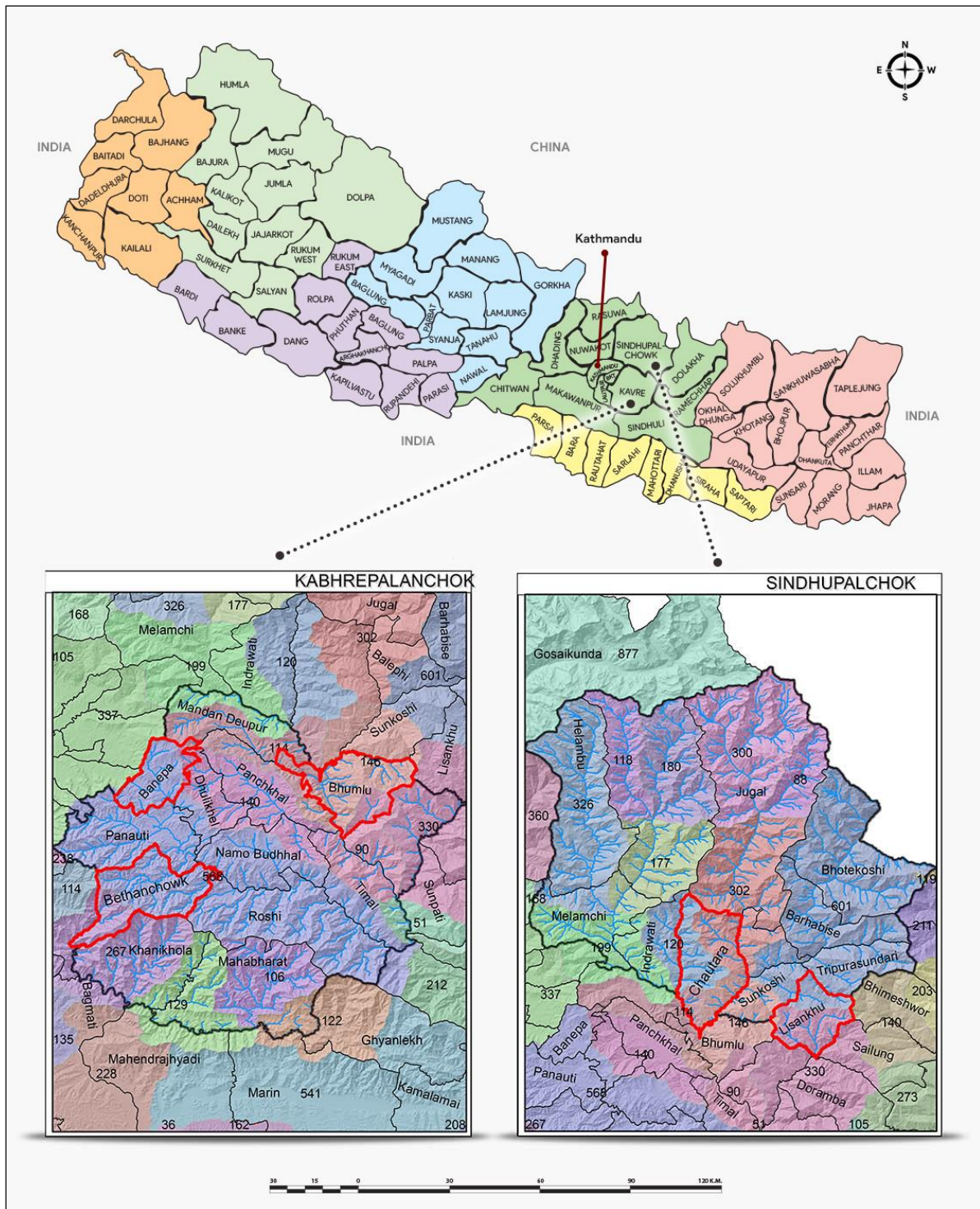


Figure 2. Key sites for the socio-ecological household survey in the mid-hills of Nepal

Surveys were undertaken across five sites: Bhumlu, Bethanchowk and Banepa in Kavrepalanchok, and Chautara-Sangachowk-Gadi (hereafter Chautara) and Lisankhupakha in Sindhupalchok, all of which sit relatively close to Kathmandu valley in comparison to other parts of the Nepalese mid-hills (Figure 2). Three CFUG communities were represented at each of the five sites, two where EnLiFT2 is working intensively and one where the project is only providing information and general support. The surveyed 15 CFUG sites are only representative of the total of 30 sites across the 3 CFUGs, which in turn are

only a representation of the estimated more than a 1000 active CFUGs across Sindhupalchok and Kabhrepalanchok Districts in Nepal. These sites were partly chosen because they represent a range of important CFUGs on the fringe of the large city of Kathmandu, with Banepa and Bethanchowk on the fringe of the valley rim and Chautara and Lisankhupakha on the more distant margins of direct urban influence (Figure 3).



Figure 3. Typical landscape types in the study sites: a. Landscapes near the village of Banepa on the Kathmandu fringe; b. Farmland and scattered homesteads in the more remote Chautara municipality

At least 100 respondents were to be obtained from each of the 5 sites. Purposive stratification of sampling of district household list was undertaken to ensure representation of specific key groups relevant to the research aims. Initially, 60 randomly selected households were interviewed from a CFUG, but subsequently CFUG leaders worked with the survey team to undertake a stratification from the local knowledge of household types. The sample was checked to ensure saturation sampling including:

- Members with only CFUG forest and CFUG & private forest interests, with 20% at least with only access to CFUG forest.
- Men/women household representatives, with at least 40% representation from both genders.
- Ethnic group representation, the aim where possible was to reflect the balance across the local community with some representation from each key ethnic group: Brahmin/Chhetri, Janajati and Dalit.

The survey data was entered into an Access database from January to May 2020. In some cases, the data entry operator undertook translations and conversions of raw numeric data, so data cleaning was an important step before analysis to ensure that entries were correct. The values attributed to the forest are examined in relation to demographic information, management approaches and questions on how values contribute to the livelihoods of local people in the attempt to generate a holistic evaluation of forestry practices in the mid-hills of Nepal. By analysing the data across sites and forest types, the approaches to establishing and managing local forests are compared, enabling recommendations for future practice. Analysis was undertaken of frequency and bi-variate (nominal) and ranked (scalar) data to determine relationships between perceptions of forest values and management interventions. The data were transcribed into IBM SSP Statistics 22 and analysed using a range of non-parametric statistical tests depending on the data format and the questions being asked (Gray and Kinnear 2012; IBM Corporation 2013):

- Kruskal-Wallis (K-W) test for comparing three or more groups' responses to independent Likert data;
- Mann-Whitney test for comparing two groups' responses to independent Likert data;
- Pearson Chi-square (PC) test for comparing categorical data for differences between independent groups;
- Wilcoxon signed ranks test for comparing two related samples, e.g. across two time periods.

Significant relationships are represented at the 95% (.05) confidence level and presented in tabular form or as asymptotic significance (p) values in the text to support a number of the key arguments.

5. Results

5.1 Key Demographic data

The socio-ecological survey sample is balanced quite evenly across genders and the five research sites. Younger males are slightly less represented across the sample, probably because of a disproportionate out-migration of that cohort from the region. The sample is dominated by the upper classes (Brahmin/Chhetri and Janajati), but the 10 percent minimum target of the more disadvantaged Dalit caste was met, again with a well-balanced gender representation.

Table 1. Distribution of household respondents by Gender, Municipality, Caste, Maximum Level of Education of Respondent, Maximum Level of Education within the Respondent Household and Age

		Gender			
		Male		Female	
		Frequency	%	Frequency	%
Municipality	Banepa	58	46.4	67	53.6
	Betanchowk	70	58.8	49	41.2
	Bhumlu	68	58.6	48	41.4
	Chautara	57	47.1	64	52.9
	Lisankhupakhar	66	55.5	53	44.5
Caste	Brahmin/Chhetri	129	51.0	124	49.0
	Janajati	155	55.6	124	44.4
	Dalit	31	50.8	30	49.2
Maximum level of Education of respondent	Illiterate	81	42.4	110	57.6
	Literate without schooling	119	51.5	112	48.5
	Schooling	98	66.2	50	33.8
	Further education	20	69.0	9	31.0
Maximum level of Education within the respondent's household	Illiterate	30	5.0	70	11.7
	Literate without schooling	80	13.3	92	15.3
	Schooling	347	57.8	297	49.5
	Further education	131	21.8	120	20.0
Age of respondent	18-40	91	42.3	124	57.7
	41-60	136	54.8	112	45.2
	over 60	91	67.9	43	32.1

Almost one third of respondents are illiterate, and a full two-thirds of respondent either were illiterate or were literate but had no schooling. Only 5 percent of the sample had gone on to further education beyond schooling (Table 1). The low education attainments may help to explain why many people are not interested in being provided with written materials to inform them about agroforestry, EnLift or this questionnaire. Low levels of education also suggest that respondents' livelihood opportunities are often constrained beyond their immediate agro-forestry or labour migration opportunities – an issue that is relevant to much of the discussion of the relative importance of the forest for different types of households. The gender balance in respondents was quite evenly reflected at the individual CFUG level (Figure 4).

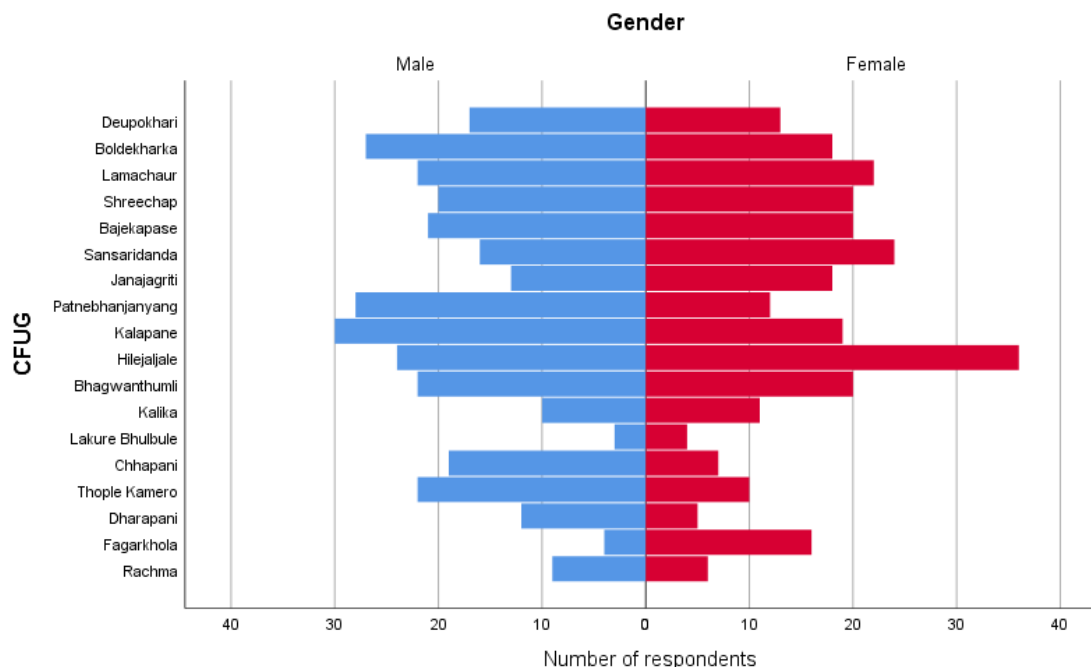


Figure 4. Distribution of respondents by gender across Community Forest User Groups

Direct questions relating to income were not asked, as they were deemed insensitive, but respondents indicated that they owned some important relevant household assets (Table 2).

Table 2. Respondent household ownership of key assets (N=581)

Asset	Frequency	Percentage
Mobile phone	580	99.8%
Computer/laptop	307	52.8%
Motorbike	100	17.2%
Tractor/bus	14	2.4%
Car	8	1.4%

The sites are quite distinctly different in relation to the socio-economic divisions, especially in relation to the representation of different castes amongst respondents (Figure 5). The differences in respondents' perceptions according to municipality discussed in the report are therefore not just associated with issues of site or situation but the relative caste and socio-economic distribution of community members.

