Workshop Report

Kailash Sacred Landscape Conservation and Development Initiative (KSLCDI)

ICIMOD

FOR MOUNTAINS AND PEOPLE

Building Climate Resilient Value Chains in the Kailash Sacred Landscape, Nepal

26–27 May 2016, Api Nampa Conservation Area, Khar Sector Office, Darchula, Nepal

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Corresponding Author: Janita Gurung, janita.gurung@icimod.org

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Building Climate Resilient Value Chains in the Kailash Sacred Landscape, Nepal

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Report Preparation
Neha Bisht, Janita Gurung, Kamala Gurung, Srijana Joshi, Uma Partap, Lipy Adhikari, Chandra Kanta Subedi and Bijay Raj Subedee

Production Team
Rachana Chettri (Consultant editor)
Christopher Butler (Editor)
Dharma R Maharjan (Layout and design)
Asha Kaji Thaku (Editorial assistant)

Photos: Chandra Kanta Subedi, Neha Bisht

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Contents

Acronyms and Abbreviations

ANCA	Api Nampa Conservation Area
CF	Community Forest
CFUG	Community Forest User Group
CHEA	Central Himalayan Environment Association
GIZ	German Development Cooperation
IAPS	Invasive Alien Plant Species
ICIMOD	International Centre for Integrated Mountain Development
KSLCDI	Kailash Sacred Landscape Conservation and Development Initiative
RECAST	Research Centre for Applied Science and Technology
VC	Value Chain
VDC	Village Development Committee

Background

The Kailash Sacred Landscape Conservation and Development Initiative (KSLCDI) is implemented in remote parts of the Tibet Autonomous Region of China and continuous areas of Nepal and India. The landscape is environmentally fragile and its people are highly vulnerable to climate change and environmental degradation. KSLCDI aims to improve livelihoods by conducting activities in farm and non-farm sectors, while simultaneously promoting ecosystem management and the efficient use of natural resources, including water and energy.

One of the livelihood strategies with which KSLCDI aims to increase incomes of local communities through their participation is the development of value chains. In Nepal, KSLCDI has identified three potential value chains in selected pilot sites: allo (Himalayan nettle), nigalo (Himalayan bamboo), and rittha (soap nut). Currently, the Initiative's priority is on upgrading and promoting these value chains through product development and by improving market linkages.

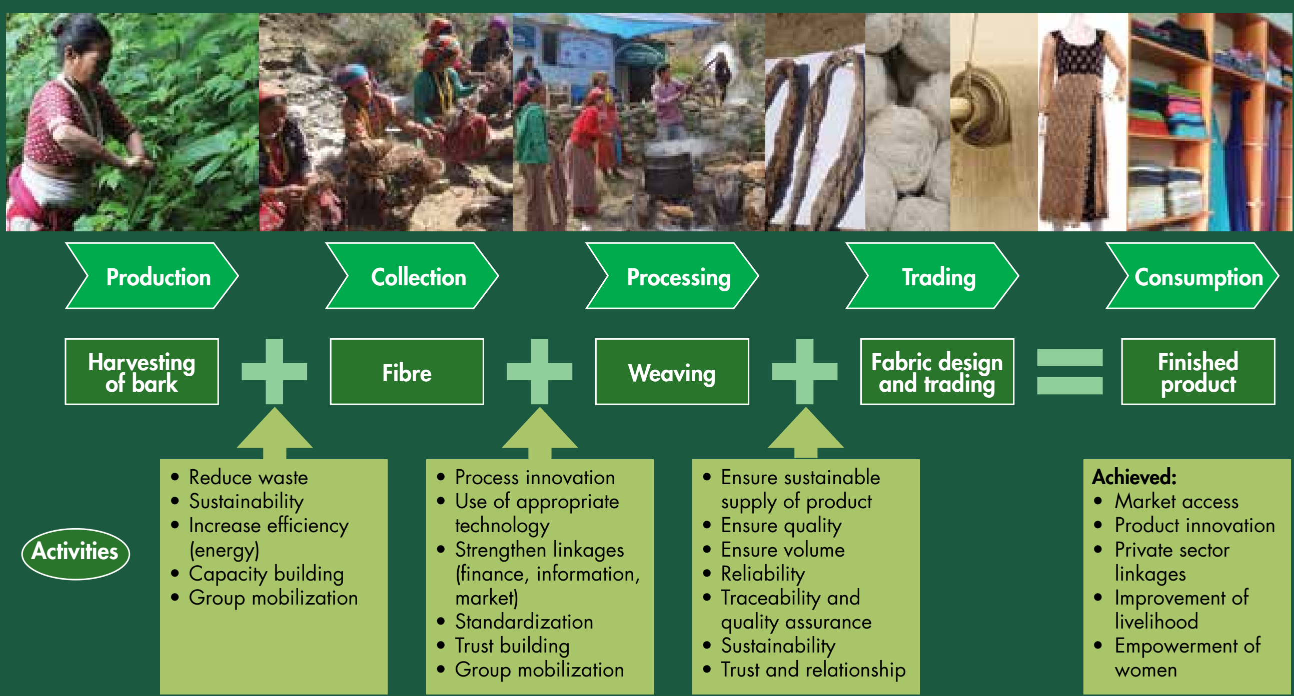
Allo value chain

In KSL-Nepal, the allo value chain has been implemented since 2014 in order to improve livelihoods and the institutional capacities of women and men (Figure 1), particularly in the pilot site of Khar VDC, Darchula District. Fibre is produced from the bark of allo (Himalayan nettle, *Girardinia diversifolia*) and processed to produce a variety of products. Various interventions have been conducted to upgrade the allo value chain, including building linkages with the private sector, adding value to allo products, and combining traditional and new technologies, among others.

