



Ministry of Forests & Environment  
Government of Nepal



# Feasibility Assessment of Portable Sawmill in Community Forest Users Group

## A Case of Piloting at Chautara Sangachowk Municipality, Sindhupalchowk



**Volume 2022-06**

**ISSN 2208-0392**

**RESEARCH PAPER SERIES** on  
**Agroforestry and Community Forestry in Nepal**

This *Research paper is based on the research project* “Enhancing livelihoods from improved forest management in Nepal” or the EnLiFT2 Project (<http://enliftnepal.org/>). EnLiFT2 Project (ACIAR FST/2017/037) is the second phase of the EnLiFT (ACIAR Project FST/2011/076) and is funded by the Australian Centre of International Agricultural Research. EnLiFT2 commenced on 2018 and is a collaboration between: University of Adelaide, University of New South Wales, Department of Forests and Soil Conservation, Forest Research and Training Center (Government of Nepal), Forest Action Nepal, Nepal Agroforestry Foundation, and RECOFTC Nepal.

The research uses the findings of the recent project and is based on the research project funded by Australian Centre for International Agricultural Research (ACIAR). This publication is reviewed by a number of reviewers including professionals from the Ministry of Forests and Environment (MOFE). This publication is based on the data collected mainly from the six nursery sites by EnLiFT2 project in collaboration with the Divisional Forest Offices of Sindhupalchok and Kabhrepalanchok districts of Nepal. This publication is subject to an additional review process from a national advisory group of the project. The editors make a decision based on the reviewers' advice, which often involves the invitation to authors to revise the manuscript to address specific concern before final publication.

For further information, contact EnLiFT2:

#### **In Nepal**

ForestAction Nepal

Dr Naya Sharma Paudel

Phone: +9779851015388

Email: [naya@forestaction.org](mailto:naya@forestaction.org)

#### **In Australia**

University of Adelaide

Dr Ian Nuberg

Phone: +61421144671

Email: [ian.nuberg@adelaide.edu.au](mailto:ian.nuberg@adelaide.edu.au)

**ISSN: 2208-0392**

#### **Disclaimer and Copyright**

The EnLiFT2 Project (ACIAR FST/2017/037) holds the copyright to its publications but encourages duplication, without alteration, of these materials for non-commercial purposes. Proper citation is required in all instances. Information owned by others that requires permission is marked as such. The information provided is, to the best of our knowledge, accurate although we do not guarantee the information nor are we liable for any damages arising from use of the information.

#### **Our Cover**

Testing of portable sawmill in Chuatara municipality by EnLiFT2.

#### **Editorial Team**

**Editor-in-Chief:** Edwin Cedamon

**Managing Editor:** Rahul Karki

**Editors:** Ian Nuberg, Naya S Paudel, Krishna K Shrestha, Hemant Ojha





# Feasibility Assessment of Portable Sawmill in Community Forest Users Group: A Case of Piloting at Chautara Sangachowk Municipality, Sindhupalchowk

**Hari Narayan Acharya | Govinda Paudel | Madan Bashyal**

ForestAction Nepal, Kathmandu, Nepal

**Craig Johns | Edwin Cedamon | Ian Nuberg**

School of Agriculture, Food and Wine, University of Adelaide, PMB 1, Glen Osmond,  
Australia

**Shambhu Dangal**

RECOFTC Kathmandu, Nepal

## **Suggested Citation**

Acharya, H., Paudel, G., Bashyal, M., Johns, C. Cedamon, E., Dangal, S. and Nuberg, I. (2022),  
Feasibility Assessment of Portable Sawmill in Community Forest Users Group: A Case of  
Piloting at Chautara Sangachowk Municipality, Sindhupalchowk. Research Paper Series. Vol  
2022-06.

## List of Acronyms

Cft	Cubic feet
CFUGs	Community forest user groups
Cm	Centimeters
COVID-19	Corona Virus Disease
DFO	Division Forest Office
EnLiFT2	Enhancing livelihoods from improved forest management
FECOFUN	Federation of Community Forestry Users Nepal
M	Meters
NRs	Nepalese Rupees
SDFO	Sub-division Forest Office
UPVC	Unplasticized polyvinyl chloride

# Table of Contents

Executive Summary	1
Background	2
Objective	3
Methodology	3
Description of portable sawmill	3
Site selection for sawmill operation	3
Log management	4
Human resource use and mobilisation	4
Results and Discussion	4
Technical efficiency	4
Installation	4
Pre-operation	5
Sawing process	5
Choice of species	5
Size	5
Quantity of logs	6
Wood products (Sawn)	7
Demand for sawn timber	8
Economic Efficiency	8
Cost per unit log/volume	8
Social acceptance	10
Management of sawmill (institutional aspects)	10
Challenges (social, legal and technical)	11
Social	11
Technical	11
Legal	12
Conclusion	12
Annexes	13
Annex-1 Detailed of logs and sawn timber at testing period.	13
Annex-2 Detailed of logs and sawn timber at operation period	17
Annex-3 Photo plates	20

## Executive Summary

Rural people in Nepal have been sawing logs manually using wooden scaffold on which logs are mounted on the frame and cut into planks by the use of a blade saw. Such practice is labor intensive, time-consuming and therefore expensive. The traditional practice of this kind is gradually replaced by the sawmills where logs are cut into pieces (and planks) by bandsaws. These sawmills are available in the cities and small towns located far from the village, and therefore requires that the logs in the villages are transported to and from the sawmill. In order to provide sawmilling facilities in the villages, EnLiFT2 (Enhancing livelihoods from improved forest management in Nepal) project and Division Forest Office, Sindhupalchowk have experimented the operation of a portable sawmill in Chautara Sangachokgadi Municipality. The objective of this experimentation is to see the feasibility of the portable sawmill and contemplate on the operational modality of the mill. During the experiment, a total of 2,546 cubic feet of round wood (logs) were processed. On the basis of calculation of the cost, the actual cost of the timber sawing is Nepalese Rupees (NRs) 95 per cubic foot of the round wood. It can be concluded that the portable sawmill can become a profitable business provided that the government provides a policy environment conducive to the entrepreneur(s) and that the supply of the timber to the mill is reliable.