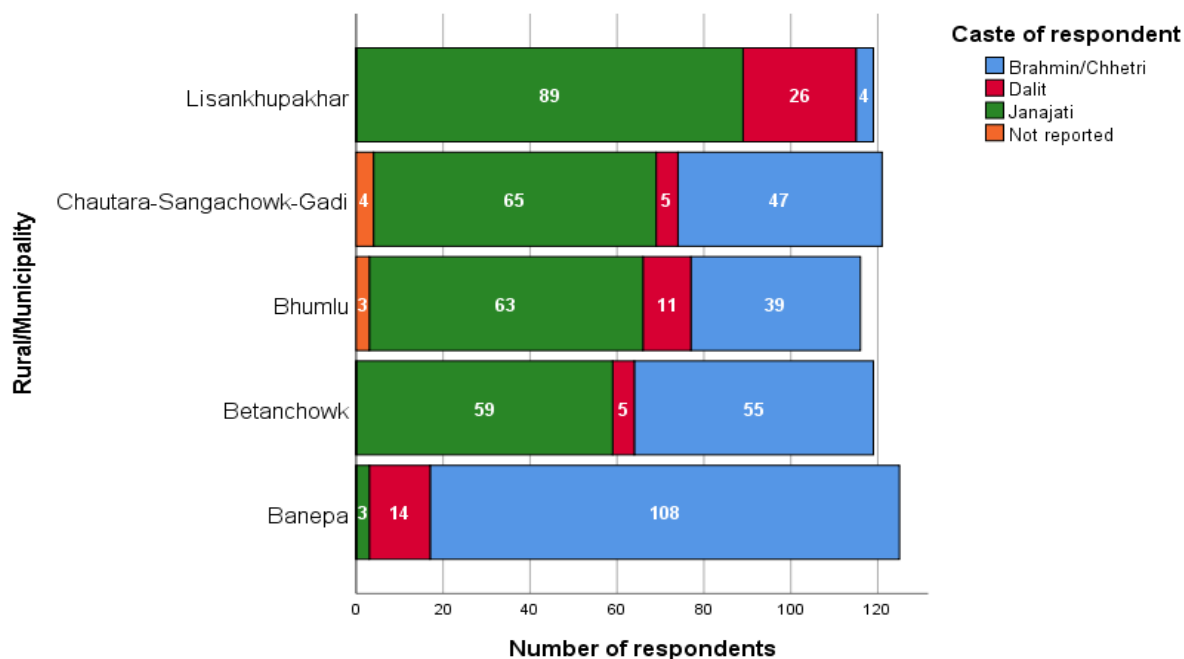


Figure 5. Distribution of respondents by Caste groups

Almost all respondents were involved in the management of the community forest (Table 3), while about a quarter are also managing private forests and a small minority also have leasehold forest that they use for particular purposes.

Table 3. Frequency of respondents by forest type being managed

Forest Type	Frequency of respondents engaged in forest management		
	No	Yes	Valid Responses
Community forest	5	591	596
Private Forest	415	164	579
Leasehold Forest	500	10	510

Respondents are valuing the forest in many ways. As will be discussed at length in the following sections, some of the reasons for valuing the forest are quite specific to generating direct or indirect benefits for their household and community, but some are associated with broader non-use values of the forest and their CFUGs activities (Tables 4 and 5). Retaining greenery/beauty was deemed the most important reason to be proud of the forests across all castes and education levels of respondents, suggesting an important existence and aesthetic value of the forest that might be influencing broader attitudes to the exploitation of the forest for commercial benefits. In contrast, most respondents are not showing significant pride in the governance of their community forest user groups.

Table 4. Respondents' mean ratings of the reasons for feelings of pride in their Community Forestry User Group by Caste

	Caste			
	Brahmin/ Chhetri	Janajati	Dalit	Total
Conservation of plants and animals	3.61	3.57	3.58	3.59
<i>Retaining greenery/beauty</i>	4.33	4.25	4.20	4.28
Supply of timber & other forest products	3.35	3.66	3.48	3.51
Participation of Dalits and the poor	3.62	3.38	3.46	3.49
Participation of women	3.86	3.63	3.42	3.70
Benefits for the community	3.25	3.12	2.97	3.16
<i>Leadership of the CFUG committee</i>	3.08	2.86	2.53	2.92

Table 5. Respondents' mean ratings of the reasons for feelings of pride in their Community Forestry User Group by highest level of education of respondent

	Highest education attainment of respondent				
	Illiterate	Literate without schooling	Schooling	Further education	Total
Conservation of plants and animals	3.57	3.66	3.74	3.29	3.63
<i>Retaining greenery/beauty</i>	4.28	4.34	4.49	4.27	4.36
Supply of timber and other forest products	3.53	3.45	3.84	3.14	3.56
Participation of Dalits and the poor	3.48	3.52	3.72	3.61	3.56
Participation of women	3.61	3.75	3.89	4.00	3.75
Benefits for the community	3.15	3.20	3.33	3.20	3.22
<i>Leadership of the CFUG committee</i>	2.78	2.93	3.16	2.80	2.92

5.2 Livelihood values and income from the forest

The forest and agriculture are an important component of livelihood generation for respondents. Community forestry sits alongside grain and livestock production as the most important sources of livelihood amongst the surveyed respondents (Table 6). The importance of the different livelihood elements varied across sites

Table 6. Grouped median importance of livelihood sources by municipality

	Municipality						K-W p value
	Banepa	Betanchowk	Bhumlu	Chautara	Lisan-khupakhar	Total	
Community forest	3.04	2.97	3.25	3.06	2.67	3.01	0.004
Private forest	1.26	2.00	1.72	1.25	2.21	1.60	0.000
Grain crop production	4.36	3.92	3.78	3.74	3.01	3.76	0.000
Fruit crop production	1.31	1.15	1.49	1.27	1.11	1.26	0.000
Livestock production	3.56	3.50	3.15	3.07	2.49	3.13	0.000
Trade or business	2.04	2.70	1.59	1.80	1.60	1.88	0.000
Salaried/pension	1.62	1.42	1.37	1.63	1.18	1.43	0.000
Local labour wage	1.22	1.68	2.43	1.58	2.38	1.71	0.000
Remittance	1.25	1.23	1.19	1.21	1.65	1.26	0.000

To explain the results further we provide some systematic comparisons of the importance of the community forest to different groups in the Nepalese mid-hills (Table 7). While there do not appear to be many strong simple relationships evident in the data, perhaps younger respondents with some schooling are recognising more value in the Community forest for livelihood outcomes. An important observation is that formal education within the household appears to be particularly important for households seeing the community forest as a very important component of their livelihoods.

Table 7. Systematic group comparisons of the importance of Community Forestry for household livelihoods

		Importance of Community Forest for Livelihoods (1 = low, 5 = high)									
		1		2		3		4		5	
		n	Row %	n	Row %	n	Row %	n	Row %	n	Row %
Municipality	Banepa	19	15.2%	24	19.2%	36	28.8%	32	25.6%	14	11.2%
	Betanchowk	12	10.1%	35	29.4%	27	22.7%	36	30.3%	9	7.6%
	Bhumlu	5	4.3%	25	21.6%	37	31.9%	40	34.5%	9	7.8%
	Chautara	1	0.8%	31	25.8%	51	42.5%	29	24.2%	8	6.7%
	Lisankhupakhar	23	20.0%	24	20.9%	43	37.4%	21	18.3%	4	3.5%
Age of respondent	18-40	19	8.9%	43	20.1%	70	32.7%	58	27.1%	24	11.2%
	41-60	25	10.2%	57	23.3%	84	34.3%	66	26.9%	13	5.3%
	over 60	16	11.9%	38	28.4%	39	29.1%	34	25.4%	7	5.2%
Caste	Brahmin/Chhetri	22	8.7%	58	22.9%	75	29.6%	72	28.5%	26	10.3%

	Janajati	29	10.5%	71	25.7%	98	35.5%	69	25.0%	9	3.3%
	Dalit	9	15.0%	10	16.7%	17	28.3%	16	26.7%	8	13.3%
Education of respondent	Illiterate	21	11.1%	54	28.4%	57	30.0%	49	25.8%	9	4.7%
	Literate without schooling	26	11.4%	54	23.6%	70	30.6%	64	27.9%	15	6.6%
	Schooling	7	4.8%	26	17.7%	61	41.5%	34	23.1%	19	12.9%
	Further education	6	20.7%	5	17.2%	6	20.7%	11	37.9%	1	3.4%
Highest education within the respondent's household	Illiterate	3	12.0%	4	16.0%	9	36.0%	8	32.0%	1	4.0%
	Literate without schooling	9	15.5%	14	24.1%	18	31.0%	14	24.1%	3	5.2%
	Schooling	29	8.8%	82	24.8%	109	33.0%	80	24.2%	30	9.1%
	Further education	19	10.5%	39	21.5%	58	32.0%	55	30.4%	10	5.5%

Some private forestry is particularly important in Betanchowk, and there is some suggestion from the data that it is more important for more highly educated respondents (Table 8).

Table 8. Systematic group comparisons of the importance of Private Forestry for household livelihoods

		Importance of Private Forest for Livelihoods (1 = low, 5 = high)									
		1		2		3		4		5	
		n	Row %	n	Row %	n	Row %	n	Row %	n	Row %
Municipality	Banepa	96	77.4%	13	10.5%	7	5.6%	6	4.8%	2	1.6%
	Betanchowk	58	48.7%	3	2.5%	15	12.6%	25	21.0%	18	15.1%
	Bhumlu	60	51.7%	18	15.5%	14	12.1%	20	17.2%	4	3.4%
	Chautara	94	79.0%	7	5.9%	3	2.5%	10	8.4%	5	4.2%
	Lisankhupakhar	37	32.5%	28	24.6%	30	26.3%	17	14.9%	2	1.8%
Age	18-40	124	58.2%	23	10.8%	26	12.2%	28	13.1%	12	5.6%
	41-60	147	60.2%	29	11.9%	30	12.3%	29	11.9%	9	3.7%
	over 60	72	54.1%	17	12.8%	13	9.8%	21	15.8%	10	7.5%
Caste	Brahmin/Chhetri	158	62.7%	23	9.1%	26	10.3%	27	10.7%	18	7.1%
	Dalit	42	70.0%	10	16.7%	5	8.3%	3	5.0%	0	0.0%
	Janajati	139	50.7%	36	13.1%	38	13.9%	48	17.5%	13	4.7%
Education of respondent	Illiterate	120	64.5%	19	10.2%	18	9.7%	25	13.4%	4	2.2%
	Literate without schooling	133	57.8%	28	12.2%	27	11.7%	26	11.3%	16	7.0%
	Schooling	82	55.8%	20	13.6%	18	12.2%	20	13.6%	7	4.8%
	Further education	10	34.5%	2	6.9%	6	20.7%	7	24.1%	4	13.8%

While agricultural and forestry remain vital for livelihood generation, less than one third of respondents stated that they are accessing more than half of their income from agriculture and forestry (Table 9). In other words, the key activities that are important for respondents' livelihoods remain in the fields of agriculture and forestry. However, that does not necessarily translate to financial capital, where people appear to be more reliant on off-farm/forest activities.

Table 9. Distribution of respondents by percent income from agriculture and/or forestry

Income from agriculture &/or forestry (%)	Frequency	Percent
0-25	200	33.8
26-50	216	36.5
51-75	104	17.6
75-100	71	12.0
Total	591	100.0

Again, the relationships between key demographic and socio-economic characteristics and the importance of agriculture and forestry for household incomes provides some interesting insights (Table 10). For example, if responses for the percentage of income derived from agriculture and forestry are examined in more detail according to the municipality, it is evident that respondents from the locations closer to Kathmandu such as Banepa and Betanchowk, where more intensive agriculture is present, are deriving a significantly greater percentage of their income from agriculture and forestry – suggesting perhaps an increasing commercial focus in those places (Pearson Chi-Square $N=591$, 58.2, $p<0.001$).

Table 10. Systematic group comparisons of the importance of agriculture and forestry for household incomes

		Percent income from agriculture and forestry							
		0-25%		26-50%		51-75%		75-100%	
		Count	Row %	Count	Row %	Count	Row %	Count	Row %
Municipality	Banepa	30	24.2	35	28.2	29	23.4	30	24.2
	Betanchowk	34	29.1	49	41.9	14	12.0	20	17.1
	Bhumlu	41	36.3	36	31.9	26	23.0	10	8.8
	Chautara-Sangachowk-Gadi	38	32.2	54	45.8	16	13.6	10	8.5
	Lisankhupakhar	57	47.9	42	35.3	19	16.0	1	0.8
Age	18-40	66	31.1	80	37.7	35	16.5	31	14.6
	41-60	88	35.8	90	36.6	39	15.9	29	11.8
	over 60	45	34.4	45	34.4	30	22.9	11	8.4
Caste	Brahmin/Chhetri	54	21.9	85	34.4	51	20.6	57	23.1
	Janajati	113	40.8	111	40.1	43	15.5	10	3.6
	Dalit	32	52.5	18	29.5	8	13.1	3	4.9
Education of respondent	Illiterate	76	40.6	57	30.5	37	19.8	17	9.1
	Literate without schooling	68	29.6	92	40.0	40	17.4	30	13.0
	Schooling	43	29.5	61	41.8	24	16.4	18	12.3
	Further education	13	46.4	6	21.4	3	10.7	6	21.4

Within particular municipalities, remittances are more or less important, with 40% of respondent households from Lisankhupakhar, the most remote site, receiving foreign remittances in comparison to 11 to 22% across the other four sites. All ethnic groups are receiving remittances, with 20% of all Brahmin/Chhetri respondents, 23% of the Janajati respondents and 18% of the Dalit respondents having family members sending remittances. The availability of remittances for a household are not having significant impacts on the way respondents are identifying the benefits from the forest. In some respects, the results from Lisankhupakhar may more closely resemble other communities within the Nepalese mid-hills away from the larger commercial centres. In those more marginal municipalities respondents are perhaps going to be more dependent on forestry activities and there may be fewer opportunities to generate financial income generated away from remittance income.