Some activities contributing to 'greening' the allo value chain have also been conducted. In this regard, environment-friendly harvesting has been promoted, the use of improved stoves – 'rocket' stoves – has decreased fuelwood consumption, and the substitution of caustic soda with ash for bleaching has contributed towards improved water quality and health in the community.

Figure 1: **The allo value chain being implemented in KSL-Nepal**

Steps in the Allo Value Chain



Nigalo value chain

Nigalo (*Drepanostachyum falcatum*), commonly known as Himalayan bamboo, has the potential to improve the livelihoods of the landless and poor. Nigalo craft making and trade is the main source of cash income for many farmers in KSL-Nepal, including in Ranishikhar VDC in Darchula District, the pilot site for the nigalo value chain intervention. The interventions and upgrading strategies are to facilitate access to nigalo resources, promote the development of local institutions, capacity building, product value addition and development, increase access to credit and finance, and to promote linkages with other private players.

Rittha value chain

Rittha (*Sapindus mukorossi*), commonly known as soap nut, is a major component in the large-scale manufacture of soap, shampoos, and detergents. The tree can be found growing widely on farms in the hilly far-western districts of Nepal. Rittha value chain piloting is being done in Gokuleshwor VDC of Baitadi as part of KSLCDI. Interventions in the value chain are targeted towards strengthening existing community forest user groups (CFUGs) and cooperatives, supporting cooperative storage facilities, introducing a grading and quality certification system, and supporting product diversification, packaging and branding.

Climate is an important aspect of value chains, especially because it affects agricultural growth, determines the resource base, and impacts development projects, in general. Climate proofing of value chains is necessary in order to respond to climate vulnerabilities and identify adaptation and mitigation potentials for the identified value chain (GIZ 2011[1]). Climate proofing is also one step in the process of 'greening' the value chain (see box).

Greening the value chain

Defined as a general approach to optimize the input-output flow of products from an environmental point of view.

Greening tools review whether:
- value chains are affected by environmental degradation and climate change;
- they are causing negative environmental impacts; and
- they potentially create positive environmental services (e.g. through carbon sequestration).

Source: GIZ (2011)

Workshop Objectives

A two-day workshop was conducted at the Khar Sector Office of Api Nampa Conservation Area (ANCA) in Darchula District, Nepal, to climate proof the allo value chain from the production to the processing levels.

Climate proofing methodology

Steps in the climate proofing process include the following (Figure 2) (GIZ 2012)[2] :

Figure 2: **Steps to making the allo value chain climate resilient**

[1] GIZ (2011) Value chain climate proofing tool – A contribution to "Greening the Value Chain". GIZ.
[2] GIZ (2012) Climate Proofing Tool: Manual. Second edition. GIZ.

1) Analysis of adaptation needs:

- Which climate trends affect the allo value chain? [This also includes climate-related events such as forest fires, snowstorms, droughts, etc.]
- How is it affected?
- What is the level of risk i) in the next year, and ii) in the next 10 years?
- Which adaptation options already exist, and are there enough resources to implement them?
- What can we do to minimize and/or avoid these impacts on the value chain?

2) Selection of feasible adaptation options.

3) Integration of selected adaptation options into the allo value chain management plan (which is currently being developed).

Further to the steps identified above, and in line with ICIMOD's operational framework on Inclusive and Climate Resilient Value Chain Development (Joshi et al. 2016[3]), five key elements for climate smart planning of the allo value chain were also considered as appropriate:

1) Energy
2) Water
3) Soil/soil nutrients
4) Weather
5) Knowledge

[3] Joshi, S.R., Rasul, G, Shrestha, A.J. (2016) Pro-poor and Climate Resilient Value Chain Development. Operational Guidelines for the Hindu Kush Himalayas. ICIMOD Working Paper 2016/1 Kathmandu: ICIMOD.

DAY One: Thursday, 26 May 2016

Key points discussed

1. Differentiating between climate and weather
2. Need for cooperatives in the villages

Method

The team used a picture series tool developed by GIZ on climate change and value chains to increase understanding amongst community members on the impacts of climate change, utilizing the pictures as an impetus to start discussions on the observations that the locals have made over the years regarding changes in climate, and the importance of group work for achieving success in value chains.

Picture 1: **Discussing cooperatives and their role in value chain development**

Picture 2: **Understanding the value chain concept**

DAY Two: Friday, 27 May 2016

The second day, the team started with a recap of what had been done the previous day. To see how clearly the communities understood the concepts of climate, weather and value chains, the participants were asked to use some of the pictures from the picture series tool and explain to everyone what they meant and represented.

Picture 3: **Telling the difference between rain (short-term) and rainy season (long-term)**

Following this, the community members were divided into groups to gather information on the allo plant resource, soil, water, and energy. Their current status, availability, the ways in which they are changing and the information and gaps in existing knowledge were identified (Tables 1.1–1.4). Each group had two resource persons from KSLCDI guiding each discussion and making sure that all participants' voices were heard and noted down.

After completing the group work, each group individually presented their work – making sure to speak in their local dialect. The community discussed issues that were not clear or needed more information so that every person in the room might come to the same level of understanding.

