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## Research Article

# Distribution, Species Composition and Use of *Buchanania latifolia* in Banke District, Nepal

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### Abstract

**Background and Objective:** *Buchanania latifolia* is one of the important tree species in Terai. The seeds of this species can be used to produce commercially valuable oils. Thus, this will be a handsome source of income for local people but there is not any research regarding this in Nepal. Thus, this study was objectively conducted to show its distribution, status and use. **Materials and Methods:** This research was done in eight community forests of Banke District, Nepal. Total 90 plots were established having 25×20 m for the tree, 10×10 m for pole and 5×5 m for regeneration in the field to collect primary data. The diameter at breast height and height of the tree was measured, associated species were listed. The GPS coordinates of the location of this species in the forest were recorded to show its distribution. Moreover, the key informant interview and focus group discussion were conducted to know its distribution, status and use and analyzed. The density and volume were calculated. The distribution map was prepared. Descriptive analysis was done to analyze the collected data. **Results:** The result showed that *Shorea robusta*, *Terminalia alata*, *Lagerstroemia parviflora*, *Dillenia pentagyna*, *Terminalia bellirica* and *Terminalia chebula* were the most common associate species of *Buchanania latifolia* in CFs. The highest volume was around  $0.826 \pm 0.045$  m<sup>3</sup>/stem in Madhu community forest. About 2-3 tons of seed may be collected every year from all CFs. The seed collection of this species together with *Aegle marmelos* (Bael), *Ziziphus mauritiana* (Bayar), *Phyllanthus emblica* (Amala), *Terminalia chebula* (Harro) and *Terminalia bellirica* (Barro) may be cost effective. **Conclusion:** Herder can generate about NPR 200-300 per day for 3 months as a side business so over 6000 employment may be created. The timber can be used for soft furniture, madal, plough materials, paduka and seeds as edible oil.

**Key words:** *Buchanania latifolia*, fruit, seeds, oil, community forests

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**Competing Interest:** The authors have declared that no competing interest exists.

**Data Availability:** All relevant data are within the paper and its supporting information files.

## INTRODUCTION

The tress species offers multiple benefits to human beings. These benefits are social, economic and environmental<sup>1</sup>. The social benefits are people use the tree for timber, firewood, fodder and religious purpose. However, some tree species are very important for fruits and oil extraction. *Buchanania latifolia* is socially important because people like to eat its fruit and seed can be used for oil preparation. Fruits and oil production can be helpful to generate income for the community at the local level. Because of dominance in the forest, it has high environmental importance. So, this species will be a handsome source of income<sup>2</sup>. *Buchanania latifolia* was first time introduced by Carl Ludwig Blume in 1826 when the plant specimens were collected from Java, Indonesia. In the beginning, this was named *Coniogeton arborescens* but Blume claimed under genus *Buchanania* in 1850, according to its matching characteristics. *Buchanania latifolia* belongs to the Sapindales order, Anacardiaceae family and Anacardioidae subfamily<sup>3</sup>. The fruit of this species is named Chironji nut. The leaves are spirally arranged, smooth, leathery, elongated oblong and 5-26 cm long. The flowers are very small cream to yellowish-white. The edible fruit is globular, small (1 cm long), reddish to purple-black. The pigeons, other birds and animals preferred this fruit most<sup>4</sup>.

Forest is the source of wood, fruits, fodder, litter and other many products<sup>5</sup>. Indeed, *Shorea robusta* and *Terminalia alata* are dominant species in Terai, Nepal and their economic value is very high<sup>6</sup>. However, there are some dominant plant species such as *Buchanania latifolia* and its value is ignored yet. So, it is essential to explore the product use of such plant species. The innovation can create the opportunity in science for human being<sup>7,8</sup>. So it is essential to explore the value of plant species and their use according to changing contexts.

There are several important plant species in Nepal but their value and use are still unknown<sup>9</sup>. *Buchanania latifolia* is widely distributed in the Terai Districts of Nepal<sup>10</sup>. Its distribution is in tropical areas in general<sup>11</sup>. These species create a very good association with other economically high-value species like *-Shorea robusta* and *Terminalia alata*. The kernel of *Buchanania latifolia* is very useful for the production of low-cost vegetable oil. This oil may be the alternative product of mustard and other expensive oil. However, no research has been done regarding this so far in Nepal. This species is dominantly distributed in the lower part (Terai) of Nepal<sup>12</sup> but the geographical distribution of this species is still unknown. At the same time, the species composition and growing stock are also unknown. Moreover, this species is considered a low-value species. There is very

limited use of the product of this species. In this context, a study related to this is important. Thus, this study was objectively conducted to assess the distribution, status and use of *Buchanania latifolia*.