Just over a third of respondents stated that the forest is important for supporting their household income (Scores 4 & 5 in Table 11). Perhaps there is some indication that those respondents who consider agriculture and forestry industries to be less important for their incomes, appear to be considering the community forestry to be more important (Table 11). This apparent contradiction is interesting and requires further investigation, but it does suggest that for those households dependent on primary production, the forest remains vital for supporting subsistence production systems and may not have become an important source of financial capital. Yet, the community forests are providing income opportunities for those who are taking risks to generate most of their income through other means than natural resource exploitation.

Table 11. Importance of income from agriculture and/or forestry by attitudes to the importance of community forests

Score		Percent income from agriculture and forestry				
		0-25%	26-50%	51-75%	75-100%	Total
1	Count	20	30	6	4	60
	Column %	10.1%	14.0%	5.8%	5.6%	10.2%
2	Count	52	47	25	14	138
	Column %	26.1%	22.0%	24.3%	19.7%	23.5%
3	Count	68	68	28	25	189
	Column %	34.2%	31.8%	27.2%	35.2%	32.2%
4	Count	50	54	33	19	156
	Column %	25.1%	25.2%	32.0%	26.8%	26.6%
5	Count	9	15	11	9	44
	Column %	4.5%	7.0%	10.7%	12.7%	7.5%

It is possible to conclude that the forest is being used in a complex range of ways, but largely for subsistence production and less widely for commercial activity.

5.2.1 Direct use values of the forest

Salla, or pine, (*Pinus* spp.) species form the majority of the forests but numerous CFUGs include, and households manage Chilaune (*Schima wallichii*), Uttis, or alder, (*Alnus nepalensis*) or mixed forests (Table 12). Chilaune, for example are a slow growing, twisted grain tree, often grown in marginal upland areas as a substitute for Sal (*Shorea robusta*), which is altitude limited and barely represented in the sample, even though it is the most widely traded timber across Nepal. Such a species as Chilaune may generate opportunities in other places that are not currently recognising its values/importance, so further analysis of where and who are managing the alternative forest types might be of interest.

Table 12. Respondents use of forest species / species mixes in local forests (Multiple responses allowed)

Species	N	Percent of all responses	Species	N	Percent of all responses
Salla	657	33.7%	Sal	7	0.4%
Chilaune	293	15.0%	Kutmiro	6	0.3%
Uttis	281	14.4%	Chhap	5	0.3%
Other	216	11.1%	Bans	4	0.2%
Mix pine-broadleaf	155	7.9%	Dhupi	4	0.2%
Khasru	67	3.4%	Dudhilo	4	0.2%
Guras	64	3.3%	Dabdabe	3	0.2%
Kafal	30	1.5%	Phalant	3	0.2%
Katus	27	1.4%	Dhalke	2	0.1%
Mix Katus-Chilaune	27	1.4%	Kush	2	0.1%
Angeri	17	0.9%	Mauwa	2	0.1%
Pahale	13	0.7%	Paiyu	2	0.1%
Jhingane	12	0.6%	Setikath	2	0.1%
Rakchan	12	0.6%	Lampate	1	0.1%
Lapsi	11	0.6%	Mix Katus-Guras	1	0.1%
Jhyanu	10	0.5%	Padke	1	0.1%
Bakle	8	0.4%	Tuni	1	0.1%

Respondents from across all municipalities did not value the sale of timber highly, with only sixty four out of 600 respondents, or just over 11 percent of the sample, having sold timber in the last five years (Figure 6).

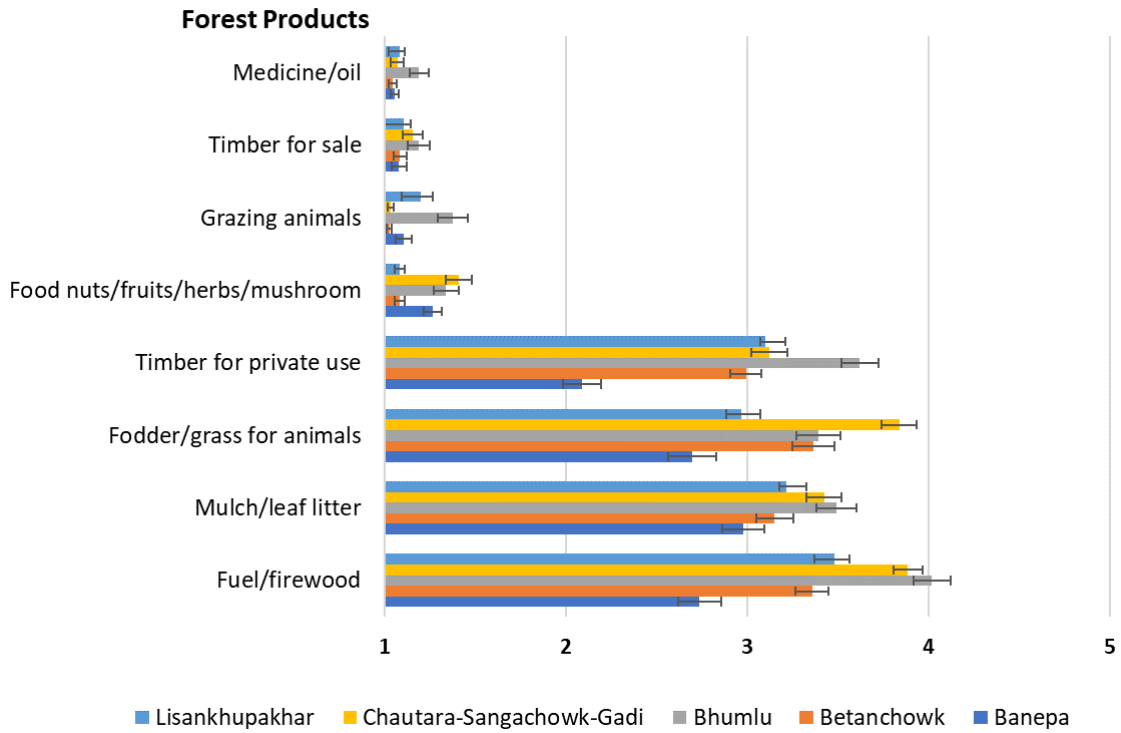


Figure 6. Mean relative importance of the direct benefits of community forests by municipality using 1-5 Likert scale data (from farthest (Lisankhupakhar) to nearest (Banepa) to Kathmandu)

Rather, there is a strong recognition of agroforestry values for local building, fuel and agricultural resources with respondents were prioritising non-use, aesthetic values or non-destructive use values such as timber for private use, fuel, mulch and fodder. In other words, people do not appear to be valuing opportunities for the commercial exploitation of forests for timber highly, but there is a strong recognition of agroforestry values for local building, fuel and agricultural resources. Male respondents identified significantly greater value of timber for private use and firewood than female respondents.

The lack of interest in the commercial exploitation of the forest resource is apparent across the socio-economic spectrum (Table 13). We do not provide all of the statistical analysis outcomes in this report, but the results presented in Table 14 provide support for several elements of discussion on the implications of the ways that respondents are valuing the forest.

Table 13. Direct uses of the forest presented as grouped median score by caste

	Caste							
	Brahmin/Chhetri		Janajati		Dalit		Total	
	Grouped		Grouped		Grouped		Grouped	
	Median	N	Median	N	Median	N	Median	N
Timber for private use	2.88	253	3.26	275	2.74	61	3.08	589
Timber for sale	1.07	249	1.07	258	1.04	57	1.07	564
Fuel / firewood	3.41	248	3.73	273	3.49	60	3.58	581
Food nuts/fruits/herbs/mushroom	1.22	251	1.14	270	1.15	59	1.18	580
Medicine / oil	1.08	251	1.06	267	1.05	58	1.07	576
Mulch / leaf litter	3.34	253	3.43	272	3.08	60	3.35	585
Fodder / grass for animals	3.38	253	3.50	271	2.75	58	3.39	582
Grazing animals	1.07	249	1.09	262	1.11	59	1.08	570
Other	1.38	26	1.00	24	1.33	3	1.08	53

Table 14. Significance of direct uses of the community forest by caste groups

Forest use	Kruskal-Wallis H	Asymptotic Significance <i>p</i> values*
Timber for private use	15.035	0.001
Timber for sale	2.254	0.324
Fuel/firewood	13.750	0.001
Food nuts/fruits/herbs/mushroom	5.298	0.071
Medicine/oil	0.780	0.677
Mulch/leaf litter	4.585	0.101
Fodder/grass for animals	11.164	0.004
Grazing animals	0.880	0.644
Other	4.971	0.083

The single lowest ranked direct benefit of forest product by any caste was timber for sale by the Dalit caste, and the use of the forest for mulch/leaf litter or fodder/grass for animals was also significantly lower for Dalit respondents than other castes (Figure 7). The results suggest that even though the forest is not heavily exploited for commercial outcomes, it remains important for supporting local subsistence activities: building houses and other structures and providing fuel, fodder and mulch for agricultural activities (Figure 8). The Janajati caste are valuing the forest for timber for private use and firewood/fuel more than the other castes, which may be associated with the Janajati caste often having wooden framed houses that need regular repairs, unlike the Brahmin and Chhetri castes that are more likely to clay or brick houses.

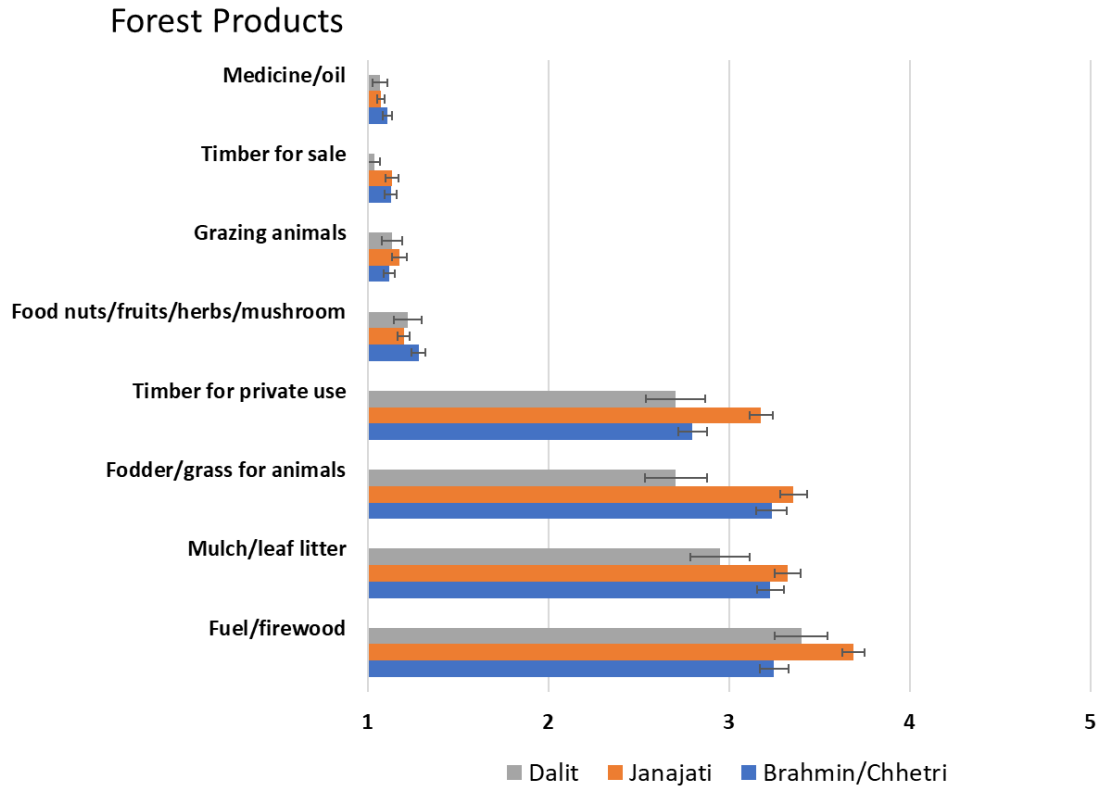


Figure 7. Mean perceived direct benefits of forest products and activities by caste



Figure 8. Timber stores, fodder collection and mulch spreading in the Nepalese mid-hills

The use of forest timber for private use or for fuel is ranked highly (Table 15), but its relative importance differed significantly across the municipalities (Figure 9a and 9b). For example, less value was attributed to both timber for private use (K-W $H=106.0$, $p<.001$) and timber for fuel (K-W $H=86.70$, $p<.001$) in Banepa, which is directly adjacent to Kathmandu valley than more distant municipalities.