Picture 4: **Explaining the differences between the weather and climate**

Table 1.1: Allo resource

	Godani	Sundamunda
Where is the resource found?	1) Maley Pad Forest (Wards 1,2,3)	1) Chhabhagey Forest (Ward 9)
	2) Daulad Forest	2) Panyar Mathi Forest (Ward 9)
	3) Bhera Khola Forest	3) Barbhagey Forest (Ward 9)
	4) Thakilad Forest	4) Sirdhar Forest (Ward 9)
	5) Hudkey Khola Forest (Ward 2)	5) Sela Ijar Forest (Ward 9)
	6) Pateli Forest (Ward 4)	6) Chhada Mathi Forest (Ward 9)
	7) Pan Dhunga Forest (Ward 2)	7) Palte Khani Forest (Ward 9)
	8) Private land (Gaur Singh Thagunna)	8) Kathaijar – private land (Ward 9)
How far is the resource? (Walking distance)	**Maley Pad:** From Ward 3: 1.5 hours From Ward 2: 2 hours	**Chhabhagey:** From Wards 8,9: 3 hours From Ward 7: 4 hours
	Daulad: From Ward 3: 1 hour From Ward 2: 1.5 hours	**Panyar:** From Wards 8,9: 2.5 hours From Ward 7: 3 hours
	Pan Dhunga: From Ward 3: 3 hours From Ward 2: 2.5 hours	**Sela Ijar:** From Wards 8,9: 3 hours From Ward 7: 4 hours
How much resource is extracted?	**Maley Pad:** 10 people collected for 3 days at the rate of 10 kg per day = 300kg	**Chhabhagey:** Dry allo collection 12 people collected for 3 days at the rate of 3 kg per day = 108 kg
	Daulad: (same as above)	**Panyar:** Green allo collection 30 people collected 3 kg each for 1 day = 90 kg
		Sela Ijar: 8 people collected 4 kg each for 3 days = 96 kg
Approach	Collection and processing (cooking and drying) is done collectively in groups Fibre is distributed equally among group members	Similar to Godani

Table 1.2: Soils

Resource production	Allo needs nutrient-rich soils to grow It does not grow well in soils with high gravel/rock content
	It grows well in areas grazed by sheep and goats
	Allo grows well in moist soils/areas In dry soils/areas, the plant does not grow well and the fibre produced from such plants is not good quality
Collection	In Khar VDC, collectors have received training. They now leave the de-barked plant (after harvesting) in the forest so that it can decay on the forest floor and return nutrients back into the soil In Sipti VDC, however, the whole plant is brought back home after being harvesting so nutrients are removed from the ecosystem
Processing	Allo bark is cooked in ash and kamero (white mica clay soil). The kamero makes the fibre slippery while the ash bleaches it. The chemical substitute for ash – i.e. caustic soda – makes the fibre brittle and causes it to break On-foot journey to fetch kamero: Godani = 1.5 hours Sundamunda = 1 day Sipti = 1 day
Knowledge gap	Allo is only found naturally, in the wild It is challenging to produce in the nursery for transplantation

Table 1.3: **Water**

What is water used for?	Production	Soil must be moist for allo to grow
	Collection	Water is not used
	Processing	Water is needed in the highest quantity for this step in the value chain: • Allo bark must be soaked in water for up to two days • The soaked allo is then cooked in water and ash • The cooked allo is then washed • The washed allo is then soaked in a kamero-water solution • The kamero-soaked allo is then dried
	Trade	Water is not used
How much water is used?	Production	Moist soil is required Too much water and the allo will rot
	Collection	Water is not used
	Processing	• Soaking allo: A lot of water is used; it must be completely soaked • Cooking allo: For every 5 kg of allo, 10-15 litres of water is required (more water is required if the allo is not properly soaked in step one) • Washing allo: Allo is taken to the stream to be washed in Godani. This takes about 1-1.5 hours; in Sundamunda, tap water is collected in a pool to wash allo – about 1,000 litres is required • Kamero-water solution soaking: The kamero solution has 10 litres of water for every 5 kg of allo
Water quality	Water is used in various stages (up to three times), and in the end not much water is left; the remaining water is either drained into the ground or dries up by itself Water that is used during washing drains into the ground In Godani, all the washing is done in the local stream	
Knowledge gap	• How much water is required in the nursery for allo planting? • What will be the effect on allo (from production to processing) if there is water scarcity? • What is the effect of water quality on allo? • What is the effect of allo processing on water quality?	

Table 1.4: **Energy**

Energy		
Collection	Debarking the allo plant in the collection site itself is better than collecting the plants and transporting them whole to the village	No need of energy
Processing		
Fire wood for allo processing	Collection month	Mangsir, Paush, Magh, Falgun, Chaitra
	Collection place	Gokarna CF, Uvokhola
	Wood from the trees	Bajh, Khusro, Kaulo, Gaurash, Angari, Saud, Okhar
	NPR 50 per household (depending upon the CFUG decision)	
Use of stove for allo processing per 6 kg in half portion of iron drum.	**Traditional stove**	**Rocket stove**
	Time for cooking of dried allo – 4 hrs	Time for cooking of dried allo – 3 hrs
	High amount of energy gets wasted outside the cooking drum	Few amount of energy gets wasted outside the cooking drum
	3 Bhari wood needed	1.5 Bhari wood needed
	Easy to use but emission of high amount of smoke	Easy to use with less amount of smoke emission
	Traditional practice	Learned to use after training
		Rocket stove has to be protected from rain
Use of caustic soda per 6 kg of allo	200 grams	200 grams
Use of ash per 6 kg of allo	3.5 kg	3.5 kg

Impacts of different climatic factors on the allo value chain

Following the first group work activity, the second session was about gathering information on the impacts of increasing temperatures, drought, changing winter temperatures, forest fires and rainfall patterns on the resource base (i.e. allo), on the soil, water quantity and energy needs related to allo plant. The groups looked into the biophysical and socioeconomic impacts, determined the risk levels and the potential adaptation options that can be taken up (Tables 2.1–2.5). Risk level assessment was done using a GIZ climate proofing tool as shown in Figures 3.1 and 3.2.

Discussions on the sustainable harvesting of allo were also conducted during the workshop. The differences in harvesting methods practiced by communities in Khar (Far-West Nepal) and Sankhuwasabha (Eastern Nepal) were analysed. The sustainable harvesting of allo is an important criteria for adapting to the impacts of climate change.