## MATERIALS AND METHODS

**Site description:** Banke District was selected as a study site. The area of Banke Districts is 2,337 km<sup>2</sup> and with a population of 491,313 in 2011. The latitude and longitude of the Banke District is 28.1461°N and 81.7787°E. The elevation of the study area ranges between 153-1,247 m above mean sea level. The mean maximum temperature is around 40°C in Summer but drops to very low during winter. There are four seasons particularly, Monsoon (June to September: The wet season with abundant rainfall), Autumn (October to November), Dry winter (December to February) and Spring (March to May). This district is home to eight ecosystem types namely *Shorea robusta* forest, deciduous riverine forest, savannas and grasslands, mixed hardwood forest, floodplains, Bhabar and foothills of Churerange<sup>13</sup>.

This study was conducted in eight community forests of Banke Districts for primary data collection. The detailed field data were collected from Jankalyan, Harilatha, Trishakti, Siddha Sai Kumari, Hariyali, Madhu, Janamukhi and Jaya Durga community forests in Table 1. However, the secondary information particularly, the species distribution and possible collection quantity of seed from other community forests were also collected.

**Data collection and analysis:** Systematic sampling was conducted to collect the data from the field<sup>14,15</sup>. A rough map was prepared of the community forest and the location of the *Buchanania latifolia*. Then, the survey was done to prepare the map and the location of this species was distributed on it. The exact location of this species was noted using the GPS receiver. A total of 90 sample plots were established in the field to collect the biophysical data from community forests. The plots were laid at 25×20 m for the tree, 10×10 m for pole and 5×5 m for regeneration in the field. The diameter and height of the plants were measured, the species were noted and several plants in the plants were counted. The data collection sheet was developed to collect the field data. The GPS coordinates showing the location of *Buchanania latifolia* in the community forests and other information were also gathered from the operational plan. Besides, the list of community forests was prepared and committee members were interviewed via telephone whether *Buchanania latifolia* is available in their community and how much seed can be collected. The data were collected from 9-28, February, 2020.

Table 1: List of selected community forests

Community forest	Area (ha)	Household number	Types	Remarks
Jankalyan	245.71	201	Natural	
Haralantha	115.27	202	Natural	
Trishakti	177.27	149	Natural	
Siddha Sai Kumari	197.89	145	Natural	
Hariyali	123.85	172	Natural	
Madhu	240.05	205	Mixed	
Janmukhi	434.64	207	Mixed	
Jaya Durga	488.90	206	Natural	

**Informant interview:** The experts specifically forestry professionals were interviewed to know the use of this product. So, a checklist was prepared to gather information regarding this species<sup>16</sup>.

**Group discussion:** Especially focused on collecting information regarding the availability of *Buchanania latifolia* Roxb. and its use in daily life<sup>17</sup>. It was done on Sunday, 9 February, 2020. Altogether 16 participants have participated in this workshop. Out of these two were female and the rest of them was male participants. Some of the participants were officials as well.

**Data analysis:** Collected data were analyzed using descriptive and inferential statistics. The distribution map of the species was prepared using GPS coordinates for the location of the species. The status was assessed by calculating the growing stock and the descriptive and inferential statistical analysis was done to find the product use of plant species. Following formulae were applied to estimate the growing stock<sup>18</sup>.

$$\text{Basal area (BA)} = \frac{\pi(\text{DBH})^2}{4}$$

$$\text{Volume} = \text{Basal area} \times \text{height} \times \text{form factor}$$

$$\text{Density} = \frac{\text{Number of plants}}{\text{Area (ha)}}$$

## RESULTS

### Distribution of *Buchanania latifolia*

**Distribution map of *Buchanania latifolia* in community forests:** The detailed survey and stem mapping of *Buchanania latifolia* was done insight of community forests specifically Hariyali, Haralantha, Trishakti, Harisiddhi, Jankalyan, Madhu, Jaya Durga and Janmukhi community forest. This species is well distributed in the community forests. However, there are sparse distributions of this species in some parts of the community forests.