Table 15. Grouped median importance scores for various forest uses by respondents' income dependence on agriculture and forestry

Income from agriculture and forestry	Timber for private use	Timber for sale	Fuel/ firewood	Food nuts /fruits/ herbs/ mushroom	Medicine/ oil	Mulch/ leaf litter	Fodder/ grass for animals	Grazing animals
0-25%	3.05	1.04	3.51	1.15	1.06	3.02	3.19	1.09
26-50%	3.06	1.06	3.61	1.10	1.04	3.41	3.44	1.06
51-75%	3.21	1.09	3.67	1.18	1.05	3.69	3.47	1.09
75-100%	3.06	1.13	3.61	1.51	1.18	3.58	3.89	1.12
Total	3.08	1.07	3.59	1.18	1.07	3.36	3.40	1.08

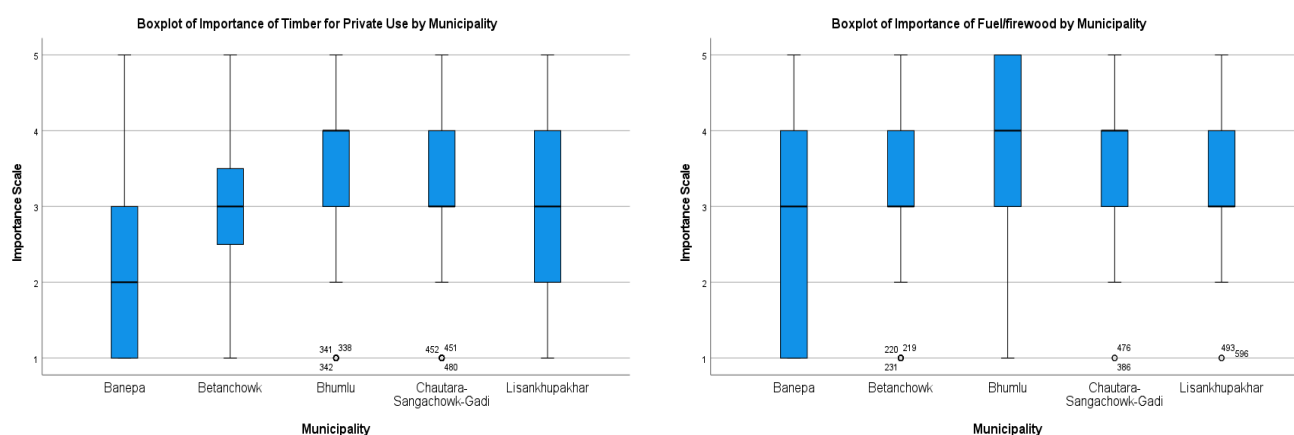


Figure 9. Perceived importance by Municipality of a. Timber for private use; b. Fuel / Firewood

As you might expect, those households that are more dependent on agriculture and forestry for their income are valuing the mulch and fodder resources more than those who have other sources of income (Figure 10a and 10b). This again suggests that the forest is providing very important inputs into the wider agroforestry system in the Nepalese mid-hills, just not necessarily for direct commercial sale.

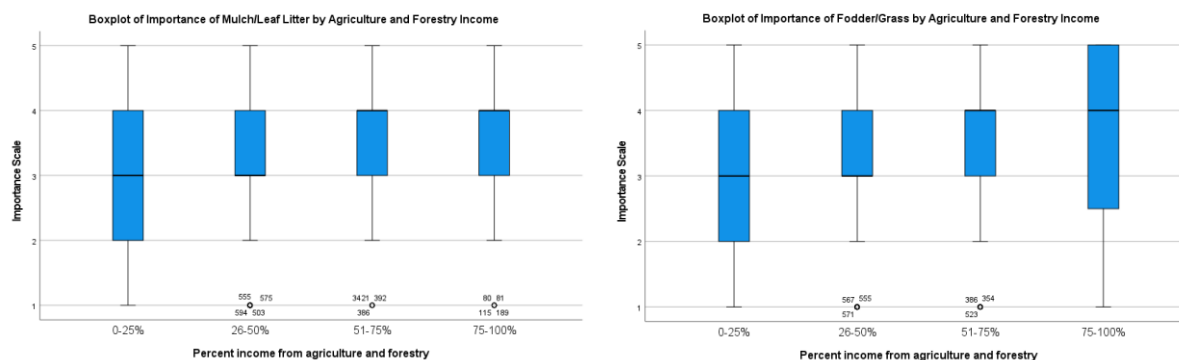


Figure 10. Perceived importance by dependence on forestry and agriculture for income of a. Mulch / leaf litter and b. Fodder / grass for animals

For those people who are highly dependent on forestry and agriculture for their livelihoods, the forest appears to be seen as an extension of the farm, because they are significantly more likely to use the forest for fodder, mulch, foods and medicines/oils. This primary-industry dependent group appear to be practical agro-foresters, who are gaining private benefits to support their wider agro-ecological activities from the forest. These results again suggest that the subsistence values of the community forest remain vitally important and it that the farming system is dependent on households maintaining access to the resources of the forest. It might, for example, be important for providing households with the capacity to explore a wider range of food crops and animal husbandry on their private farmland than they would otherwise.

5.2.2 Community forestry and food security

Food sufficiency derived solely from activities from private lands is low across all sites, but particularly Lisankhupakhar and Bhumlu – the more remote, higher altitude sites (Table 16). That low level of food availability from subsistence production was particularly acute for Dalit respondents, with only 5% of respondents from the Dalit caste stating that they are food secure from their own lands across all sites.

Table 16. Responses by municipality and caste of the sufficiency of on-farm food production for meeting annual household needs

		Sufficiency of on farm food production			
		Sufficient		Insufficient	
		Count	Row N %	Count	Row N %
Municipality	Banepa	45	36.3%	79	63.7%
	Betanchowk	35	29.7%	83	70.3%
	Bhumlu	28	24.1%	88	75.9%
	Chautara	39	32.5%	81	67.5%
	Lisankhupakhar	15	13.4%	97	86.6%
Caste of respondent	Brahmin/Chhetri	95	37.7%	157	62.3%
	Dalit	3	5.0%	57	95.0%
	Janajati	62	22.8%	210	77.2%
	Not reported	2	33.3%	4	66.7%

In general, poorer people are not perceiving forests as a pathway to local food security, although there are some important distinctions in the results according to socio-economic characteristics. For example, family income is the major mechanism to pay for food, but debt (~10%) and ongoing inability to access food (~5%) are also important issues across the cohort (Table 17). The poor food access levels run across classes, but the Janajati and Dalit are more likely to have debt or ongoing access issues. Importantly, while a very small minority of Dalit respondents stated that they are food secure from their own lands, they are still largely not seeing the community forest as a pathway to supporting local food security. .

Table 17. Frequency and percentage of respondents by Caste using pathways to accessing food alternative to on-farm production

Pathways of accessing food	Brahmin/Chhetri		Janajati		Dalit		Total	
	n	%	n	%	n	%	n	%
Family income	156	98	209	96	59	100	424	97
Social welfare	8	5	12	6	2	3	22	5
Food-for-work	1	1	1	0	2	3	4	1
Community support	0	0	0	0	1	2	1	0
Forest food	1	1	1	0	0	0	2	0
Debt	11	7	33	15	11	19	55	13
Remains difficult to access food	1	1	21	10	6	10	28	6
Total	159	100	218	100	59	100	436	100

There remains an important group who are unable to access sufficient food from their own subsistence production or income (Table 17). That group of 84 households, or about one quarter of all households who responded to the question, are reliant on generating debt or ongoing community support to access sufficient food, or are finding that it is difficult to access sufficient food throughout the year. That suggests that food security remains a significant challenge for many people within the surveyed CFUGs.

Almost one third of respondents are illiterate, and a full two-thirds of respondents either were illiterate or were literate but had no formal schooling (Table 1). Only 5 percent of the sample had gone on to further education beyond secondary school. These low education attainments would suggest that the majority of respondents have limited livelihood opportunities beyond their immediate agroforestry or labour migration opportunities. Yet, when respondents were asked about their dependence on agriculture and forestry to generate their livelihoods, only approximately 25% of respondents were dependent on those industries for more than 50% of their income (Table 11). The education level of the respondent does not appear to be significantly influential over the perceived direct values of the forest across all of the direct uses (Table 18).

Table 18. Grouped median direct vales of the forest by respondent’s level of education

	Illiterate		Literate without schooling		Schooling		Further education		Total	
	Grouped Median	n	Grouped Median	n	Grouped Median	n	Grouped Median	n	Grouped Median	n
Timber for private use	3.04	190	3.13	229	3.14	146	2.60	29	3.08	594
Timber for sale	1.04	182	1.09	219	1.06	141	1.11	28	1.07	570
Fuel/ firewood	3.52	186	3.56	228	3.77	145	3.33	28	3.59	587
Food nuts/fruits/ herbs/mushroom	1.15	186	1.17	227	1.17	145	1.44	28	1.18	586
Medicine/oil	1.04	184	1.06	225	1.09	145	1.15	28	1.07	582
Mulch/leaf litter	3.30	188	3.40	227	3.39	147	3.25	29	3.36	591
Fodder/grass for animals	3.29	188	3.46	226	3.47	145	3.21	29	3.40	588
Grazing animals	1.07	183	1.09	220	1.08	145	1.16	28	1.08	576

When the same direct value data is analysed by the highest education level within the household not just the respondent themselves, some particularly interesting results emerge. Respondents from households with higher levels of education attainment appear to be making more use of the forest timber for commercial sale, as well as accessing foods such as fungi, fruits and herbs (Tables 19). Not many of all respondents considered timber for sale as very or extremely important, but all of those who did had a member of their household with school level or higher education. In fact, of all respondents who said timber for sale was important, almost all had formal education within their household. People with a computer were significantly more likely to derive benefits from timber for commercial sale or the collection of food from the forest than those who do not.

Table 19. Frequency of respondents by importance score for timber for sale and forest foods and highest educational level within the household

		Highest education level in household			
		Illiterate	Literate without schooling	Schooling	Further education
		Count	Count	Count	Count
Timber for sale	Not at all	23	52	303	155
	Some Use	0	2	4	6
	Important	0	1	7	10
	Very important	0	0	2	1
	Extremely important	0	0	1	2
Food nuts/fruits/herbs/ mushroom	Not at all	24	53	270	141
	Some Use	0	1	36	27
	Important	1	2	15	7
	Very important	0	1	3	4
	Extremely important	0	0	0	0

These results would appear to have important implications for the development of the forest. If projects wish to engage in a more targeted manner with communities to develop forest industries, it may be possible to more explicitly recognise the importance of education within a household to enable people to develop business activities linked to timber or other commercial uses.

5.2.3 Indirect values of the forest

People who are more dependent on agriculture and forestry for their incomes are valuing the forest for the indirect resource values (Table 20). If agriculture and forestry are very important, then respondents are also more likely to value water quantity and quality, erosion, flood, earthquake, drought management, religious/tourism and recreation values. That association is interesting: perhaps those people aiming to generate income from agriculture and forestry are more observant of the role of the forest in influencing the broader environment; perhaps because are more directly dependent on primary resources they wish that the forest continues to play those key roles in ensuring the natural resources are available.

Table 20. Grouped median value of perceived indirect values of the forest according to respondents' dependency on agriculture & forestry income

	Percentage income from agriculture &/or forestry				
	0-25%	26-50%	51-75%	75-100%	Total
Water quantity	1.57	1.78	1.87	2.50	1.76
Water quality	2.51	2.99	2.90	3.68	2.92
Control landslides/ erosion	2.55	2.48	2.65	3.22	2.61
Managing storm/ flashfloods	1.60	1.41	1.50	1.95	1.54
Responding to earthquake	2.63	2.58	2.95	3.06	2.70
Managing drier periods	1.57	1.42	1.77	2.44	1.61
Supporting food security	1.21	1.13	1.20	1.26	1.19
Providing shade/ shelter	1.45	1.27	1.36	1.62	1.39
Improve biodiversity/ habitat	3.36	3.09	3.18	3.46	3.24
Conserve carbon dioxide	2.80	2.85	3.13	3.70	2.96
Religious/ spiritual values	1.64	1.75	1.91	2.93	1.82
Tourism/ recreation	1.31	1.32	1.54	1.93	1.41

Most respondents, or just over 80 percent of respondents, agreed that the climate is changing (Table 21).

Table 21. Respondents' perceptions of weather pattern changes in their region over the last ten years

Response	Frequency	Percentage
Yes	483	80.6
No	42	7.0
Unsure	74	12.4
Total	599	100

Interestingly if respondents were recognising changes to weather patterns they were also more likely to rate indirect values of the forest such as water quality, landslide protection or biodiversity highly (Table 22). Higher levels of education in the household are associated with a broader understanding of flood and drought risk, religion and tourism/recreation values of the forest.

Respondents with families who have multi-generational links to their community are valuing the forest for landslide, erosion, earthquake risk management more, possibly because they knew what it was like before the forest cover returned to mitigate those risks. The experience or the received wisdom of previous land management challenges are likely to be important drivers of these values.