Livelihoods diversification was also discussed as an adaptation option should the allo value chain fail for any reason, whether climate-induced or otherwise. Participants identified cultivation of beans as a priority livelihoods option, followed by goat rearing.

Figure 3.1: **Levels of risk for this year**

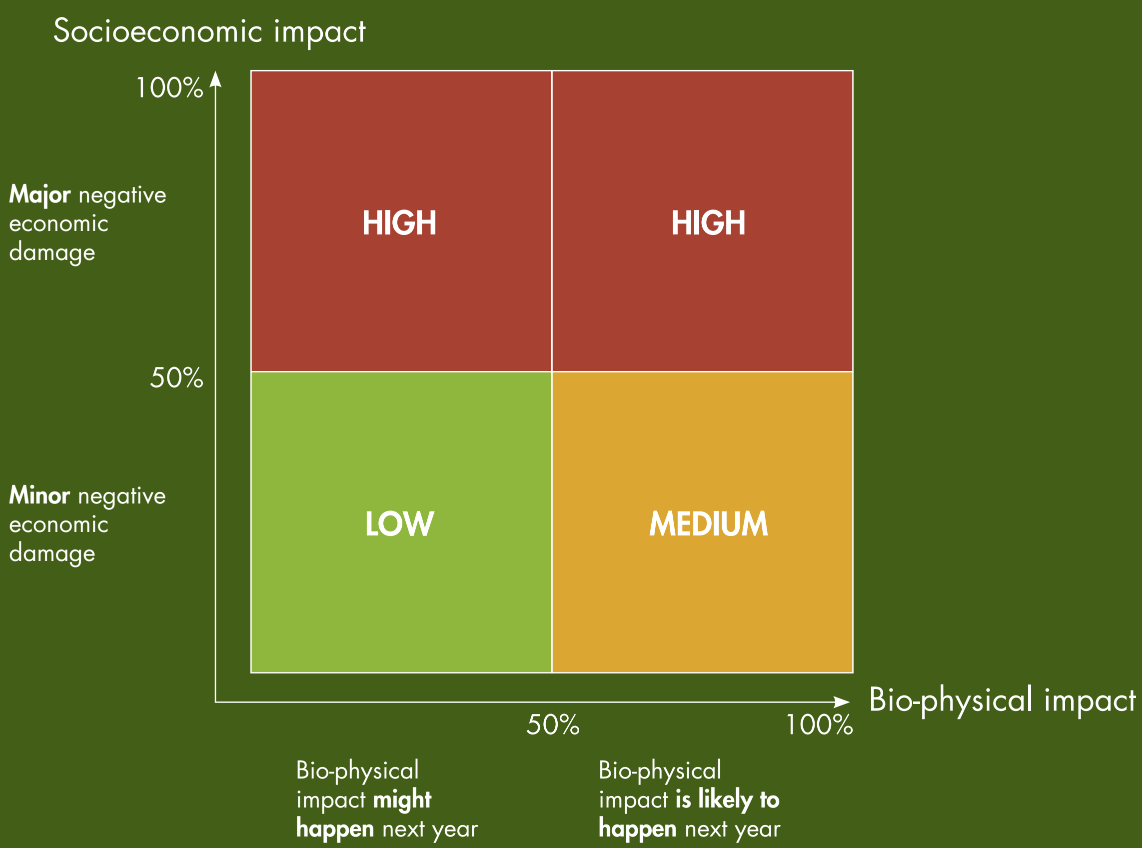


Figure 3.2: **Levels of risk for the next 10 years**

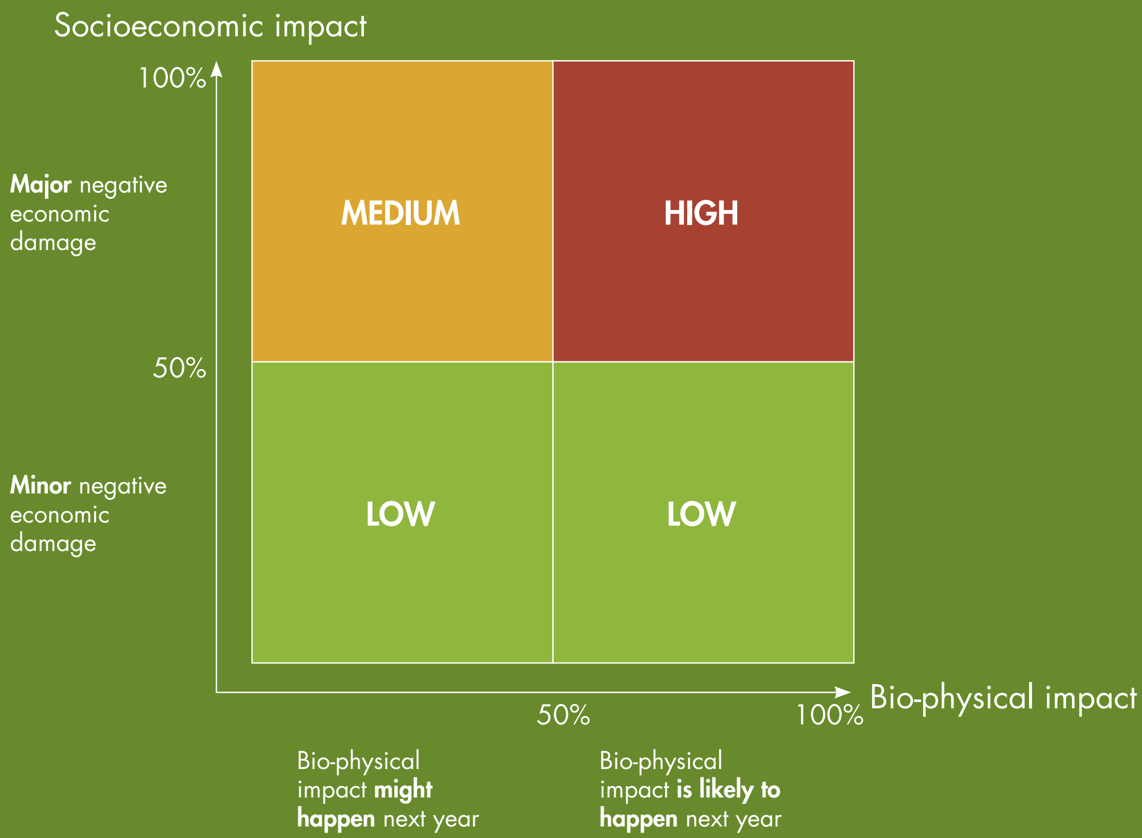


Table 2.1: **Impacts of heat on allo resource and use**

Parameters	Bio-physical	Socioeconomic	Risk level		Adaptation options
			Now	After 10 years	
Natural resource	Drying of plants	Reduction in income generation	Low	Low (Reduced chances of rainfall due to increasing temperature)	Introduce grazing by goats in allo habitat
	Replacement by invasive alien plant species (IAPS) *Ageratina adenophora*	Reduction in allo related activities	Low (Sundamunda) Medium (Godani)	60% increase in IAPS – alters the allo habitat	Reduce deforestation in allo habitat
	Note: 10 years ago, allo was found in nearby agricultural fields and surroundings				
Soil	Drying of soil reduces plant height	Reduced production	Low	Medium	Leaf litter in forests for decomposition
	Thinner stems	Loss for cooperatives	Allo growing well		Add sheep and goat manure in forest areas
Water	Difficulty in processing if water sources dry up	Search for new water sources	Low (Godani)	Medium (Godani)	Small water conservation ponds
		Takes time to get water, increased work load, especially for women	Low (Sundamunda)	High (Sundamunda)	Rain water harvesting tanks
	Note: Water level has reduced considerably in Godani since last year				
Energy	Forest fires cause a reduction in forest plants	Lack of fuelwood for processing allo	Medium (Godani)		Improved cook stove
		Have to journey far in search of firewood	Walk four to five hours to get fire wood- Sundamunda (forest opened twice a year)	Forest cover will increase and fuelwood problem will decrease	
		Increased work load for women			

Table 2.2: **Impacts of drought on allo resource and use**

Parameters	Bio-physical	Socioeconomic	Risk level		Adaptation options
			Now	After 10 years	
Natural resource	• No germination • Stunted growth • Less seed production • Bark extraction is difficult as it sticks to the stem • Have to journey farther to collect allo	• Low production • Low income generation—negative impacts on livelihood, food security, education of kids	Low	High	• Establish a nursery • Set aside a specific site designated for allo production
Soil	• Reduced moisture content • Soil erosion • Landslides • Destruction of soil organisms	• Low production • Low income generation—negative impacts on livelihood, food security, education of kids • Dust causes allergies and illness	Low	High	• Ponds and trenches for moisture conservation • Soil and water conservation • Innovative technologies for reduced water use
Water	• Drying up of springs • Foul odour from dried springs • Reduced water level • Water sources farther away	• Water collection takes too much time. Other household work suffers • Processing negatively affected • Low production • Low income generation—negative impacts on livelihood, food security, education of kids • Reduced electricity generation from hydropower	Medium	High	• Reduce deforestation • Plantation near water sources