## Background

A portable sawmill is considered to be an efficient machine in terms of providing facility to saw timber at one's doorstep or within the forest. It is an alternative form of sawing timber to using the static band saw operated in commercial areas in the rural setting. Portable sawmills are believed to be cheaper and relatively hassle free in terms of cost and time consumed for transportation. However, its use has not actually been tested to assess their feasibility in the different terrains and socioeconomic settings of Nepal.

In the existing practice, rural people have been using wooden frame hand saws, cross cutting saws, power chain saws, and axe tools to saw for domestic purposes. These types of tools pose risks to the users, are less cost effective, incur more loss of wood and produce low quality products in comparison to those produced by machinery tools. Sindhupalchowk, a district with one of the richest forest covers in public and private land, has a high demand for timber for domestic purposes as well as export of sawn logs. Currently, band saws are the most used in market hubs of Chautara, Barbise, Melamchi and Jalbire, which are far from the rural setting. It usually takes workers at least a day to transport the logs to those market hubs, place their logs in queue, and have their timber sawn.

To address the issues pertaining to sawing timber, the Division Forest Office (DFO) in Sindhupalchowk purchased a Portable Sawmill in 2020 to provide service at the village level to saw timber collected from private and community forests, mainly for domestic use. However, the machine was lying idle at DFO premises due to the prolonged COVID- 19 pandemic and subsequent lockdown. In facilitation of the EnLiFT2 project, there was an agreement among the project partners including the DFO, the Federation of Community Forestry Users Nepal (FECOFUN) and the Project Implementation Unit to conduct a feasibility piloting in Chautara Sangachokgadi Municipality, Sindhuplachowk.

The primary actors having stake on sawmill include DFO Sindhupalchowk and community forest user groups. The EnLiFT2 project served as a bridge between the DFO and the Cluster Forest Management Mechanism to prepare contracts, develop operation models and operation activities in the field.

In close coordination with the DFO team, EnLiFT2 carried out the testing on 25-28 April 2022 (testing), where 251 cft of timber was sawn. Following the testing of the portable sawmill, EnLiFT2 supported the Cluster Level Forest Management Committee with decision making, operation model preparation and coordination with the DFO. A formal agreement was made between the DFO Sindhupalchowk and the Cluster mechanism on 10 April 2023 (operation) to provide services to local users in the cluster area. This report summarises the findings and lessons learnt from the portable sawmill piloting tests conducted in Chautara.

## Objective

The overall objective of the feasibility study was to assess the operation of Portable Sawmill in community forests situated in hilly terrain of Nepal. The specific objectives of the feasibility assessment included-

- To estimate the cost of sawing per unit saw log.
- To analyse the ease of transportation, use by local persons, installation and maintenance.
- To assess the quality of sawn products; and
- To understand the perceptions of the local community on the use, quality and price of sawing.
- To recommend the feasibility of using portable sawmill in different socio-economic and geographical conditions.

## Methodology

### Description of portable sawmill

A portable sawmill was purchased by DFO Sindhupalchowk in 2020 with the objective to provide sawing service to rural users. The purchase of the sawmill was included in their regular programme budget allocated by the Provincial Government. Nevertheless, only Sindhupalchowk DFO purchased the sawmill to support the District Forest Product Supply Committee. A tentative budget of Sixteen Lakh NPR was allocated for the purchase of the sawmill.

Norwood LumberMate LM 29 Portable Sawmill was purchased by DFO Sindhupalchowk, which is applicable for hardwood and softwood logs up to 29" (72 cm) in diameter combined with its 22" (55 cm) throat opening. It is bound with 14 hp (429 cc) having a Kohler OHV recoil start gas engine. This machine's bed length is-16' (4.8 m), its width-5'11" (1.8 m), Blade Length-144", Band wheels -19" x 5/8" (47.5 x 1.5 m) and has Drive-Configuration clutch of dimension.

### Site selection for sawmill operation

As per the agreement reached with DFO, Sindhupalchowk, wards 8 and 13 of Chautara Sangachokgadi Municipality were selected as the sites to conduct the sawmill tests. Both these wards lie within the cluster mechanism working area. The understanding was that there could be additional sites which could be reached based on the demand and quantity of logs.

## Log management

Logs from private forest and community forest were used to test the portable sawmill. The sawn logs were primarily used for domestic purposes. The logs acquired from community forests were based on the release letter provided by the community forest users group to their members.

The fact that the portable sawmill tests were carried out with less amount of timber logs was mainly due to; a) off season sawing operations due to construction work carried out mainly during the winter season; b) most of users saw from band saw which is nearby community forest area; c) most of the users have opted for alternative products i.e.; steel, aluminum , and UPVC; d) most CFUGs have not distributed logs for 2-3 years; and e) local labour scarcity for transportation.