Table 22. Indirect values of the forest according to perceptions of changing weather patterns

Grouped Median	Have the weather patterns changed?		
	Yes	No & Unsure	Total
Water quantity ^{ns}	1.78	1.69	1.76
Water quality ^{**}	3.03	2.29	2.92
Control landslides/ erosion ^{**}	2.70	2.16	2.61
Managing storm/ flash floods ^{ns}	1.57	1.44	1.55
Responding to earthquake [*]	2.79	2.35	2.70
Managing drier periods [*]	1.66	1.41	1.61
Supporting food security ^{ns}	1.20	1.12	1.19
Providing shade/ shelter ^{ns}	1.37	1.43	1.38
Improve biodiversity/ habitat ^{ns}	3.35	2.69	3.24
Conserve carbon dioxide ^{ns}	3.08	2.54	2.96
Religious/ spiritual values [*]	1.88	1.59	1.82
Tourism/ recreation [*]	1.44	1.27	1.40

Kruskal-Wallis test for importance of indirect values

*** significant at 99% confidence level, * significant at 95% confidence level, ns not significant*

As climate change has a more substantial impact on communities in the mid-hills of Nepal, certain indirect values of the forest such as maintaining water quality, controlling landslides and erosion and conserving carbon dioxide may become more influential over forest management decisions.

Respondents from Bhumlu identified the forest as particularly important for landslide management and responding to earthquakes, which is likely to be related to the fact that there was a big impact by the 2015 earthquake and the EnLift project supported the community to recover after the event. In contrast, only a few respondents identified important problems emerging from the presence of forests. The more significant issues are from weeds, crop damage by animals and perceived reductions in water quantity.

5.3 Respondents changing engagement with forestry activities over time

Almost all respondents are involved in some CFUG activities. Yet, households commonly stated that they are less actively managing or utilising the community forest than they did five years ago, including in key activities such as tree planting, clearing unwanted trees, timber harvesting, fodder/grass collection and firewood gathering (Figure 11 and Table 23).

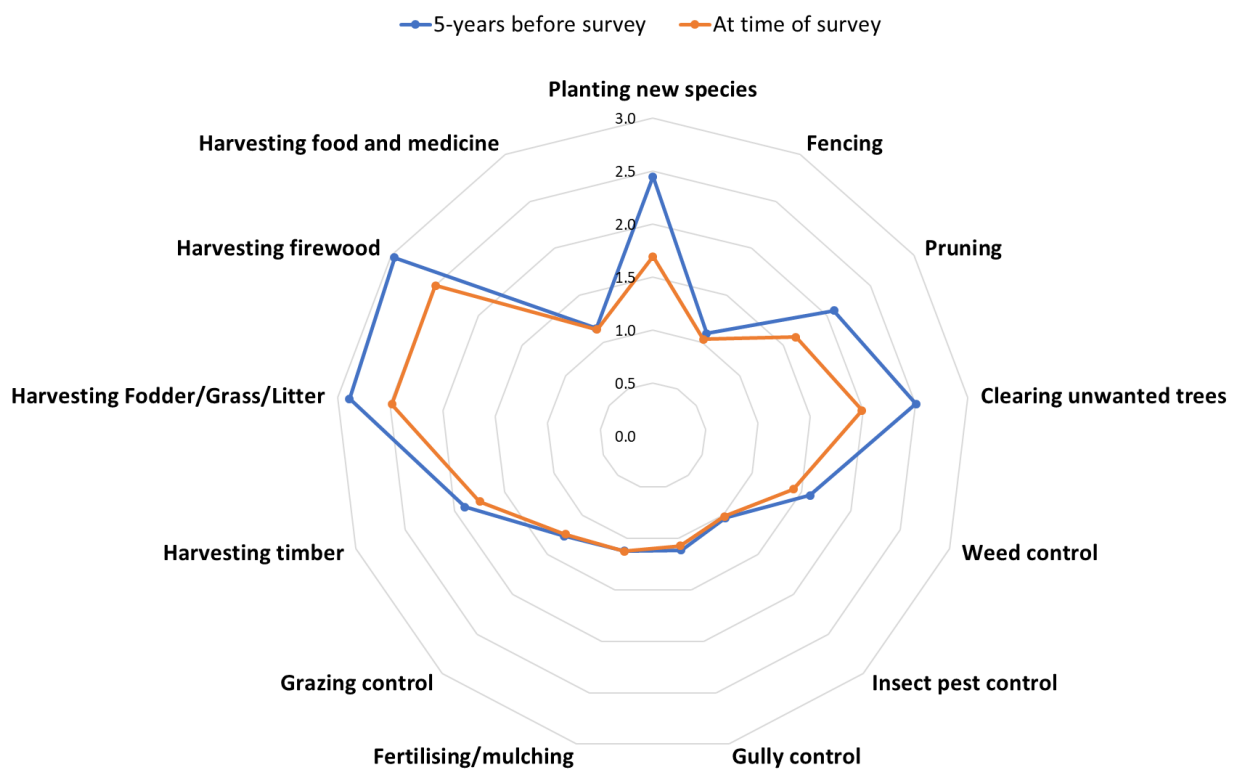


Figure 11. Mean perceptions of the importance of involvement of respondents in community forestry activities at the time of the survey and five years previously (1 – unimportant; 5 extremely important)

Table 23. Median scores of respondent involvement in different forest-related activities at the year of the survey and 5 years ago

	At year of the survey		5 years ago	
	N	Median	N	Median
Planting new species**	522	1.00	565	3.00
Fencing*	484	1.00	493	1.00
Pruning**	526	1.00	557	2.00
Clearing unwanted trees**	531	1.00	563	3.00
Weed control**	522	1.00	546	1.00
Insect pest control ^{ns}	488	1.00	497	1.00
Gully control ^{ns}	491	1.00	501	1.00
Fertilising/mulching ^{ns}	487	1.00	495	1.00
Grazing control *	505	1.00	503	1.00
Harvesting timber **	541	1.00	532	1.00
Harvesting fodder/grass/litter**	571	2.00	566	3.00
Harvesting firewood **	577	2.00	572	3.00
Harvesting food and medicine ^{ns}	503	1.00	492	1.00

Wilcoxon signed ranks test conducted for scores of at year of survey and 5 years ago as 2 related samples
 ** significant at 99% confidence level, * significant at 95% confidence level, ^{ns} not significant

While interventions such as planting new species, pruning and clearing have declined in relative importance as forests mature, so have the activities relating to subsistence production activities including harvesting firewood, fodder, grass and litter (Figure 11). In other words, people are less involved in forestry activities in general, but it is in relation to the key uses of the forest to support subsistence livelihoods where there are significant perceived declines in forest management involvement (Table 23). Perhaps as people are becoming less dependent on their immediate environments to source livelihoods or incomes, the relationships with the forest are changing. That broad trend across the sites may suggest that Nepali forestry policy, and activities that are trying to promote more actions in or use of the forest could be working against a broader socio-demographic trend of declining engagement with community forestry across the Nepali mid-hills. Interestingly however, activities in private forestry do not appear to have declined as much as activities in the community forest (Table 24), suggesting perhaps that people are more willing to continue to invest their time into forests that lead to private benefits.

Table 24. Importance score and number of respondents for forest related activities now and 5 years ago

Forest related activity	Community Forest				Private Forest			
	Now		5 years ago		Now		5 years ago	
	Mean score	n	Mean score	n	Mean score	n	Mean score	n
Change in land use	NA	NA	NA	NA	1.10	118	1.19	119
Planting new species	1.69	522	2.45	565	1.47	222	1.82	219
Fencing	1.03	484	1.09	493	1.01	214	1.02	210
Pruning	1.63	526	2.07	557	2.11	230	2.26	226
Clearing unwanted trees	1.98	531	2.50	563	2.07	229	2.16	227
Weed control	1.42	522	1.58	546	1.49	226	1.59	223
Insect pest control	1.02	488	1.03	497	1.04	221	1.03	218
Gully control	1.07	491	1.11	501	1.09	220	1.11	217
Fertilising/mulching	1.12	487	1.12	495	1.11	220	1.12	217
Grazing control	1.24	505	1.26	503	1.21	219	1.23	216
Harvesting timber	1.74	541	1.89	532	1.93	230	2.02	228
Harvesting fodder/grass	2.48	571	2.89	566	2.85	233	2.82	231
Harvesting firewood	2.50	577	2.97	572	3.05	235	3.06	233
Harvesting food & medicine	1.13	503	1.15	492	1.20	206	1.23	200

NA – not applicable. This question was not asked for community forestry because changes in land use were not expected to occur in the last 5 years

In general, people appear to be losing interest in forestry activities, but their reduction in involvement in management is differentiated across groups according to their income dependence on agriculture and forestry (Table 25). It is worthwhile depicting these results in graphical form to highlight the key findings, which have important implications for future forest management.

Table 25. Grouped median score of importance of forest-related activities in relation to income sourced from agriculture and forestry

Forest-related activity	Income from Agriculture & Forestry and involvement in community forestry 5 years ago					Income from Agriculture & Forestry and involvement in community forestry at the time of the survey				
	0-25%	26-50%	51-75%	75-100%	Total	0-25%	26-50%	51-75%	75-100%	Total
Planting new species	2.74	2.34	1.89	2.52	2.42	1.64	1.42	1.24	1.40	1.45
Fencing	1.08	1.03	1.06	1.15	1.05	1.03	1.02	1.01	1.04	1.02
Pruning	2.32	1.54	1.75	2.45	1.87	1.69	1.28	1.38	1.27	1.41
Clearing unwanted trees	2.76	2.38	2.60	2.58	2.55	2.16	1.64	1.70	1.47	1.76
Weed control	1.54	1.24	1.25	1.38	1.35	1.44	1.16	1.15	1.19	1.24
Insect pest control	1.03	1.02	1.00	1.07	1.02	1.02	1.01	1.00	1.04	1.01
Gully control	1.08	1.04	1.07	1.17	1.07	1.08	1.04	1.02	1.06	1.05
Fertilising/mulching	1.17	1.02	1.00	1.12	1.07	1.19	1.02	1.00	1.08	1.07
Grazing control	1.24	1.10	1.15	1.12	1.15	1.27	1.07	1.08	1.11	1.14
Harvesting timber	1.69	1.44	1.77	2.13	1.64	1.53	1.46	1.62	1.57	1.52
Harvesting fodder/grass	2.89	2.92	3.24	3.23	3.03	2.26	2.20	2.78	2.73	2.40
Harvesting firewood	3.19	2.91	3.18	2.86	3.05	2.54	2.29	2.59	2.44	2.44
Harvesting food and medicine	1.07	1.06	1.11	1.31	1.10	1.06	1.07	1.08	1.24	1.09

While perceptions of activity 5 years ago in the forest does not appear to differ substantially across the different agro-forestry dependency groups (Figure 12a), Figure 12b suggests that those households that are dependent on agro-forestry for more than half of their income, are now more active in harvesting fodder, grass and mulch but less active in pruning, clearing and weed control than those households less dependent on agro-forestry.

There appears to be a mismatch, because the more dependent on agriculture appear to be more active in exploiting the forest resource, but they state that they are less active in forest management. More management participation by those groups who are not drawing the majority of their income from the forest may be associated with more direct involvement in decision-making. There is also an interesting question as to what is motivating the group less dependent on agriculture and forestry to undertake those forest management tasks – perhaps it is associated with the ongoing need to manage the forest for particular outcomes or it might relate to other social relationships within CFUG groups.