### Average diameter, height and crown of *Buchanania latifolia* in community forests:

The highest DBH  $35.92 \pm 0.66$  cm of *Buchanania latifolia* was recorded in Madhu community forest but it was the lowest  $11.43 \pm 0.23$  in Siddha Sai Kumari community forests. Similarly, the highest record  $15.99 \pm 0.45$  m of the height of the tree was found in Janmukhi community forest slightly greater than of Janmukhi community forest  $15.63 \pm 0.31$  m but it was the lowest  $10.68 \pm 0.24$  m in Siddha Sai Kumari community forest. The crown diameter was the highest at  $7.35 \pm 0.19$  m in Jaya Durga community forest but it was the lowest at  $4.23 \pm 0.04$  m in Siddha Sai community forest in Table 2.

### Statistical comparison of DBH distribution of *Buchanania latifolia*:

One way ANOVA showed that there were significant differences in average values of diameter, height and crown diameter of *Buchanania latifolia* among eight community forests of Banke Districts at 95% confidence level. Moreover, Tukey's b Test showed that there was a significant difference in the average diameter of *Buchanania latifolia* of Siddha Sai Kumari, Jaya Durga and Madhu community forests with others at a 95% confidence level. The Tukey's b Test showed that there was no significant difference in the average height of *Buchanania latifolia* among Siddha Sai Kumari, Janmukhi, Jaya Durga and Madhu community forest but the values have differed with Trisakti and Jankalyan community forest at 95% confidence level. The Tukey's b Test showed that there was a significant difference in crown diameter of *Buchanania latifolia* between some community forests such as this value of Trishakti community forest was significantly differed at 95% confidence level with this value of other community forests.

### Composition of *Buchanania latifolia* in community forests:

*Buchanania latifolia* always comes in association with the other plant species in the tropical forest in Terai and that was also found in most of the community forest of Banke District. More than 22 species were found as associate species in the community forests. The *Shorea robusta*, *Terminalia alata*, *Lagerstroemia parviflora*, *Dillenia pentagyna*, *Terminalia bellirica* and *Terminalia chebula* were the most common species in the community forests in Table 3.

### Growing stock of *Buchanania latifolia* in community forests

**Volume distribution:** The average volume per stem of *Buchanania latifolia* was varied in different community forests. The highest record was found around  $0.826 \pm 0.045$  m<sup>3</sup>/stem

Table 2: Summary of DBH, height and crown diameter of *Buchanania latifolia*

CFS	Diameter (cm)				Height (m)				Crown dia (m)			
	Average±SE	SD	Max	Min	Average+SE	SD	Max	Min	Average+SE	SD	Max	Min
Jankalyan	31.62±0.63	5.43	43.98	19.42	14.38±0.37	3.22	19.00	8.00	6.09±0.11	0.98	8.10	4.50
Haralatta	28.15±0.49	7.09	56.02	13.05	11.33±0.21	2.95	17.00	4.00	5.78±0.08	1.15	8.70	3.80
Trishakti	21.24±0.69	4.23	28.60	12.70	10.68±0.24	1.47	8.00	5.00	4.42±0.06	0.39	5.10	3.80
Siddha Sai Kumari	11.43±0.23	1.99	18.79	9.55	15.57±0.33	2.88	19.00	5.00	4.23±0.04	0.32	5.10	3.80
Hariyali	27.61±0.35	6.62	57.15	12.92	11.51±0.15	2.80	20.00	2.00	5.92±0.07	1.31	8.30	3.50
Madhu	35.92±0.66	5.74	63.38	29.94	15.63±0.31	2.73	24.00	10.00	7.09±0.06	0.55	7.80	6.20
Janmukhi	28.80±1.49	12.28	7.50	6.90	15.99±0.45	3.71	23.00	7.00	5.87±0.20	1.67	9.60	2.70
Jaya Durga	24.06±0.56	6.85	96.00	41.50	14.51±0.31	3.73	25.00	1.00	7.35±0.19	2.32	13.00	2.00