## Human resource use and mobilisation

For the purpose of testing the portable sawmill, EnLiFT2 project team consulted ZhenPhen Wood Pro Pvt. Ltd., which is the seller of Norwood Company in Nepal, who facilitated the training of two local carpenters on how to operate the portable sawmill as well as provided support for installation, blade sharpening, levelling, sawing, fitting, and other activities.

According to the Cluster Level Mechanism Portable Sawmill Operation Guideline, three members, including two operators, were involved in coordinating with the local government, users, the DFO and other concerned stakeholders. The EnLiFT2 field staff were also fully engaged in testing and operating the sawmill.

The EnLiFT2 project team managed all operational activities like fuel, transportation, logistic support to the team and trainees, recording, measurement of logs/products, hazard assessment, and coordination with the DFO-CFUG on testing period. At the time of operation, the Cluster Forest Management Committee formed an operational team who managed all activities, whereas the EnLiFT2 team provided needed support.

# Results and Discussion

## Technical efficiency

### Installation

Careful supervision is required during transportation, installation, fitting and setting of portable sawmill before operation. A mini truck (Bolero jeep) is sufficient for transportation and three unskilled labours can easily do the loading and unloading. The machine operator should be fully aware about the tools and techniques of installation of all accessories of the mill. During the testing period, it took more than two hours for installation but later in the operation period it required one and half hours for the full installation work of the trolley and machine. Installation work depends on the surface and space of the

land, support from local people and availability of local materials (stone, wooden products). During site selection for installation, water availability, protection of mill, temporary shade preparation, storage area of log and sawn wood, dust management and finally, a socially acceptable area must all be carefully taken into account.

## **Pre-operation**

There are many things to keep in mind before starting the portable sawmill. Inserting key, fuel on/off, levelling and tightness of the blade, adjusting blade guard setting and the fitting of the wheeler cover are the main requirements. Similarly, levelling the log, clamping, guarding and adjusting the blade up-down settings are other important considerations prior to the operation of portable sawmill. A technical or experienced operator can easily do this work within an hour which will decrease the technical and physical hazard of the sawing process.

## **Sawing process**

After the proper completion of pre-operation activities, the sawmill is considered fully ready for the sawing process. Operators should consult with clients to saw the appropriate size of final products that may differ according to size of log used ie; greater sized logs as planks and smaller size logs as lumber for domestic purposes.

The following data explores two distinct sawing processes, i.e., a) testing period and b) operation period. During the testing period, the conditions were: verbal agreement with the DFO, pre-fixed sawing stations (two), use of only community forestry logs, presence of skilled operators from mill suppliers, activities managed by EnLiFT2 team and pre-storage of logs. Likewise, during the operation period, conditions included - written agreement with the DFO, a sawing station announced by the ward office (seven), an operation team formed by the cluster mechanism, presence of a previously trained local operator, use of private and community logs and the situation of stations far from road head and fuel center.

## **Choice of species**

The majority of Chautara Sangachowk Municipality's area is covered with Khote Salla (*Pinus roxburghii*), Patule Salla (*Pinus patula*) and Gobre Salla (*Pinus wallichiana*) which were planted by the then Nepal Australia Community Forestry Project. Apart from these species, there are Chilaune (*Schima wallichii*), Mahuwa (*Madhuca indica*), Kadam (*Neolamarckia cadamba*) Lapsi (*Choerospodias axillaris*) which are mostly on private land. These species were mainly used for the sawing process.

## **Size**

During both sawing processes, the girth class of logs ranged from 25 to 60 inches and *Patula Salla* have on average, higher size than other species. It was observed that the smaller sized logs took longer time to be sawn in comparison to the large ones due to loading and unloading. The following table shows the average time taken (in minutes) to saw logs per cft according to girth class.

Girth class inch	Average time of sawing in minutes		
	<i>Patule Salla</i>	<i>Khote Salla</i>	Other species
< 30	5.0	5.0	6.0
30-35	4.0	5.0	5.0
35-40	3.0	3.0	3.0
40-45	3.0	3.0	2.5
45-50	2.5	2.5	2.5
>50	2.5	2.5	2.5
Average	3	3	3

## Quantity of logs

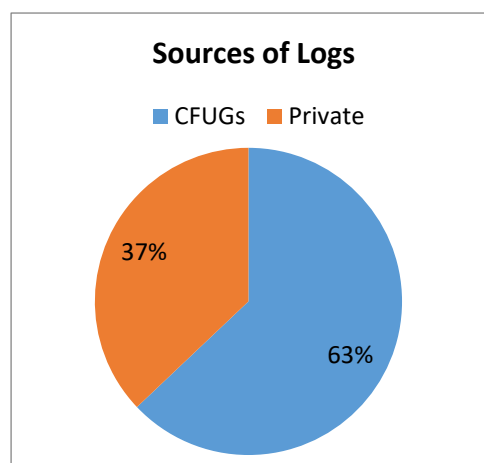
A total of 756 logs were sawn during the test as well as the operation of the portable sawmill comprising a total volume of 2545 cft. The size of the logs varied during the testing and actual operation of the sawmill whereas during the testing, logs were collected from CFUGs, and the average log size was larger than that during the operation period. During the operation period, need base activities were done where a few were from private land, and most were from CFUGs.