Figure 12a. Median Involvement Score in Forestry activities 5 years beforehand in relation to proportion of income sourced from agriculture and forestry

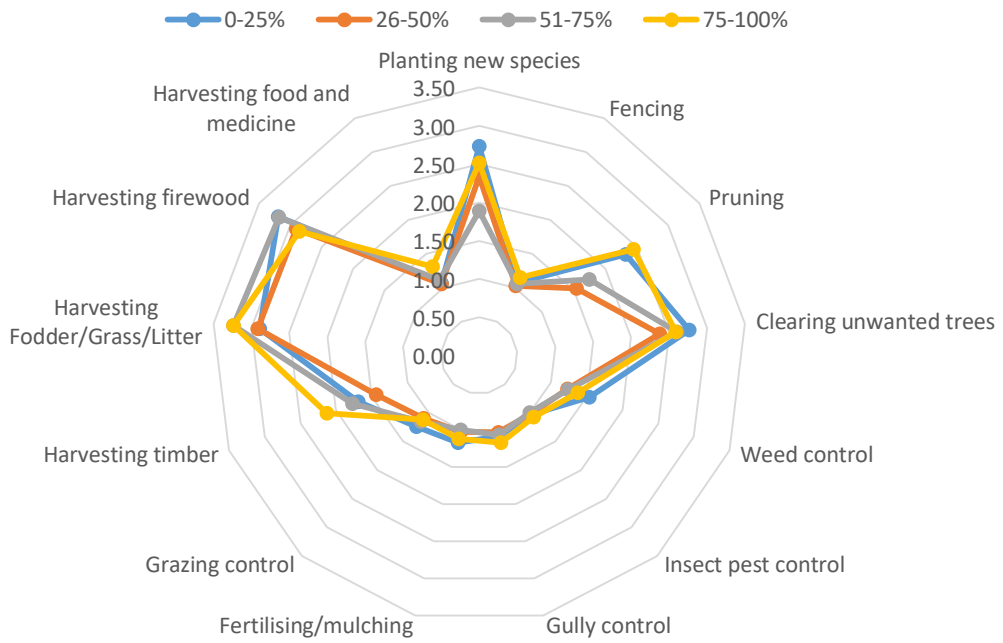
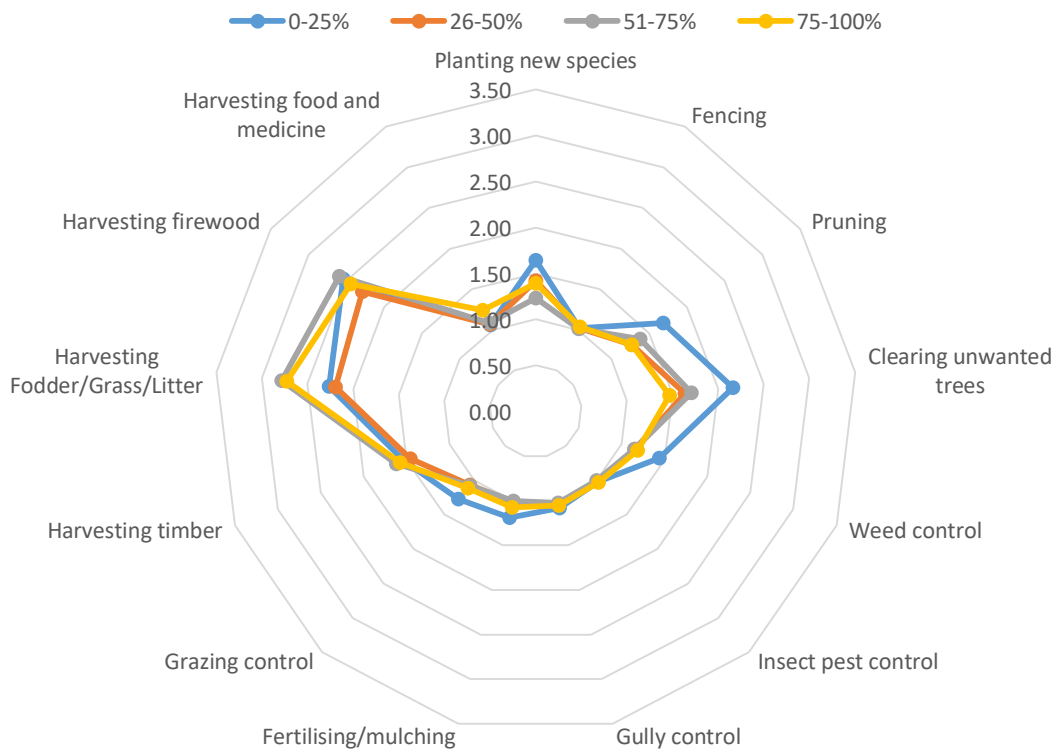


Figure 12b. Median Involvement Score in Forestry activities now in relation to proportion of income sourced from agriculture and forestry



In summary, the results suggest that income dependence on forestry and agriculture has some important influences over activity in the forest. For almost all fields, those respondents more dependent on forestry and agriculture for their income are less likely to be actively undertaking key management activities in the forest such as pruning, clearing or weed control. Nevertheless, in recent times the households dependent on agriculture and forestry appear to be more involved in harvesting timber for private use and fodder and mulch.

5.4 Forest product marketing

Only 64 out of 600 respondents, or approximately 11 percent of the sample, have sold timber in the last five years. Again, this raises questions about who is valuing forest in different ways, including who does this small minority who are valuing the timber production highly represent within the mid-hills community, and why have they chosen to undertake commercial forestry. For example, the Dalit caste do not value the forest highly for its fodder provision (Table 13), possibly because they are working for other socio-economic groups rather than owning the livestock themselves. On the other hand, the data suggests that there is limited use of the forest as a commercial entity across all communities – while some people are selling timber, it still does not represent a major industry for communities, even though the forest is a standing natural resource for all groups. Perhaps there is not a widespread culture of viewing the forest as a direct source of income.

Table 26. Most important 5 forest products sold over the last 5 years (Multiple responses allowed, N=51)

Forest products	Frequency by Municipality					Total frequency	Gross income (NRs)
	Banepa	Betanchowk	Bhumlu	Chautara	Lisankhupakhar		
Cardamom pods	0	0	5	0	0	5	1,053,000
Tree	2	3	4	3	2	14	929,000
Timber	1	2	7	4	4	18	408,640
Fruit-Lapsi	0	0	1	15	0	16	229,600
Firewood	0	1	0	0	1	2	47,000
Marigold flowers	0	0	1	0	0	1	20,000
Thatch grass	0	0	1	0	0	1	2,500
Broom Grass	0	0	1	0	0	1	300
Cardamom seedling	0	0	1	1	0	2	No data
Fodder	0	0	1	0	0	1	No data
Garlic	0	0	1	0	0	1	No data
Total	3	6	17	19	6	51	2,690,040

The forest is being used in a range of ways but largely for subsistence production, and only by a small groups for commercial activities. Perhaps such a lack of acknowledgement of commercial timber values may be linked to a history of bad experiences with clear-felling or poor management of the forests either in relation to the marketplace or governance. That said, and almost in contrast, many respondents stated that they were interested in investing more into their community and/or private forests and learning about new forest products, especially in timber and medicines (Table 26). That suggests a latent demand for communities to learn about and exploit opportunities, but also suggests that socio-cultural, governance or technical barriers may exist for commercialising timber production that are constraining the translation of their ambitions into outcomes. Further coding and analysis of qualitative data will help to partially answer these questions.

Timber, standing trees, Lapsi fruits and cardamom are the top four forest products that have been traded by respondents in the last five years, comprising just over an estimated NRs 2.7 million gross sales (Table 26). The survey did not ask the sources of the timber or standing trees sold, however anecdotal evidence suggests that timber sold by private individuals are largely from private agroforests. Timber and tree sales are common in all municipalities, but respondents from Bhumlu community suggest a broader range of respondents with tree and timber selling experience. All of the respondents' households participating in the sale of forest products have members who are educated to the level of literacy and/or schooling or above (Table 27).

Table 27. Sale of forest products by a household by the highest level of education within that household

		Illiterate	Literate without schooling	Schooling	Further education	Total
Yes	N	0	4	29	31	64
	%	0	7	9	18	11
No	N	23	51	289	142	505
	%	100	93	91	82	89

Respondents were asked to identify potential forest products that might be successfully exploited in the future, and timber and medicinal and aromatic plants (MAP) were favoured by a sizeable proportion of respondents, which could possibly be driven by previous selling experience (Table 28). That finding would seem follow a broader trend in terms of prospects of forest-related enterprises, which suggests that forest users and landholders with current commercial interests are more likely to wish to intensify their current timber and MAP marketing and value adding activities, rather than developing new products. However, it does also suggest that many households not currently involved in commercial activities would be interested in developing commercial activities in the future.

Table 28. New commercial forest products that could be successful exploited as identified by respondents (Multiple responses allowed, N=217)

New products	Frequency	Percent (%)
Timber	158	56.6
Medicinal & aromatic plants	89	31.9
Non-timber products	14	5.0
Fruit	9	3.2
Fodder	4	1.4
Flowers	3	1.1
Vegetable	1	0.4
Water	1	0.4
Total	279	100.0

The interest in potential new commercial activities in association with the forest suggests that there is a latent demand for more opportunities to exploit the forest for commercial outcomes. It also suggests that there are conceptual and real barriers to achieving commercial goals, which may necessitate the careful tailoring of programs that respond to the different goals of individuals and CFUGs. While about a third of all respondents believed there are new forest products that could be successfully marketed, respondents from Bhumlu municipality indicated the highest level of interest and Chautara respondents showed the lowest (Table 29). The contrasting attitudes towards new forest products exploitation of Bhumlu and Chautara, despite both being pioneer sites for the Australian Forestry Programs is hard to explain based on the survey data because Chautara appears to have better market access and infrastructure than Bhumlu. Education level within the household does not appear to have a strong influence over the perception of opportunities for exploiting new forest products (Table 30).

Table 29. Frequency of respondents who believe there are new forest products that could be exploited by municipality

Municipality	Count	Percentage	Total
Banepa	49	39	125
Betanchowk	46	39	119
Bhumlu	53	46	115
Chautara	27	23	120
Lisankhupakhar	35	31	114
Total	210	35	593

Table 30. Frequency of respondents who believe there are new forest products that could be exploited by highest education level within the household

		Illiterate		Literate without schooling		Schooling		Further education	
		Count	%	Count	%	Count	%	Count	%
Identified forest product to exploit	Yes	7	28	21	36	108	33	73	41
	No	6	24	15	25	88	27	57	32
	Unsure	12	48	22	40	134	41	49	27

6. Governance of the forests

Although most respondents do not seem to perceive of the forest as a direct source of income, almost all respondents are involved in CFUG activities, and about one quarter of respondents (164/600) also use private forests, with limited leasehold forestry (10/600). People who identify themselves as relying on the forest for their livelihoods are unsurprisingly valuing the forest for timber for private use, firewood, mulch and fodder/grasses significantly more than those who are not exploiting the forest for their livelihoods. Importantly, those household heads that identified the forests as important contributors to their livelihoods do not consider timber for sale was not significant. Previous work by Nuberg et al. (2019, 114) similarly notes that “the motivation to engage with the agroforestry interventions was influenced by the extent that a household already had some off-farm income. Among all off-farm sources, income from overseas remittances was most important.” As the roles of the forest evolve in the mid-hills, the governance arrangements that guide the planning of forest management were also reviewed.

People in general are unfamiliar with the community forest plan. The relatively low awareness of the operational plan for the CFUGS run across all major demographic variables of location, age and caste (Table 31). Education appears to be an important correlating factor with awareness of the operational plan. The only sub-group across respondents with a disproportionately high awareness of the plan for their community forest were highly educated individuals. The process and the output of the plan itself appears to marginalise those groups with little to no formal education or literacy, which could be limiting the role of forests in providing a means of lifting those households out of poverty or supplementing incomes during times of need.

Table 31. Respondents knowledge of the operational planning for their Community forest

		Do respondents know about the operational plan for your community forest?			
		Yes		No	
		Count	Row N %	Count	Row N %
Municipality	Banepa	38	30.4	87	69.6
	Betanchowk	35	29.4	84	70.6
	Bhumlu	31	26.7	85	73.3
	Chautara	27	22.7	92	77.3
	Lisankhupakhar	31	26.1	88	73.9
Age	18-40	57	26.5	158	73.5
	41-60	72	29.0	176	71.0
	over 60	33	24.8	100	75.2
Caste	Brahmin/Chhetri	78	31.0	174	69.0
	Janajati	69	24.7	210	75.3
	Dalit	13	21.3	48	78.7
Highest education level of respondent	Illiterate	22	11.6	168	88.4
	Literate without schooling	73	31.6	158	68.4
	Schooling	50	33.8	98	66.2
	Further education	17	58.6	12	41.4

Education levels do seem to be an important factor as to whether respondents felt that they were influential over decisions and actions within the CFUG. People with further education were more likely to be influential in planning meetings and active in forest patrols and management (Table 32).

Table 32. Median perceived level of influence over CFUG decisions and activities according to level of education of respondent

CFUG activity	Education of respondent				
	Illiterate	Literate without schooling	Schooling	Further education	Total
General assemblies	2.56	3.04	3.19	2.56	2.92
Executive committee meetings	1.90	3.15	3.38	3.00	2.92
CFUG planning meetings	1.74	2.73	2.88	3.40	2.55
Tole meetings	2.95	3.22	3.40	2.80	3.17
Operation plan revision processes	2.00	2.48	3.19	3.00	2.55
Decisions on forest product harvesting	2.74	3.18	3.16	3.00	3.07
Forest patrols/ management	2.25	2.28	3.19	3.33	2.54
Enforcing fines/ penalties	1.30	1.92	2.75	2.50	1.89
Arbitrating disputes	1.50	1.85	2.71	2.50	1.98

Attendance at the CFUG general assembly or not was a significant indicator of whether a household is more likely to undertake a particular activity eg. pruning and clearing of unwanted trees, harvesting timber. That result is interesting and potentially important, because it does raise the question whether local forest planning is being translated into actions. The face-to-face presentation and associated deliberation on opportunities for forest management appears to be more influential over household behaviours in the forest, whereas the written plan appears to lack relevance for many people, except for during the planting phase. To speculate, it might be because people are illiterate, aging or broadly lacking interest in the forests, so are not really willing to engage in the formal planning/scientific forestry process. It may also be because more high-end skills and knowledge are increasingly required to manage the forest. As more highly training individuals with particular skills are required to manage the commercial aspects of forest management and harvesting, and the general community level are unable to undertake such sophisticated forestry planning or management activities, the less educated may be showing less interest.