Energy	No firewood for the next year	• Difficulty in allo processing • Allo weaving, thread making and stitching is affected • Affects livelihood	Low	High	• Innovative technologies (bio-gas, rocket stove) • Plants adapted to drought conditions should be planted and promoted

Table 2.3: **Impacts of cold weather on allo resource and use**

Parameters	Bio-physical	Socioeconomic	Risk level		Adaptation options
			Now	After 10 years	
Natural resource	• Allo production not good • Late seed germination	Less fibre – low income	Medium	High	• Sustainable harvesting • Sustainable forest management (both community and government forest)
Soil	• Soil dry • Low levels of litter decomposition • Leaf litter blown away by wind • Reduced fertility	Less fibre – low income	Medium	High	• Sustainable harvesting • Sustainable forest management (both community and government forest)
Water	Less rainfall – water sources dry up	• Longer queues at water collection sources due to drying up of water sources • 30 minutes to two hours in a queue (Sundamunda)	High	High	• Rain water harvesting • Construction of conservation ponds • Conservation of water sources
Energy	Because of reduced amounts of snowfall, fewer branches break from trees which means there is less fuelwood for villagers who are only allowed to collect fallen branches	Have to journey farther to collect fuelwood. Sundamunda: Ten hours instead of the earlier three Godani: Threee hours instead of the earlier one Less time for allo processing	Medium	High	Improved cook stove Sustainable forest management

Table 2.4: **Impacts of rain on allo resource and use**

Parameters	Bio-physical	Socioeconomic	Risk level		Adaptation options
			Now	After 10 years	
Natural resource	• No germination due to low rainfall • Erratic rainfall–drying of allo plant • Pathogens • Leaves, roots and stems eaten by insects • Insect-infested plants – low bark production	• People dependent on allo directly affected • Affects income generation	Low	High	• Allo plantation in agricultural areas (terraced bunds and open spaces) to replace complete dependence on forests
Soil	• Soil erosion • Good growth when there is a drizzle • Low rainfall – no germination	• Economic impacts due to low production	Low	High	• Reduce deforestation • No cattle grazing • Allow sheep and goat to graze
Water	• Reduced rainfall and shorter winter months cause low production • Low soil binding by roots and low absorption due to low rainfall	• Economic impacts	Low	High	• Forest conservation • Control forest fires
Energy	• Drying of forests due to low rainfall • No germination • More rainfall is good	• Health impacts on livestock • Negative income impacts	Low	High	• Plantations (trees and shrubs) by communities • Managed forest extraction
Knowledge	• Knowledge on allo harvesting and processing • Interested in making thread and clothes but lack of proper skills and capacity	• Income may increase if capacity is built	Low	High	• Older and experienced people to not give up, younger generation to be motivated