Species	Operation Period		Tested Period		Total	
	No. of log	Vol cft	No. of log	Vol cft	No. of log	Vol cft
<i>Pinus roxburghii</i>	503	1516	30	156.08	533	1672.08
<i>Pinus patula</i>	137	583	40	85.21	177	668.21
Others	42	194	4	11.43	46	205.43
Total	682	2293	74	252.72	756	2545.72

During the operation period, 1516, 583 and 194 cft of *Khote Salla*, *Patale Salla* and others were sawn respectively. Following table shows details of species with regards to source of the logs.

Source of Logs	Species			Total
	<i>Pinus roxburghii</i>	<i>Pinus patula</i>	Other species	
CFUGs	1154	289	0	1443
Private	362	294	194	850
Total	1516	583	194	2293

On the basis of sources of logs, 63% were from CFUGs and only 37% were from private land. Mostly other species like *Mahuwa*, *Lapsi*, *Kadam*, *Katus* are found on private land rather than CFUGs.



## Wood products (Sawn)

### Quantity

During the operation of portable sawmill, out of 2293 cft timber from 682 logs only 1634 cft of sawn wood (4017 pieces) were key output of the sawing. Likewise, during testing period only 252.73 cft of 74 logs were sawn which produced 189.09 cft of 326 pieces according to the demand of local users.

Category	Testing period	Operation period
No. of logs	74	682
Logs volume (in cft)	252.53	2293
Sawn volume (in cft)	189.09	1634
No. of Sawn pieces	326	4017

There was a specific size selected during the testing period whereas users' available logs were used during the operation period. The average cylindrical size of *Khote Salla* were smaller than *Patule Salla* which shows the lower rate sawn percentage. The table below shows the percentage of each species sawn during testing and operation period.

Species	Log Volume cft	Sawn Volume cft	Sawn percentage
<i>Pinus roxburghii</i>	1601.21	1118.98	70
<i>Pinus patula</i>	739.08	557.82	75
Other species	205.43	146.29	71
Average			72

## Size

All logs were sawn according to the user's demand. Common purposes mentioned by the users included building construction, goat/pig shed formation, furniture making, frame for shuttering and stocking for the next year. Most of user's sawn planks were small (1"x6" or 9"xL), larger beams (2"x3" or 3"x4"xL) and lumber (5" or 7"x 9"x L) for domestic purposes.

## Quality

After logs were sawn, the products were rather straight, plane and non-defected timber as demanded by the locals. This type of mill can saw more than one plank at a time, but may produce up to three planks and more than six beams in a single sawing. The products from this sawing process are easy to convert to other materials like planning, piecing on fix size and fitting process.

## Demand for sawn timber

Local users saw logs to meet their domestic demand. Generally, planks were used for making shutter frames, door/window frame, partition, and upper flooring. Beams were used for door and window frames, roofing frames and shuttering purposes as well as larger sized sawn lumber which will be usable for future construction works.

## Economic Efficiency

This section describes the financial efficiency of mill operation in the rural area of Sindhupalchowk district. Transportation, operation, maintenance and loading/unloading costs have been submitted for economic efficiency assessment.

### Cost per unit log/volume

The actual cost of sawing is estimated based on actual expenditure during the sawing process. Transportation, installation, fuel, sawing hours, maintenance and setting time are included to estimate unit cost of logs/volume.

If there are more than 300 cft logs at a station the sawing process for at least two days when all other facilities are available (i.e. plane land, water availability, feeding station, accessible for transportation and fuel purchasing) was calculated. The following table shows the total cost of a single station for at least two days.

Actual cost for two days				
Parameter	Unit	Quantity	Rate	Total Amount NRs
Operator	Persons	4	2500	10000
Fuel	Lit	20	178	3560
Transportation	time	1	2500	2500
Unskilled labour	Persons	4	1500	6000

Tea/snacks	Persons	10	200	2000
Blade new	no	1	3300	3300
Depreciation cost of Machine	10% of 20 lakh for two day			1096
Total cost for two day				28456

From both testing and operation activities of the sawing process, total time to process 2545.72 cft of log volume was 8140 minutes. This includes time required for loading/unloading the timber and time taken to cut the timber. This means, per day 150 cft log volume can be sawn to required size within an eight-hour time period. The given table shows the actual cost per unit volume according to a field experiment from a portable sawmill.

<b>Per cft cost</b>		
Per day sawing rate (piecing)	cft	150
Actual cost per day	NRs	14228
Per cft actual cost	NRs	95
If the management cost and profit is as below-		
15% Management cost	NRs	14
10% Profit cost	NRs	9
Total Cost per cft	NRs	118

From both testing and operation activities the total cost comes to be around NRs 95 per cft, excluding governmental taxes. The sawmill may add certain percentage of management cost and profit on top of the per cubic sawing cost of NRs 95. However, the management cost and profit may vary from mill to mill depending on the owner's decision. As shown in the table above, if the owner of the portable sawmill decides to add 15% management cost and 10% profit, the per cubic feet sawing cost will be NRs 118. Management costs include institutional management for entrepreneurship and profit cost include benefit for entrepreneurs.

In and around Chautara Sangachowkgadi municipality, sawing cost per cft is about NRs 120 excluding the transportation cost of logs and sawn timber. It is assumed that for 150 cft log transportation from users to sawmill, there will be an added cost of NRs 30 per cft bringing the final cost to more than NRs 150 per cft.

## Social acceptance

As the portable sawmill is a relatively new technology in Nepal, it is crucial to understand the perception of people with regards to its acceptability. Local people are enthusiastic about the learning process. There were however some positive and negative aspects of the technology expressed by the participants during the testing period.