7. Discussion

The protocol is developing results to better understand the local socio-ecological complexity of forestry in the mid-hills of Nepal. By asking CFUG members directly about their perceptions and involvement with the forest, a number of historical assumptions could either be supported or challenged, and specific goals could better target appropriate interventions. The understanding of socio-ecological characteristics and trends is important, because there is likely to be less of an uptake of forestry activities if people are disinclined to consider the forest a productive economic asset or if those activities might threaten other use or non-use values (Nightingale 2003). A lot of forestry activity and policy is organised as though most Nepalese households are still largely dependent on forestry and agriculture for their livelihoods and food security, but the survey data suggests that the situation is actually far more complex.

Nepal is passing through a rapid and complex agrarian transition, where more people across rural areas are moving away from a direct dependence on subsistence agriculture. As Nepalese society transitions, it is changing from a country with a simple agricultural based economy to a place where many people in rural areas now increasingly work as labourers or are becoming dependent on secondary and tertiary industries for their livelihoods (Rigg 2006; Fox 2018; Pain et al. 2021). Byres (1977, 259) notes for western nations that “The development of capitalist agriculture and its eventual yielding of hegemony to the urban bourgeoisie was a long-drawn-out process, sometimes stretching over centuries, which has taken a variety of historical forms”. Yet, the form this transition in rural society has been taking in Asian nations such as Nepal has often been extremely rapid and has not seen a simple stratified development of capitalist agriculture (Pain et al. 2021). In the case of Nepal, the transition has been partly facilitated by international labour migration. Again quoting Byres (1977, 260), such development has a tendency to “hasten the process of differentiation among the peasantry”, with a group who remains dependent on subsistence agriculture, and a group that is more focused on commercial agriculture or off-farm economic activities. Such a differentiation of household types has been recorded here in relation to the varied dependency of households on agricultural and forestry for their livelihoods and income.

Some of the results are surprising: some suggest that future commercial forestry will be difficult to develop in the region; while others suggest particular opportunities associated with support for different groups and communities. The overwhelming and important initial result is that respondents across all castes do not value the sale of timber highly, prioritising non-use, aesthetic values or non-destructive use values such as timber for private use, fuel, mulch and fodder to support livelihoods (Figure 6). There still is important direct use of the forest. For example, almost all respondents (584/599) have some dependence on firewood for their cooking activities, suggesting that the forest remains a vital basic resource. However, there does not appear to be much confidence in the commercial exploitation of the forests for timber, with only just over 11 percent of respondents having sold timber at a particular time. Perhaps the lack of acknowledgement of commercial timber values may be linked to a lack of opportunities or a history of bad experiences with such activities either in the marketplace or from a governance perspective. That said, and almost in contrast, numerous respondents stated that they were interested in investing more into their community and/or private forests and learning about new forest products, especially in timber and medicines. So, the results suggest a latent demand for more commercial forestry opportunities to be provided to communities, but also ongoing cultural barriers to exploiting timber production, which may make the goal of translating the aims of further forestry investment and interest into on-ground outcomes difficult without careful tailoring of programs.

The value of the forest for communities appears to be declining as households commonly stated that they are investing less time into the management of the community forest than they did five years ago (Figure 11). Although 5 years ago many of the forests may have required more direct management interventions before they matured, it is striking how all major activities in the forest declined from 5 years ago to the present. The finding is evident across many of the major areas of forest management including planting, thinning and harvesting. The result may be partly explained by the differentiation in Nepalese rural society, with only 29% of the 600 respondent households stating that they depend on agriculture and forestry activities for more than 50% of their household income. As the rural mid-hills transition away from a predominantly subsistence economy, people appear to be focusing on alternative income sources and commercial opportunities from the forest are not as important as other values - such as the retention of greenery/beauty (Tables 4 and 5). That trend across the sites may suggest that Nepali forestry policy and EnLiFT activities that are trying to generate broad community enthusiasm in more commercial forestry activities may be working against a broad socio-demographic drift in declining engagement with community forestry across the Nepali mid-hills.

As the results here suggest that there are also important structural changes across Nepalese society which appear to be making the forests a less important livelihood asset within the surveyed communities (Bhawana et al. 2017; Fox 2018). As a result, the management of community forests may need to focus both on reflecting the subsistence agroforestry values on one hand, and the incipient alternative commercial values of less-advantaged groups on the other (Section 5.2.1). That result is important, because a lot of the limitations of community forestry are said to relate to governance arrangements (Shrestha and McManus 2008; Thoms 2008; Gurung et al. 2011; Yadav et al. 2017; Sapkota et al. 2020), but socio-demographic structural change may also be an important factor. Forestry in most developed societies is managed and implemented by forestry specialists who must negotiate the complex processes relevant to governing and enacting forestry. While in the mid-hills of Nepal people are still undertaking low-skilled or traditional activities such as grazing or collecting food from the forest, most are not

involved in the more complex technical activities such as thinning or harvesting. Perhaps more high-end forestry skill and knowledge development is required within each CFUG to manage forests in a sophisticated manner to meet the needs of end users, while also generating financial gains for their members.

Knowledge economies appear important for providing people with the means of exploiting the forest for commercial benefits. People who living in households with formal education are making more use of the forest to directly access fungi, fruits and herbs and using timber for commercial sale (Table 19). The findings here also suggest that the most important determinant factor for involvement in the development and understanding of forest planning within CFUGs relates to levels of education (Tables 31 and 32). That result is interesting, because it suggests that governance arrangements may not be inclusive of more marginalised community members by educational attainment. That result is supported by the fact that of the reasons identified for having pride in their CFUG, respondents ranked “leadership of the CFUG committee” lowest (Table 5). The role of education is also something that policy could respond to by advocating for and investing in more education opportunities for remote and less-advantaged community members. Perhaps also the result raises important political questions regarding forest development, as scientific, commercial forestry could be being resisted in the mid-hills because it would act to marginalise an established power arrangement whereby a particular educated cohort within the community is managing the forest and others are dependent on them for those roles, thereby legitimising their influence. That educated, active group is less dependent on forestry and agriculture, so there is may be little financial incentive for them to push the CFUG to become more active and generate further income from the forest.

8. Conclusion

The socio-ecological protocol incorporates elements of social and environmental impact and vulnerability assessments, to generate a mechanism for asking unique questions that are relevant in the development or implementation of a project, and has the potential to guide surrounding policy and activities that could support future actions. Without such information, it is easy to imagine how a lot of work and investment could miss the target of responding to particular local needs or opportunities, and even generate new problems by undermining or neglecting key issues if actions are trying to work against broader socio-economic, demographic, political or environmental trends. The protocol helps the researcher to understand where opportunities lie to target the most effective interventions for EnLift, and similar approaches may be useful for other ACIAR projects or development projects in general.

As Nepalese society evolves with changing economic and socio-ecological opportunities and risks, the roles of forests are changing as well. Research that examines people’s perceptions can help to identify important changes in how people think about, work with and exploit the forest. The work here suggests that there are opportunities to develop unique forestry pathways that better meet the goals of CFUG members. Many people now are not looking to agroforestry as a means of expanding their financial capital and for that reason relationships with the local forest and the CFUGs are changing – people are less involved in the management; many are not interested in the planning processes and are increasingly dependent upon non-agricultural or forestry activities for their incomes. That means that if forestry policy is developed with the argument that people are largely dependent on agriculture and forestry

seems, the approaches being applied to support people may become less effective at alleviating poverty or generating new development opportunities. If forests could be managed as complex agroforestry systems, multiple vested interests in forest management would continue to provide local needs, addressing equity and access issues. There are, for example, opportunities for commercial timber production by the few interested individuals in CFUGs to be directly supported with technical training and other assistance to exploit the best value of timber resources. Even though all households within a CFUG may not be directly involved in more sophisticated commercial forestry activities, systems could be put in place to direct their profits back to the wider communities as the use of the forest became more intensive.

This argument begs a further question: how can the forest be managed to meet the needs of the 25% of respondents who are directly dependent on agriculture and forestry for their livelihoods, a result that runs across caste and location? Education is clearly an important mechanism to support more sophisticated perceptions and use of the forest, and to guide the transition from subsistence to commercial production in the forest. If a forestry project wishes to engage with communities to generate more commercial activities, they may need to recognise the importance of education in enabling people to develop businesses and undertake actions linked to timber use, support broader education goals as well as developing specific training opportunities. However, a focus on support for those groups might work to entrench established power arrangements, whereby a particular group within the community is managing the forest and others are dependent on them for those roles, thereby legitimising their influence. In the cohort from this research, that active group appears to be the respondents less dependent on forestry and agriculture, so there may be little direct livelihood or financial incentive for them to guide the CFUG to become more active and generate further income from the forest. An alternative might be to acknowledge that the socio-ecological context in the Nepalese mid-hills has changed importantly since the trees were planted, and the need for more highly technical and strategic skills are required to develop and implement appropriate sustainable harvesting regimes. CFUGs may increasingly require the engagement of professional foresters and if formal training and education opportunities are available, those foresters would ideally come from the CFUG groups themselves.

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Appendix 1

Enhancing livelihoods from improved forest management in Nepal

Socio-ecological Questionnaire

Symbols/ Project info

Introduction: Namaste! We are undertaking research on the use of forests in the middle hills of Nepal. The research is part of a bigger project funded by the Australian government on how forests could be used to enhance livelihoods and food security. We are asking you to provide answers to how your household uses the forest, its values and its management. If you agree, the survey should take about 90 minutes and your answers will be kept confidential. The results will be analysed to see how technical and policy support could be better targeted to assist individuals and communities to develop successful forest enterprises. Thank you for your support.

Don't worry if you cannot answer any question, you can just leave that question and move onto the next one. We don't mind what answers you provide, we just want your honest answers, even if it means no answer.

A. Survey Information

Questionnaire no.		Respondent code					
Surveyed by		Date of survey	___-__ - 20.....	Start time:		End time:	
District		Rural / Municipality		Ward no.			
Sub-division/Forest Office		What is the CFUG?					
Data entry Operator		Data Entry Completed		Data entry Supervisor		Corrections Completed	

A1. Gender: 1. Male 2. Female 3. Other

A2. What is your age? 1. 18-25 2. 26-40 3. 41-60 4. over 60

A3. What is your Caste or Ethnicity? 1= Brahmin / Chhetri 2 = Janajati 3 = Dalit, 4 = Others (Specify)

A4. What is your highest education level? 1. Illiterate 2. Literate without schooling 3. Schooling 4. Further education

A5. Have you been directly involved in EnLift activities to this point? 1. Yes 2. No

B. Land and forest details

B1. What kind of closed forest management regimes are your household engaged in?

- | | | |
|------------------------------------|--|--------------------|
| a. Community Forestry (CF) | 1. Yes <input type="checkbox"/> 2. No <input type="checkbox"/> | Approx. Area |
| b. Forest on Private Land (PF) | 1. Yes <input type="checkbox"/> 2. No <input type="checkbox"/> | Approx. Area |
| c. Leasehold Forest - collectively | 1. Yes <input type="checkbox"/> 2. No <input type="checkbox"/> | Approx. Area |
| d. Leasehold Forest - individually | 1. Yes <input type="checkbox"/> 2. No <input type="checkbox"/> | Approx. Area |
| e. Other Forest | 1. Yes <input type="checkbox"/> 2. No <input type="checkbox"/> | Approx. Area |

For Enumerator to say: We will focus our questions on Community forest and Private forest for the remainder of the questionnaire. Please consider any Leasehold forest as part of your managed Community or Private Forest depending on whether they are managed collectively or individually.

B2. What are the four most important types of forest that you manage or use? (eg. Sal, Pine, Schima-castanopsis, Alnus, Quercus, others including mixtures)

- | | | |
|------------------------|----------------------|------------------------------|
| a. Forest type 1 | Regime (CF/PF) | Approx. Area (Hectare) |
| b. Forest type 2 | Regime (CF/PF) | Approx. Area (Hectare) |
| c. Forest type 3 | Regime (CF/PF) | Approx. Area (Hectare) |
| d. Forest type 4 | Regime (CF/PF) | Approx. Area (Hectare) |

B3. What direct benefit of forest products have been most important to your household over the last 5 years?

Use the scale:

1. Not at all	2. Some use	3. Important	4. Very important	5. Extremely important
---------------	-------------	--------------	-------------------	------------------------

Code	Forest Use	Importance of use (1 to 5)	Primary source of forest product (in %)	
			CF	PF
a.	Timber for private use			
b.	Timber for sale			
c.	Fuel/firewood			
d.	Food nuts, fruits/herbs, mushroom			
e.	Medicines and Oils			
f.	Mulch / leaf litter			
g.	Fodder / grass for animals			
h.	Grazing animals			
i.	Other:			

B4. Has your household sold any forest products (timber or non-timber) during the last 5 years?

1. Yes 2. No 3. Unsure

If no or unsure, skip to B7. If yes, continue to B5

B5. Please list the top 5 forest products sold, along with the total volumes/units, price and income generated over the last 5 years?