Table 2.5: **Impacts of fire on allo resource and use**

Parameters	Bio-physical	Socioeconomic	Risk level		Adaptation options
			Now	After 10 years	
Natural resource	• Roots die • Seeds get destroyed • Plants die	–	Low	High	• Community awareness on the negative effects of forest fires • Community should be mobilised in case of fires in their forests • Water conservation ponds in the forest area for fire control and also increased moisture retention
Soil	• Smaller fires are good (nutrient enrichment) but large fires have negative effects	–	Low	High	
Water	• Dries up water sources	–	Low	High	
Energy	• Fuelwood destroyed	–	Low	High	

Conclusion

The two-day training workshop helped create awareness amongst local communities regarding the impacts of climate change on the series of steps that are part of the allo value chain. The group exercises were also helpful in pinpointing those adaptation strategies that can be adopted to make the value chain more resilient to climate change, particularly at the production, collection and processing levels within the value chain.

The following steps are recommended as follow-up actions to this workshop:

1. Incorporate potential adaption options in the Allo Value Chain
2. Have a clear understanding of the linkages between forests, allo plant resource, water and energy
3. Organize a similar workshop in India for different value chains, with three participants from partner organization CHEA as trained resource persons.

Following this workshop, the same methodology was used by the KSLCDI team to make the rittha and nigalo value chains climate resilient in Gokuleshwor (Baitadi District), and Ranishikhar (Darchula District), respectively. Results from these exercises are included as Annex A.

Annex A: Making the rittha and nigalo value chains climate resilient

Rittha value chain

The value chain climate proofing of rittha or soapnut (*Sapindus mukorossi*) was conducted in Gokuleshwor VDC of Baitadi District, KSL Nepal. The rittha value chain has been selected because of its high availability in the region, and the value addition potential it has in terms of uses in making powder and herbal soaps. Based on the local communities' perceptions, climate in the area has changed over the past ten years, as reflected in Figure A.1.

Figure A1: **Climate change trend for the rittha value chain**

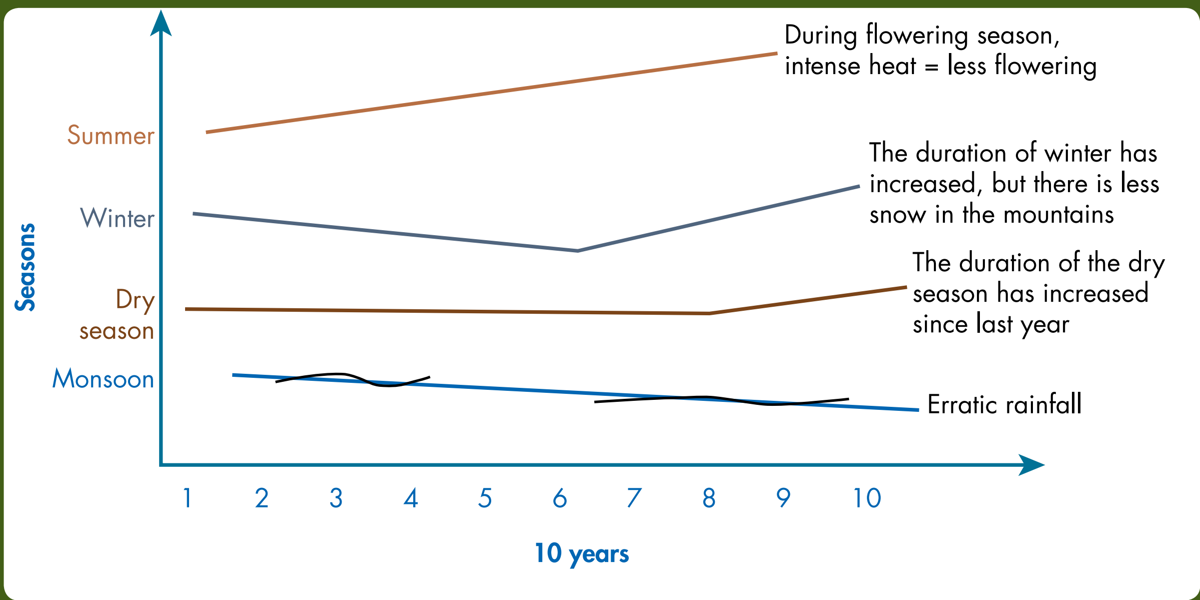


Table A1: **Climate impacts on the rittha value chain**

Climate trend	Bio-physical impact	Socioeconomic impact	Level of risk		Adaptation options
			In the year ahead	In the next 10 years	
Summer season–Higher temperature, heat waves and extreme heat	• Increase in temperature after June causes blackening of A-grade rittha • Drying of flowers • Prevents fruit from setting	Reduced income as a result of lower sales (blackening of rittha)	Low (Medium effect on businessmen)	Low	Need cold store
Winter season	• Rittha seeds turn black because of dew	Same as above	Low	Medium	X
Dry season	• Production is low but the quality of rittha seeds improves	Reduced income	Low	Medium	Irrigation
Rainy season	• Heavy rainfall—flowers fall • Less rainfall—flowers fall as they dry	Reduced income	Low	Medium	For small seedlings, polyhouses can be constructed in a nursery, but nothing can be done for bigger trees