**Pros:** Mobility of the machine is easier when compared to existing sawmills in the district; it sees the actual size of the logs in accordance to the reading scale and can produce output as per the demand; it produces less dust and excavates only one side which reduces dust pollution; it has very low sound, less likelihood of machinery injury and is easy to load and unload manually; sawn wood pieces are very smooth and have superior finishing as opposed to band saw and the machine is easy to handle after simple training; it produces straight, plane, levelled sawn timber, which can be operated by a layman; the sawmill will be appropriate for sawing more than 1000 cft softwood; lumber and beam saw is faster than band saw and 4, 8, 12 small size beams can produce at a single time which is more efficient in local area.

**Cons:** It requires installation every time it is transported to new areas; it requires regular checking of the bolt, trolley level, clamp, water and fuel; the machine needs high level of care when operating the start button, accelerator, guard and water tank; use of one liter of petrol requires five liters of water which is a little bit difficult to manage for dry areas; larger sized logs, knots and stump logs are a little difficult to saw.

## Management of sawmill (institutional aspects)

Based on the experience gained from the testing and operation of the portable sawmill, it can be argued that the most efficient way of operating portable sawmill is through private sector rather than a community or cooperative model. Its initial cost is higher than ordinary mills and requires technical expertise, which can be handled by private sector rather than collective management. Private sector can register in concerned authorization with citizenship and landowner registration certificate, coordinate with the DFO and other regulatory organizations. The sawmill can be used for business as well as a service model. The role of private sector in portable sawmill business can be important mainly in two ways – transportation of logs from field, and sawing and transportation of sawn timber to homes, a process in which collective and cooperative models may prove to be less effective.

Apart from the private sector, certain modality for instance CFUG's cluster level mechanism comprising of local government, community forest user groups, and FECOFUN or any similar organisations related to forestry sector may work with formation of a core operation team which may run easily in terms of services rather than business purposes. Bagmati Provincial government allows the CFUGs to own and operate the portable sawmills in the community, even in the community forest area. However, this rule applies only for the CFUGs, and may not applicable to the privately owned portable sawmills.

# Challenges (social, legal and technical)

## Social

Portable sawmill is rather a cheaper option than the band saw and other types of locally available saws (circular saw, chain saw, wooden frame saw, buckling or crossing saw). Nowadays, people are trying to saw logs using power chain saw because of the ease of sawing at stumpage point, making it easy for transportation, but end of losing lots of wood. The rural areas are scarce of labour required to load /unload logs from the field. Taking account of hilly terrain and difficult landscape, transportation of logs from farm to sawing station is difficult. Likewise, the quantity of logs to saw also affects the social acceptance in an area where a lower quantity will raise the cost of the sawing process.

Local level construction contractors and circular saw holders are more interested in the sawing process rather than domestic users due to plane, smooth and required size of sawing which affects real users or target group of sawing process (poor, woman-headed households, *Dalit*). Moreover, there should be sufficient amount of logs (more than 500 cft) in a station in order to reduce the cost for installing and transporting a mill from place to place.

## Technical

There are a couple of technical challenges pertinent to portable sawmill. Fueling, starting, blade sharpening, logs clamping, levelling are common regular operations during the sawing process. Key technical challenges are:

- Sharpening of saw blade by local operator feels more difficult with locally available sharpeners where semi-auto sharpeners are expensive (\$2800) and have to be outsourced (India).
- The portable sawmill runs through a petrol-powered engine. Storing the highly inflammable fuel safely in the community requires a lot of care and need to be done with caution.
- Levelling of blade, trolley, logs must be carefully inspected from time to time to lower risks of blade bending, rough sawing and improper size of output products.
- If the carpenter(s) is also the owner (and or operator) of the portable sawmill, it will be an added advantage because carpenters are experienced (and better prepared) to sawing timber as the size people demand.
- The current portable sawmill model requires that levelling, loading/unloading, clamping logs are done manually. Some degree of automation will enhance the efficiency of the machine.
- Detailed knowledge regarding the engine and mobile refueling is necessary for safe and effective use of the machinery.

## Legal

According to the Forest Act 2076 and Forest Regulation 2079, CFUGs can run forest-based enterprise on their own (individually) or in collaboration with the local government, other organisations and private sector. The Bagmati Province Forest Act 2076 also provisions that CFUGs can operate forest-based enterprises according to provision on operational plan. Likewise, Bagmati Province's "Forest based enterprise and distance from forest directive 2077" clarifies that the distance related provision no more exist to operate portable sawmill and can operate through supervision of the DFO and/or SDFO within or outside the forest. Forest Rules in Bagmati Province allows the installation (and operation) of the portable sawmills in the communities and also inside the forest. However, no portable sawmills are registered and operated in the communities yet. So, there may be issues regarding registration, operation and service delivery through portable sawmills when these rules are actually implemented.

Another issue is the legally obtained log from users either from private or community forests, needs to have an authorization letter from the DFO. Most users are unaware about the issuance of such letters in addition to provisions related to payment of taxes to different governments and transportation mechanisms. This has posed risk in terms of having chances of timber being illegal in the eyes of the regulators.

## Conclusion

The output products using portable sawmill are smooth, plane and are if the required size of users. It gives a higher percentage of sawn products, minimum injury hazard, safety for operators. This type of mill reduces cost and time of users, increases quality output and provides door to door services.