Cod e	Forest Product (Timber or Non-Timber)	Quantity	Units (no. of trees, kg, Cft)	Sales price per unit (rupee)	Total income (rupee)
a.					
b.					
c.					
d.					
e.					

B6. For the products listed above, please provide details on who the immediate buyer was (if known), and what final product it went into (if known)?

Cod e	Forest Product (Timber or non-timber)	Buyer Name (if known) (Business or Person)	How often do you deal with this buyer?	Final Product (if known) (ie. Construction, furniture, plywood, firewood, bricks, essential oil, food etc)
a.				
b.				
c.				
d.				
e.				

B7. Do you believe that there are new forest products that you could successfully exploit? 1. Yes 2. No 3. Unsure

If no or unsure, skip to B9. If yes, continue to B8.

B8. What new products do you think you could exploit and why?

Product	Reason why it is a good opportunity
a. _____	_____
b. _____	_____
c. _____	_____

B9. What are the 3 biggest constraints preventing you from maximizing the commercial benefits from your forest products?

Constraint	Explain why it is an issue
a. _____	_____
b. _____	_____
c. _____	_____

For Enumerator to say: In the next two questions we will identify the most important indirect benefits or major problems your household faces with the forest (use separate tables with respondent).

B10. In your experience, which indirect values generated from the forest are most important to your household?

Use the scale:

1. Not at all	2. Some use	3. Important	4. Very important	5. Extremely important
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B11. In your experience, what problems are generated from the forest and its management?

Use the scale:

1. No problems	2. Some problems	3. Important problems	4. Very important problems	5. Extremely important problems
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B10. Indirect Forest Values

CD	Forest Use	Importance of the CF (1 - 5)	Importance of the PF (1 - 5)
a.	Water quantity		
b.	Water quality		
c.	Control landslides / erosion		
d.	Managing storms / floods		
e.	Responding to earthquake		
f.	Managing drier periods		
g.	Supporting food security		
h.	Providing shade/shelter		
i.	Improved biodiversity & habitat		
j.	Conserve carbon dioxide		
k.	Religious/spiritual values		
l.	Tourism and recreation		
m.	Other:		

B11. Forest Problems

CD	Problem	Problems from the CF (1-5)	Problems from the PF (1-5)
1.	Water quantity		
2.	Water quality		
3.	Increase in landslides / erosion		
4.	Increase in flashfloods		
5.	Less food plants and fungi		
6.	Risk of fire		
7.	More weeds / invasive species		
8.	Wild animal predation		
9.	Crop damage by wild animals		
10.	Decrease in personal safety		
11.	Shading of crops		
12.	Time taken to manage		
13.	Other		

B12. How actively is your household involved in different forest-related activities in your Community and Private forest, both currently and 5 years ago?

Use the scale:

1. No involvement	2. Some involvement	3. Important involvement	4. Very important involvement	5. Extremely important involvement
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Code	Forest-related activity	Currently (CF)		Five years ago (CF)		Currently (PF)		Five years ago (CF)	
		1-5	Who undertakes the activity now? M/F/C	1-5	Who undertook the activity? M/F/C	1-5	Who undertakes the activity now? M/F/C	1-5	Who undertook the activity? M/F/C
a.	Change in landuse from agriculture to forestry								
b.	Planting of new species								
c.	Fencing								
d.	Pruning								
e.	Clearing unwanted trees								
f.	Weed control								
g.	Insect pest control								
h.	Gully control								
i.	Fertilising / mulching								
j.	Grazing control								
k.	Harvesting timber								
l.	Harvesting of fodder, grass, mulch or leaf-litter								
m.	Harvesting firewood								
n.	Harvesting food and medicines								
o.	Other:								

B13. Have you experienced a wildfire in your local forest? 1. Yes 2. No

If yes, have you changed the way you manage the forest in response?

B14. Do you know what has happened to the cost of managing an area of private forest over the last five years? 1. Yes 2. No 3. Unsure

If no or unsure, skip to B15. If yes, continue to B14.

B15. How has it changed? 1. Decreased a lot 2. Decreased 3. Remained unchanged 4. Increased 5. Increased a lot

B16. In your opinion, has the condition of the forest has changed in the last 10 years? 1. Yes 2. No 3. Unsure

If no or unsure, skip to B18. If yes, continue to B17

B17. What are the three main changes to the forest that you have observed and why do you think that change in condition has occurred?

Change	CF or PF or both	Reason for the change
a.		
b.		
c.		

B18. If you were going to invest more time or resources into forestry, which type would you invest in? 1. Community forest 2. Private forest 3. Both equally

C. Agricultural and food security issues

C1. What are the main types of agricultural and grazing land that you own or manage?

Type	Area (Rupani)	What is the main ownership type (<i>Identify as:</i> 1. Privately 2. With extended family 3. Tenant 4. Other)
a. Homestead		
b. Khet (lowland field)		
c. Bari (upland field)		
d. Kharbari (grassland)		
e. Other.....		

C2. What are the major crops or livestock that you currently have on your agricultural and grazing land?

Code	Crop or livestock type	Percent for household consumption (%)	Percent for sale (%)	Percent for sharing with others (%)
a.				
b.				
c.				

C3. How many trees do you have on your agricultural and grazing land? trees

C4. Is the food production from your land sufficient for your household for the entire year? 1. Yes 2. No

If yes, skip to C7. If no, continue to C5

C5. How many months is your food production sufficient for? ____ months

C6. If you do not produce enough food from your farm, how do you access further food? (please tick more than one answer if applicable)

1. Family income 2. Social Welfare 3. Food-for-work 4. Community support

5. Forest food 6. Debt 7. It remains difficult to access sufficient food

C7. Is any area of your farmland left uncultivated? 1. Yes 2. No

If no, skip to C12. If yes, continue to C8

C8. What is the total area of land that is not cultivated: Approx. area (Rupani)

C9. What are the reasons behind not cultivating any crops on that land?

a.....

b.....

c.....

C10. Would you be interested in cultivating forest in those areas currently left uncultivated? 1. Yes 2. No 3. Unsure

C11. What type of trees would you be interested in planting? 1. Timber 2. Fodder 3. Fruit 4. Other.....

C12. Where do you source most of your forest seedlings?

.....

D. Demographic and Social Economic Data

D1. Please provide the number, gender and primary occupational status of your household members: ___ adults, ___ children (of below 18 years)

D2. Please identify major employment activities for the adults (including multiple roles):

C D	Gender M / F	Age	Forestry	Agriculture	Self-employed trader or other business	Public Service / Pension	Wage Laborer	Foreign employment / remittances	Housework/ Caring	Elderly / Unemployed / Student	Other
a.											
b.											
c.											
d.											
e.											
f.											
g.											

D3. What is the highest level of education completed by other members of your family?

Code	Highest educational Status by Gender	Illiterate	Literate without schooling	Schooling	Further education
a.	Female				
b.	Male				

D4. What percentage of your household income is sourced from forestry and agriculture?

1. 0-25% 2. 26-50% 3. 51-75% 4. 76-100%

D5. How important to your household livelihood is/are:

	Unimportant		Important		Extremely Important	
a. Community forests	1	2	3	4	5	
b. Private forests	1	2	3	4	5	
c. Grain crop production	1	2	3	4	5	
d. Fruit crop production	1	2	3	4	5	
e. Livestock production	1	2	3	4	5	
f. Trader or business	1	2	3	4	5	
g. Salaried/pension	1	2	3	4	5	
h. Local wage labour	1	2	3	4	5	
i. Remittance income	1	2	3	4	5	
j. Other_____	1	2	3	4	5	

D6. Has anyone within or your household received government welfare assistance in the last 12 months? 1. Yes 2. No

D7. Does your household own: 1. Mobile phone 2. Computer/laptop/tv 3. A motorbike 4. A tractor/truck/bus 5. A car

D8. What type of fuel does your household use for cooking: 1. Wood/Charcoal 2. Gas 3. Electricity 4. Biogas

D9. What has happened to your household financial status in the last 12 months? 1. Declined 2. Remained unchanged 3. Improved

D10. Do you believe that the quality of life is improving in your village? 1. Yes 2. No

D11. Do you think your children will live in this village in the future? ? 1. Yes 2. No 3. Unsure

D12. How long have you lived in the village? (please tick more than one answer if applicable)

1. Previous generations moved here 2. You moved here for marriage 3. You moved here for other reasons 4. Worked elsewhere & returned

E. Climate Change Questions

E1. Have the weather patterns changed in your region from 10 years ago? 1. Yes 2. No 3. Unsure

If no or unsure, skip to E3. If yes, continue to E2

E2. How important are climate change impacts on:

	Unimportant		Important		Extremely Important
a. Your forests?	1	2	3	4	5
b. Your agriculture?	1	2	3	4	5
c. Your water resources?	1	2	3	4	5

E3. How would you rate the importance of climatic impacts in your area over the last 10 years?

CD	Changes	Scale: 1= Unimportant, 3= Important, 5= Extremely Important				
a.	Heat	1	2	3	4	5
b.	Changing rainfall patterns	1	2	3	4	5
c.	Storm damage	1	2	3	4	5
d.	Danger of forest fires	1	2	3	4	5
e.	Flood damage	1	2	3	4	5
f.	Landslide / erosion damage	1	2	3	4	5
g.	Drought impacts	1	2	3	4	5
h.	Changing flowering / fruiting / harvesting seasons	1	2	3	4	5
i.	New exotic plants	1	2	3	4	5
j.	New diseases	1	2	3	4	5
k.	New insect pests	1	2	3	4	5
l.	Other:	1	2	3	4	5

E4. In general, how effectively are you adapting to the climatic impacts to your farm and forests?

Not at all	Some adaptation			Adapting effectively
1	2	3	4	5

E5. Are you using/managing the forest differently in response to climate risk? 1. Yes 2. No

In what ways?

F. Forest governance

F1. What is the most important reason for you to feel proud about your community forest?

	Unimportant		Important		Extremely
	Important				
a. Conservation of plants and animals	1	2	3	4	5
b. Retaining greenery/beauty	1	2	3	4	5
c. Supply of timber & other forest products	1	2	3	4	5
d. Participation of Dalits and the poor	1	2	3	4	5
e. Participation of women	1	2	3	4	5
f. Benefits for the community	1	2	3	4	5
g. Leadership of the CFUG committee	1	2	3	4	5
h. Other	1	2	3	4	5

F2. In what CFUG activities did you make decisions for or participate in last year and how influential was your input?

CD	CFUG Activities	Yes/No	How much do you feel that your input influenced decisions or actions? Use scale eg. 1=unimportant, 3=important, 5=extremely important
a.	General assemblies		
b.	Executive Committee (EC) meetings		
c.	CFUG planning meetings		
d.	Tolerance meetings		
e.	Operational Plan revision processes		
f.	Making decisions about forest product harvesting & distribution		
g.	Forest patrols / management		
h.	Enforcing fines and penalties		
i.	Arbitrating disputes		
		

F3. Do you know about the operational plan for your community forest? 1. Yes 2. No

If no, skip to F6. If yes, continue to F4.

F4. Are you happy with how operational plans are developed for your community forest? 1. Yes 2. No 3. Unsure

F5. In what areas will your CFUG require assistance to develop your operational plan?

	Unimportant		Important		Extremely
	Important				
a. Financial support	1	2	3	4	5
b. Technical assistance	1	2	3	4	5
c. Knowledge and information about planning	1	2	3	4	5
d. Training in forest management	1	2	3	4	5
e. Development of leadership capacities	1	2	3	4	5
f. Market connections	1	2	3	4	5
g. Other	1	2	3	4	5

F6. On a scale from 1 (not inclusive) to 5 (extremely inclusive), how inclusive are CFUG committees (EC and sub-committees)? _____

F7. What are the most important changes that you would wish for in the governance of the CFUG?

	Unimportant		Important		Extremely
	Important				
a. Greater focus on conservation	1	2	3	4	5
b. More active use of forest resources/timber for community income	1	2	3	4	5
c. Targeted forest access by women	1	2	3	4	5
d. Targeted forest access by Dalits and the poor	1	2	3	4	5
e. More representation of women and Dalits in leadership roles	1	2	3	4	5
f. More influence of women and Dalits in decision-making	1	2	3	4	5
g. More support to harvest forest products for community benefit	1	2	3	4	5
h. De-politicization of the decision-making process	1	2	3	4	5
i. Closer working relationships with the local government	1	2	3	4	5
j. Other	1	2	3	4	5

F8. Are you involved in any institutions apart from the CFUG in your village or elsewhere? 1. Yes 2. No 3. Unsure

If yes, please list the main ones: 1..... 2..... 3.....

We have come to the end of our Questionnaire Survey today with you! Thank you for your time, opinion and input. The information will be very useful for our research and will shape important policies and actions in the future in the area of livelihood and food security from agro-forestry and community forestry. Before we take permission to leave, is there anything that you would like to say regarding the discussions that we have had? Is there anything that we have missed or that you would like to add? If so please feel free to do so.

We are hoping to do some follow-up interviews in later stages of our project. Would you like to be contacted again: Yes No
Unsure

If yes, what is your name? Mobile #

Thank You!