Table 3: Species composition in the community forests

Local name	Scientific name	Jankalyan	Haralantha	Trishakti	Siddha Sai Kumari	Hariyali	Madhu	Janmukhi	Jaya Durga
Sal	<i>Shorea robusta</i>	✓	✓	✓	✓	✓	✓	✓	✓
Asna	<i>Terminalia alata</i>	✓	✓	✓	✓	✓	✓	✓	✓
Dhauti	<i>Anogeissus latifolia</i>	✓	✓	✓	✓	✓	✓	✓	✓
Thateri	<i>Dillenia pentagyna</i>	✓	✓	✓	✓	✓	✓	✓	✓
Botdhairo	<i>Lagerstroemia parviflora</i>	✓	✓	✓	✓	✓	✓	✓	✓
Tendu	<i>Diospyros malabarica</i>	✓	✓	×	✓	✓	×	✓	×
Amaro	<i>Spondias pinnata</i>	×	✓	✓	×	✓	✓	✓	×
Pyari	<i>Buchanania latifolia</i>	✓	✓	✓	×	✓	×	✓	✓
Kali	<i>Phyllanthus nepalensis</i>	✓	×	✓	✓	✓	✓	✓	×
Mainfal	<i>Catunaregam spinosa</i>	×	✓	×	✓	×	✓	×	✓
Kumbhi	<i>Careya arborea</i>	✓	×	✓	✓	✓	✓	✓	✓
Bayar	<i>Ziziphus mauritiana</i>	✓	✓	✓	×	×	✓	×	✓
Barro	<i>Terminalia bellirica</i>	✓	✓	✓	✓	✓	✓	✓	✓
Bhalayo	<i>Semecarpus anacardium</i>	✓	✓	✓	✓	✓	✓	✓	✓
Rohini	<i>Mallotus philippensis</i>	✓	✓	✓	✓	✓	✓	✓	✓
Jamun	<i>Syzygium cumuni</i>	✓	✓	✓	✓	✓	✓	✓	✓
Karma	<i>Adina cordifolia</i>	✓	✓	✓	✓	✓	✓	✓	✓
Kushum	<i>Schleichera oleosa</i>	✓	✓	✓	✓	✓	✓	✓	✓
Sadan	<i>Desmodium oojeinense</i>	✓	×	×	✓	✓	×	✓	×
Saisal	<i>Dalbergia latifolia</i>	×	✓	×	✓	×	✓	✓	✓
Siris	<i>Albizia procera</i>	✓	✓	✓	✓	✓	✓	✓	✓
Tanki	<i>Bauhinia variegata</i>	✓	✓	✓	✓	✓	✓	✓	✓
Tekui	<i>Mitragyna parviflora</i>	✓	✓	✓	×	✓	✓	✓	✓

Table 4: Volume of *Buchanania latifolia* in community forests

Variable	Jankalyan	Haralantha	Trishakti	Siddha Sai Kumari	Hariyali	Madhu	Janmukhi	Jaya Durga
Mean±SE (m <sup>3</sup> )	0.283±0.017	0.403±0.018	0.198±0.013	0.083±0.004	0.389±0.014	0.826±0.045	0.637±0.070	0.384±0.023
Standard deviation	0.143	0.258	0.083	0.038	0.270	0.395	0.576	0.282
Sample variance	0.020	0.067	0.007	0.001	0.073	0.156	0.332	0.079
Minimum	0.049	0.042	0.051	0.019	0.052	0.414	0.022	0.013
Maximum	0.559	1.342	0.353	0.222	2.564	2.680	3.256	1.508

One-way ANOVA showed that there was a significant difference in the mean value of volume per stem of *Buchanania latifolia* in the community forest at 95% confidence level since the p<0.05

in Madhu community forest while it was the lowest about 0.083±0.004 m<sup>3</sup>/stem in Siddha Sai Kumari. The highest maximum volume was recorded at 3.256 m<sup>3</sup>/stem in Janmukhi community forest while the lowest minimum volume was recorded at around 0.013 m<sup>3</sup>/stem in Jaya Durga community forests in Table 4.

The biomass per stem was varied in the community forests. The highest value was recorded around

0.413±0.023 ton/stem of *Buchanania latifolia* in Madhu community forests while it was the lowest 0.042±0.002 ton/stem in Siddha Sai Kumari community forest. The highest maximum biomass was recorded at 1.628 ton/stem in the Janmukhi community forest. On the other hand, the lowest minimum biomass was recorded 0.007 ton/stem in Jaya Durga community forest in Table 5.

Table 5: Biomass of *Buchanania latifolia* in the community forests

Statistics	Jankalayan	Haralaththa	Trishakti	Siddha Sai Kumari	Hariyali	Madhu	Janamukhi	Jaya Durga
Mean ± SE (ton)	0.141 ± 0.008	0.202 ± 0.009	0.099 ± 0.007	0.042 ± 0.002	0.194 ± 0.023	0.413 ± 0.023	0.319 ± 0.035	0.192 ± 0.012
Standard deviation	0.071	0.129	0.042	0.019	0.197	0.197	0.288	0.141
Sample variance	0.005	0.017	0.002	0.000	0.039	0.039	0.083	0.020
Minimum	0.024	0.021	0.025	0.010	0.207	0.207	0.011	0.007
Maximum	0.280	0.671	0.177	0.111	1.340	1.340	1.628	0.754