Upgrading of the present sawmill with hydraulic system of loading and unloading, movable trolley for machine movement from vehicle (loading/unloading) and fitting of wheels for transportation will reduce the total cost of the sawing process. Pre-informing users at season time will be more beneficial than late hour notification and sawing stations should have pre-fixed spaces where users may store logs in one place while waiting for milling operation. The private sector as well as the community can run this type of mill where legal registration provision is only for CFUGs which may be less effective and involve private sectors. It will be better to saw at least more than 1000 cft logs in one station which reduces the cost of installation, uninstillation and transportation.

## Annexes

### Annex-1 Detailed of logs and sawn timber at testing period.

SN	Species Name	Size of Log			Lumber size				%	LxBxH	no	Vol	time
		L	G	Vol	L	B	H	Vol					
1	Pinus patula	6	42	4.59	6	9	9	3.38	73	9x1x6	9	3.38	21
2	Pinus patula	6	35	3.19	6	8	8	2.67	84	8x1x6	7	2.33	12
3	Pinus patula	6	41	4.38	6	8	8	2.67	61	8x1x6	7	2.33	25
4	Pinus patula	6	36	3.38	6	8	7	2.33	69	3x4x6	4	2.00	20
5	Pinus patula	6	27	1.90	6	5	5	1.04	55	2.5x2.5x6	4	1.04	15
6	Pinus patula	7	30	2.73	7	7	7	2.38	87	3.5x3.5x7	4	2.38	10
7	Pinus patula	6	37	3.57	6	8	8	2.67	75	1x8x6/3x4x6	4(2)	2.33	15
8	Pinus patula	6	30	2.34	6	7	6	1.75	75	6x1x6	6	1.50	19
9	Pinus patula	6	31	2.50	6	7	7	2.04	82	7x1x6/3x4x6	3(2)	1.88	13
10	Pinus patula	6	34	3.01	6	7	7	2.04	68	7x1x6/3x4x6	3(2)	1.87	17
11	Pinus patula	6	28	2.04	6	6	6	1.50	73	1x6x6/3x3x6	3(2)	1.50	16
12	Pinus patula	6	39	3.96	6	9	9	3.38	85	9x1x6	8	3.00	26
13	Pinus patula	6	41	4.38	6	10	9	3.75	86	6x1x6	9	2.25	22
14	Pinus patula	6	36	3.38	6	9	8	3.00	89	8x1x6	8	2.67	22
15	Pinus patula	8	52	9.39	8	12	11	7.33	78	12x1x8	10	6.67	30
16	Pinus patula	6	42	4.59	6	10	9	3.75	82	10x1x6	8	3.33	22
17	Pinus patula	7	39	4.62	7	9	9	3.94	85	9x1x6	8	3.00	22
18	Pinus patula	6	37	3.57	6	8	8	2.67	75	8x1x6	7	2.33	17
19	Pinus patula	6	36	3.38	6	7	7	2.04	60	7x1x6	6	1.75	21

20	Pinus patula	6	35	3.19	6	8	8	2.67	84	9x1x6	7	2.63	20
21	Pinus patula	6	33	2.84	6	7	7	2.04	72	7x1x6	7	2.04	16
22	Pinus patula	6	33	2.84	6	7	7	2.04	72	7x1x7	6	2.04	15
23	Pinus patula	6	38	3.76	6	8	8	2.67	71	8x1x6	7	2.33	15
24	Pinus patula	6	35	3.19	6	8	8	2.67	84	6x1x8	8	2.67	21
25	Pinus patula	6	35	3.19	6	10	7	2.92	91	6x1x7	10	2.92	15
26	Pinus patula	6	43	4.82	6	10	9	3.75	78	6x1x6	10	2.50	17
27	Pinus patula	6	43	4.82	6	10	10	4.17	87	6x1x10	9	3.75	16
28	Pinus patula	6	36	3.38	6	8	7	2.33	69	6x1x7	7	2.04	9
29	Pinus patula	6	42	4.59	6	10	8	3.33	73	6x1x8	9	3.00	21
30	Pinus patula	7	35	3.72	7	8	8	3.11	84	7x4x4	4	3.11	9
31	Pinus patula	7	29	2.56	7	7	7	2.38	93	7x3.5x3.5	4	2.38	6
32	Pinus patula	6	46	5.51	6	10	9	3.75	68	6x1x9	9	3.38	16
33	Pinus patula	6	47	5.75	6	10.5	10	4.38	76	6x1x10.5	9	3.94	18
34	Pinus patula	6	39	3.96	6	10.5	8	3.50	88	6x1x9	9	3.38	14
35	Pinus patula	6	41	4.38	6	8.5	8.5	3.01	69	6x4x4	4	2.67	15
36	Pinus patula	6	40	4.17	6	9	9	3.38	81			0.00	7
37	Pinus patula	6	35	3.19	6	9	7	2.63	82			0.00	5
38	Pinus patula	6	44	5.04	6	12	9	4.50	89			0.00	10
39	Pinus patula	6	45	5.27	6	10	8.5	3.54	67			0.00	10
40	Pinus patula	6	44	5.04	6	10	9	3.75	74			0.00	10
41	Pinus roxburghii	6	33	2.84	6	7	7	2.04	72	6x1x7	6	1.75	10