Table A2: Making the rittha value chain climate resilient

Value chain	Natural resource	Water	Soil	Energy
Production	Private land Ne VDC- 5, Sou VDC- 4, Dev VDC-8, Nagrau VDC-7 High production of rittha in Nagrau as the plant is not affected by disease in the region	Water is necessary for the nursery. If there is more rain than necessary, the rithha fruit turns black, and falls to the forest floor by the months of August/September	Moist, sandy soil in sloped land where landslides are prone to occur	Not required
Collection	**Ne VDC** Around 250 households collect around 150 quintals of rittha per house **Nagrau** Minimum production per household is 50 kg Maximum production per household is 5 quintals **Price** Maximum: 22/kg Minimum: 12/kg	No water is needed during collection		Transportation is used to gather rittha in one place People are hired for seed collection; if collection expense is high, people let the seeds remain on the trees
	Note: Locals believe that the possibility of lightning striking rittha trees is very high, so people normally plant rittha trees far from their houses			
Processing	X	It rots if it is not used	X	It dries in the sun within five days It must be stored in a dry place
Market	X	X	X	Transportation is necessary for business

Table A3: Seasonal calendar for rittha value chain

	Baisakh Apr to May	Jestha May to Jun	Asar Jun to Jul	Shrawan Jul to Aug	Bhadra Aug to Sept	Asoj Sept to Oct	Kartik Oct to Nov	Mangsir Nov to Dec	Poush Dec to Jan	Magh Jan to Feb	Falgun Feb to Mar	Chaitra Mar to Apr
Germination			■	■								
Flowering	■											
Fruiting		■	■									
Collection								■				
Drying								■	■			
Market									■	■	■	
Utilization	■	■	■	■	■	■	■	■	■	■	■	■

Nigalo value chain

Nigalo (*Drepanostachyum falcatum*), commonly known as Himalayan bamboo, is used in craft making and trade in Ranishikhar VDC in Darchula District and is the main source of cash income for many farmers in the area.

Table A4: **Key natural elements in the nigalo value chain**

Value chain steps	Key natural elements				
	Resource	Water	Soil	Energy	Knowledge gap
Production	Collection of raw materials/resources related to nigalo are from the following areas: • Ranisain Community Forest, Wards 7, 8 & 9 • Chinanlaya National Forest (NF), Wards 5 & 9 • Doraya NF, Ward 9 • Saina Dera NF, Ward 9 • Ganyal Wadhar NF • Jana Khali NF • Mali Kaju Community Forest • Lutaya Sain NF, Ward 7 • Supare Banja NF, Ward 7 • Bandha NF, Wards 7, 8 and 9 • These forests are also sources of fuelwood as well as fodder and forage material for their livestock	Water, especially rainfall, is required during the months between December and June for nigalo shoot germination	The nigalo plant requires nutrient-rich and moist soil	X	According to locals, natural nigalo seed disbursement is more effective than cultivation from rhizome The community initiated rhizome plantation in the community forest last year
Collection	• Availability of nigalo, on the basis of the maximum quantity of nigalo collected from forests last year is: – Saina Dera NF : 400/500 bharis – Doraya NF: 50 bharis – Ganyal Wadhar NF: 40 to 50 bharis **Note:** One bhari contains around 200 nigalo sticks on average • Distance of collection is about 8 hours from Setkhara, Ranisikhar VDC, Ward no. 9. But people come to collect from other VDCs as well • Men are the main collectors of Nigalo from Jangle/forest				
Processing		Extracting strips of nigalo bamboo ('choya' in Nepali), requires fresh-cut bamboo stalks to be soaked in water for about two hours. Dry nigalo stalks, however, need to be soaked in water for about two days			
Marketing	• Handicrafts that are made of nigalo raw materials include mandro (floor mats) and dokos (big baskets). The main marketing hubs for these products are: – Gokuleshwar, during the Shivaratri Bazar – Mallikarjun, during the market/mela – Pasti, during the mela				Knowledge gap in terms of making other varieties of handicraft products

Table A5: **Effects of climate change on nigalo production and adaptation options**

Parameter	Bio-physical	Socioeconomic	Risk level	
			Now	After 10 years
Cold weather	Snowfall during the winter season keeps soil moist throughout the year. However, the amount of snow that falls is decreasing drastically each year. This is affecting nigalo shoot germination	Affects the traditional livelihoods of Ranishikhar VDC's community, who are mostly dependent on nigalo handicrafts, and small-scale businesses	Snowfall has decreased by about 75 percent. For instance, the area would generally receive 4.5 feet of snow, but there was no snowfall at all this year	Nigalo will disappear from the area
Rain	Lack of rain between December and June will cause the nigalo shoot to die as a result of the dryness of the soil	Affects the livelihoods of locals	There is less rainfall during the winter season, but heavy rainfall during the monsoon. This has been consistent over the last four years	No rain during the winter season may affect water sources, ultimately affecting the nigalo resource production over large areas
Heat	Due to high temperatures, nigalo plants and shoots will dry	Reduces the income of locals from the nigalo handicraft business	Livestock and wild animals have been consuming and damaging nigalo shoots. During December to June period, herders from Darchula district usually bring goat and sheep in groups (one group usually has about 250 animals) in this area, and stay here about three to four months	The consequences will be a number of landslides
Fire	This is the first time that the community experienced forest fire in a nigalo forest. Locals believe this happened because of herders who usually bring their goat/ sheep to graze in the forests			
Adaptation options				
	Initiated nigalo plantation in the Ranisikhar to Kimsain forest range. The area covers about four hectares. The plan is to expand plantation in the Digara-Patal to Ranisikhar range	Nigalo seeds are more effective in facilitating germination, and provide better quality of nigalo than through rhizome plantation	An Example: Rhizome plantations can be harvested about 10 years, whereas natural seed disbursement plantations can be harvested for up to 25 years	