42	Pinus roxburghii	6	33	2.84	6	8	7	2.33	82	6x1x8	6	2.00	59
43	Pinus roxburghii	6	33	2.84	6	8	7	2.33	82	6x1x7	6	1.75	15
44	Pinus roxburghii	6	34	3.01	6	7	7	2.04	68	6x1x7	6	1.75	13
45	Pinus roxburghii	6	30	2.34	6	7	6	1.75	75	6x1x6	6	1.50	13
46	Pinus roxburghii	8	33	3.78	8	7	7	2.72	72	8x1x7	6	2.33	12
47	Pinus roxburghii	9	24	2.25	9	5	5	1.56	69			0.00	6
48	Pinus roxburghii	9	24	2.25	6	7	6	1.75	78			0.00	5
49	Pinus roxburghii	6	32	2.67	6	7	6	1.75	66	6x1x6	6	1.50	15
50	Pinus roxburghii	6	33	2.84	6	7	7	2.04	72	6x1x7	6	1.75	8
51	Pinus roxburghii	6	28	2.04	7	6	5	1.46	71			0.00	7
52	Pinus roxburghii	6	31	2.50	6	7	6	1.75	70	6x1x6	6	1.50	9
53	Pinus roxburghii	7	28	2.38	7	6	6	1.75	73			0.00	6
54	Pinus roxburghii	10	32	4.44	10	7	6	2.92	66	10x3x3	4	2.50	10
55	Pinus roxburghii	8	31	3.34	8	7	6	2.33	70	8x1x6	6	2.00	14
56	Pinus roxburghii	8	35	4.25	8	8	7	3.11	73	8x1x8	6	2.67	10
57	Pinus roxburghii	8	33	3.78	8	7	6	2.33	62	8x1x6	6	2.00	8
58	Schima wallichina	6	30	2.34	6	6	6	1.50	64	6x1.5x6	4	1.50	15
59	Schima wallichina	6	33	2.84	6	7	6	1.75	62	6x1.5x6	4	1.50	5
60	Lakuri	8	37	4.75	8	9	8	4.00	84	8x1x9	7	3.50	18
61	Pinus roxburghii	9	39	5.94	9	8	8	4.00	67	9x1x8	7	3.50	14
62	Pinus roxburghii	8	36	4.50	8	9	8	4.00	89	8x1x8	8	3.56	10
63	Pinus roxburghii	6	30	2.34	6	6	6	1.50	64			0.00	4
64	Pinus roxburghii	6	32	2.67	6	6	6	1.50	56			0.00	4

65	Pinus roxburghii	6	27	1.90	6	6	5	1.25	66			0.00	4
66	Pinus roxburghii	6	26	1.76	6	6	5	1.25	71			0.00	4
67	Pinus roxburghii	6	30	2.34	6	6	6	1.50	64			0.00	14
68	Pinus roxburghii	6	30	2.34	6	6	6	1.50	64			0.00	6
69	Pinus roxburghii	6	30	2.34	6	6	6	1.50	64			0.00	4
70	Pinus roxburghii	6	29	2.19	6	6	6	1.50	68			0.00	4
71	Pinus roxburghii	6	27	1.90	6	6	5	1.25	66			0.00	2
72	Pinus roxburghii	6	26	1.76	6	6	5	1.25	71			0.00	3
73	Schima wallichina	6	24	1.50	6	5	5	1.04	69			0.00	3
74	Pinus roxburghii	6	33	2.84	8	6	6	2.00	71			0.00	10
	Total			252.73				189.09	75			0.00	994

## Annex-2 Detailed of logs and sawn timber at operation period

SN	Name of Client	Address	Wood Species	Types of logs	No of Logs	Total Quantity cft	Sawn wood cft	% of Sawn wood	Time period Minutes
1	Ratna Bahadur Shrestha	Ward no 13	Roxburghii	Private	22	74	53	72	275
2	Anju Shrestha	Ward no 13	Patula	Private	11	36	27	75	139
3	Bhim Bahadur Nepali	Ward no 13	Roxburghii	CFUG	42	122	87	71	376
4	Resham Bahadu Thapa	Ward no 13	Roxburghii	CFUG	6	19	13	68	54
5	Sanu kaji Rokka	Ward no 13	Roxburghii	CFUG	13	46	31	67	130
6	Dhan Bahadur Nepali	Ward no 13	Roxburghii	CFUG	20	54	38	70	220
7	Hari Bahadur Thapa	Ward no 13	Lapsi, Chilaune, Katus	Private	6	41	28	68	125
8	Mohan Gahatraj	Ward no 13	Chilaune	Private	5	17	12	71	51
9	Raju Shrestha	Ward no 13	Roxburghii	CFUG	24	82	59	72	245
10	Maila Tamang	Ward no 13	Mauwa, Salla	Private	4	7	5	71	34
11	Man Bahadur Nepali	Ward no 13	Roxburghii	Private	9	33	22	67	103
12	Ramhari Thapa	Ward no 13	Roxburghii	Private	28	63	45	71	184
13	Indra Rokka	Ward no 13	Roxburghii	CFUG	6	33	23	70	104
14	Guna Bahadur Giri	Ward no 13	Roxburghii	CFUG	11	49	34	69	152
15	Gyani Maya Tamang	Ward no 13	Patula	CFUG	9	46	36	78	139
16	Ratna Bahadur Rokka	Ward no 13	Kadam	Private	4	10	7	70	29
17	Som Bahadur Shrestha	Ward no 13	Roxburghii	CFUG	24	80	54	68	246
18	Rita Rokka	Ward no 13	Roxburghii	CFUG	11	39	27	69	116
19	Sukbir Shrestha	Ward no 13	Patula	Private	9	45	33	73	133
20	Ganga Bahadur Shrestha	Ward no 13	Lapsi, Chilaune, Katus	Private	8	54	42	78	144
21	Min Bahadur Sunar	Ward no 13	Roxburghii	Private	8	32	21	66	102
22	Laxmi Shrestha	Ward no 13	Roxburghii	CFUG	13	54	37	69	167
23	Rohit Nepali	Ward no 13	Roxburghii	CFUG	7	32	21	66	99
24	Dilip Nepali	Ward no 13	Roxburghii	CFUG	14	45	33	73	143
25	Suman Nepali	Ward no 13	Patula	CFUG	14	78	62	79	213