Annex B: List of participants

SN	Name	Gender		Address	Contact	Day 1	Day 2
		F	M				
Participants							
1.	Kamala Thagunna	√		Khar-8, Sundamunda	9749522541 9868790103	√	√
2.	Rajmati Thagunna	√		Khar-8, Sundamunda		√	√
3.	Parbati Thagunna	√		Khar-8, Sundamunda		√	√
4.	Manuri Thagunna	√		Khar-9		√	√
5.	Jasma Thagunna	√		Khar-8, Sundamunda	9749523060	√	√
6.	Belmati Thagunna	√		Khar-8, Sundamunda	9749101272	√	√
7.	Kusmati Mahar	√		Khar-8, Sundamunda	9749092348	√	√
8.	Nauma Thagunna	√		Khar-8, Sundamunda		√	√
9.	Ganga Thagunna	√		Khar-8, Sundamunda		√	√
10.	Jaina Thagunna	√		Khar-8, Sundamunda	9749583455	√	√
11.	Sanguli Dhami	√		Khar-8, Sundamunda			√
12.	Gaur Singh Dhami		√	Khar-3	9749520025	√	√
13.	Govind Singh Thagunna		√	Khar-3	9749524640	√	
14.	Bagmati Dhami	√		Khar-2		√	√
15.	Guma Tamata	√		Khar-3		√	√
16.	Manuri Dobal	√		Khar-2	9745055759	√	√
17.	Thauli Devi Dhami	√		Khar-3		√	√
18.	Kalawati Thagunna	√		Khar-3		√	√
19.	Narma Devi Dhami	√		Khar-3		√	√
20.	Faguni Thagunna	√		Khar-3		√	√
21.	Basanti Dadal	√		Khar-1	9749206658	√	√
22.	Lakshmi Mahar	√		Khar-1	9749969168	√	√
23.	Sunmati Manyal	√		Khar-1	9825631545	√	√
24.	Sher Singh Bohara		√	Khar-3	9749520045	√	
25.	Dipak Dhami		√	Khar-3	9748934534	√	
26.	Man Singh Manyal		√	Khar-3	9749512986	√	√
27.	Vidya Dev Joshi		√	Darchula	9841518311	√	√
28.	Mohan Dutt Bhatta		√	Darchula	9749516731	√	√
29.	Jagdish Kandapal		√	CHEA, India	9411502070	√	√
30.	Mohan Chandra Bhatta		√	CHEA, India	9456189806	√	√
31.	Dhirendra Joshi		√	CHEA, India	08449088075	√	√
32.	Srijana Joshi	√		Kathmandu	9851129600	√	√
33.	Neha Bisht	√		Kathmandu	9813700912	√	√
34.	Lipy Adhikari	√		Kathmandu	9841289436	√	√
35.	Chandra Kanta Subedi		√	Kathmandu	9841756654	√	√
36.	Uma Partap	√		Kathmandu	9841304446	√	√
37.	Kamala Gurung	√		Kathmandu	9851179225	√	√
38.	Janita Gurung	√		Kathmandu	9849801483	√	√
39.	Bijay Raj Subedee		√	Kathmandu	9849139831	√	√

List of resource persons

S.N.	Name	Organization
1	Mr Bijay Raj Subedee	RECAST
2	Mr Chandra Kanta Subedi	RECAST
3	Dr Janita Gurung	ICIMOD
4	Dr Kamala Gurung	ICIMOD
5	Dr Uma Partap	ICIMOD
6	Dr Srijana Joshi	ICIMOD
7	Ms Neha Bisht	ICIMOD
8	Ms Lipy Adhikari	ICIMOD

Annex C: Group members

Group Members for Session 1

Parameter / S. No	Allo plant resource	Soil	Water	Energy
1	Kamala Thagunna	Sunmati Manyal	Kusmati Mahar	Basanti Dandal
2	Jaina Thagunna	Lakshmi Mahar	Manuri Thagunna	Rajmati Thagunna
3	Ganga Thagunna	Nauma Thagunna	Belmati Thagunna	Parbati Thagunna
4	Manuri Dobal	Sanguli Dhami	Bagmati Dhami	Narpati Shahu
5	Faguni Thagunna	Guma Tamata	Kalawati Thagunna	Jasma Thagunna
6	Thauli Devi Dhami	Informal participant from Sipti	Narma Devi Dhami	Gaur Singh Dhami
7	Jagdish Kandapal	Dhirendra Joshi	Vidya Dev Joshi	Mohan Bhatt
8	Srijana Joshi	Chandra Kanta Subedi	Mohan Dutt Bhatta	Uma Partap
9	Kamala Gurung	Janita Gurung	Lipy Adhikari	Bijay Raj Subedee
10			Neha Bisht	

Group Members for Session 2

1	Kamala Thagunna	Sunmati Manyal	Kusmati Mahar	Basanti Dandal
2	Jaina Thagunna	Lakshmi Mahar	Manuri Thagunna	Rajmati Thagunna
3	Ganga Thagunna	Nauma Thagunna	Belmati Thagunna	Parbati Thagunna
4	Manuri Dobal	Sanguli Dhami	Bagmati Dhami	Narpati Shahu
5	Faguni Thagunna	Guma Tamata	Kalawati Thagunna	Jasma Thagunna
6	Thauli Devi Dhami	Informal participant from Sipti	Narma Devi Dhami	Gaur Singh Dhami
7	Jagdish Kandapal	Dhirendra Joshi	Vidya Dev Joshi	Mohan Bhatt
8	Srijana Joshi	Chandra Kanta Subedi	Mohan Dutt Bhatta	Uma Partap
9	Kamala Gurung	Janita Gurung	Lipy Adhikari	Bijay Raj Subedee
10			Neha Bisht	

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from the British people

International Centre for Integrated Mountain Development
GPO Box 3226, Kathmandu, Nepal
Tel +977-1-5003222 **Fax** +977 1 5003299
Email info@icimod.org **Web** www.icimod.org