26	Dhan Bahadur Nepali	Ward no 13	Roxburghii	CFUG	21	65	47	72	193
27	Pawan Thapa	Ward no 13	Patula	Private	4	29	22	76	82
28	Nirmal Thapa	Ward no 13	Patula	Private	3	17	13	76	49
29	Saroj Thapa	Ward no 13	Roxburghii	Private	7	19	13	68	62
30	Ramesh Rokka	ward no 13	Roxburghii	CFUG	9	23	16	70	72
31	Deepak Rokka	Ward no 13	Patula	Private	2	10	7	70	27
32	Dil Bahadur Rokka	Ward no 13	Roxburghii	Private	5	14	10	71	46
33	Ashok Rokka	Ward no 13	Patula	Private	4	15	11	73	43
34	Topin Rokka	Ward no 13	Lapsi	Private	2	12	8	67	27
35	Indra Rokka	Ward no 13	Patula	Private	7	25	19	76	70
36	Hirendra Giri	Ward no 13	Roxburghii	CFUG	14	32	22	69	104
37	Krishna Gopal Sarki	Ward no 13	Roxburghii	CFUG	11	25	17	68	78
38	Deb Bahadur Thapa	Ward no 13	Patula	Private	3	12	9	75	35
39	Sapana Thapa	Ward no 13	Patula	Private	5	23	17	74	67
40	Januka Giri	Ward no 13	Roxburghii	CFUG	9	21	15	71	67
41	Bijaya Tamang	Ward no 8	Patula	CFUG	6	23	17	74	66
42	Ran Bahadur Rokka	Ward no 8	Chilaune	Private	2	12	8	67	30
43	Arati shrestha	Ward no 8	Lapsi, Chilaune, Katus	Private	7	24	16	67	78
44	Raju Tamang	Ward no 8	lapsi	Private	2	8	6	75	18
45	Kumar Nepali	Ward no 8	Patula	Private	3	12	8	67	34
46	Saroj Karki	Ward no 8	Patula	CFUG	7	32	24	75	92
47	Sarada Shrestha	Ward no 8	Roxburghii	Private	9	22	15	68	69
48	Dhana Laxmi Shrestha	Ward no 8	Roxburghii	Private	4	13	9	69	45
49	Ram Bahadur Dulal	Ward no 8	Patula	Private	3	12	9	75	34
50	Sita Thapa	Ward no 8	Patula	Private	4	17	13	76	48
51	Minimaya Tamang	Ward no 8	Patula	Private	9	20	14	70	67
52	Relimaya Tamang	Ward no 8	Patula	CFUG	24	110	81	74	340
53	Rinjin Lama	Ward no 8	Patula	Private	8	11	8	73	40
54	Hari Bahadur Shrestha	Ward no 8	Patula	Private	2	10	7	70	29
55	Dal Bahadur Shrestha	Ward no 8	Roxburghii	CFUG	13	41	28	68	126
56	Pramila Shrestha	Ward no 8	Chilaune	Private	2	9	6	67	31
57	Tirtha Bahadur Shrestha	Ward no 8	Roxburghii	Private	3	9	6	67	32

58	Dhan Bahadur Shrestha	Ward no 8	Roxburghii	Private	5	17	12	71	54
59	Amrit Shrestha	Ward no 8	Roxburghii	CFUG	14	40	28	70	126
60	Umesh Shrestha	Ward no 8	Roxburghii	Private	3	8	5	63	27
61	Puskar Shrestha	Ward no 8	Roxburghii	CFUG	13	29	21	72	108
62	Udaya bahadur Nepali	Ward no 8	Roxburghii	CFUG	11	30	22	73	102
63	Hari Bahadur Thapa	Ward no 8	Roxburghii	CFUG	8	20	14	70	62
64	Sabina Rokka	Ward no 8	Roxburghii	CFUG	13	30	21	70	92
65	Lekh Kumar Shrestha	Ward no 8	Roxburghii	Private	6	15	11	73	55
66	Bhim Bahadur Nepali	Ward no 8	Roxburghii	CFUG	12	32	23	72	98
67	Khem Bahadur Giri	Ward no 8	Roxburghii	CFUG	7	23	16	70	73
68	Kumar Shrestha	Ward no 8	Roxburghii	CFUG	26	67	47	70	210
69	Subba Sarki	Ward no 8	Roxburghii	Private	7	19	13	68	68
70	Saroj Shrestha	Ward no 8	Roxburghii	Private	4	12	8	67	43
71	Man Bahadur Nepali	Ward no 8	Roxburghii	CFUG	7	21	14	67	67
72	Ramhari Shrestha	Ward no 8	Roxburghii	Private	4	12	8	67	37
	Total		Total		682	2293	1634	72	7146

## Annex-3 Photo plates



**Loading mill**



**Establishing mill**



**On sawing process**



**Stacking of saw wood**



**On sawing process**



**Re installation on new sites**