One-way ANOVA showed that there was a significant difference in average biomass per stem of *Buchanania latifolia* among the community forests at a 95% level of confidence since the  $p < 0.05$ . Moreover, Tukey's b Test showed that there was a significant difference between biomass per stem of *Buchanania latifolia*. The biomass of Haralanththa and Madhu significantly differed from another community forest at a 95% level of confidence. This has also differed from the Trishakti community forest

Table 6: Tree typical area of *Buchanania latifolia* in the community forest

Description	Jankalyan	Haralanththa	Trishakti	Siddha Sai Kumari	Hariyali	Madhu	Janmukhi	Jaya Durga
Mean ± SE (m <sup>2</sup> )	29.82 ± 1.15	27.29 ± 0.77	15.48 ± 0.44	14.15 ± 0.25	28.91 ± 0.65	46.61 ± 2.22	29.23 ± 1.94	39.72 ± 0.69
Standard deviation	9.90	10.99	2.73	2.23	12.31	6.01	15.97	26.95
Sample variance	97.92	120.72	7.43	4.95	151.45	36.11	254.94	726.44
Minimum	15.90	11.34	11.34	11.34	9.62	30.18	5.72	3.14
Maximum	51.50	59.42	20.42	20.42	54.08	132.67	72.35	47.76

Table 7: Potential collection of kernel of *Buchanania latifolia* from the community forest

Institution (community forest)	Potential kernel collection quintal (ton/year)	Remarks
Jay Durga Bhawani CF	3-4	Collection by herder with other species will be effective
Siddha Sai CF	2-3	
Tri Shakti CF	2	
Janmukhi CF	3-4	
Madhu CF	4-5	
Jankalyan CF	4-5	
Hariyali CF	5-6	
Haralanththa CF	4-5	

**Tree typical area:** Tree typical area per stem of *Buchanania latifolia* was varied according to community forests. The highest record of tree typical area of *Buchanania latifolia* was  $46.61 \pm 2.22$  m<sup>2</sup> in Madhu community forest while this was the least  $14.15 \pm 0.25$  m<sup>2</sup> in Siddha Sai Kumari community forest. The highest maximum value was 132.67 m<sup>2</sup> in the Madhu community forest while the lowest value of tree typical area was 20.42 m<sup>2</sup> in both Trishakti and Siddh Sai Kumari community forests. The highest minimum value was 30.18 m<sup>2</sup> in Madhu community forest and the lowest minimum value was recorded at 3.14 m<sup>2</sup> in the Jaya Durga community forest in Table 6.

**Collection of *Buchanania latifolia* and its use and proposed royalty:**

**Availability of *Buchanania latifolia*:** The interaction workshop was carried out with the users of community forest, traders and government staff to know the availability and collection of *Buchanania latifolia*. Altogether there are 89 community forests, block forests and national parks where this species is abundantly available so the seed of this species can be collected in the season. If 2-3 ton of seed is collected from one community forest, total of 74 community forests are

potential to collect so around 158-222 ton of seed of *Buchanania latifolia* can be collected. In fact, *Buchanania latifolia* is generally found in Terai as well as the Chure, Bhawar and Inner Terai as well in Table 7.

The participants of the interaction workshop suggested that the labour cost of seed collection of this species only may be expensive. Thus, it will be better to collect the seed using the herder (cow and goat herder) who will have a side business to generate the income through collection and selling of seed of *Buchanania latifolia*. If the seed of this species is collected together with *Aegle marmelos* (Bael), *Ziziphus mauritiana* (Bayar), *Phyllanthus emblica* (Amala), *Terminalia chebula* (Harro), *Terminalia bellirica* (Barro) and kernel of this species should be collected together then earnings will be worthful for their livelihood promotion as well. In addition, the students in vacation time can collect the kernel of *Buchanania latifolia*. It is expected that the collector can earn about NPR 200-300 per day for 3 months. So, this may create the employment opportunity for over 6000 man-days if the collection is concentrated only in the community forests, though this can be collected from block forests and national parks as well.

One of the important aspects of the workshop was to find the existing and potential use of this species. The results showed that there are several uses of this species but there was no commercial use of this:

- Timber is very soft so, it can be used to prepare musical instruments like Madal (Nepali musical instrument)
- Timber can also be used for Paduka (wooden sandal) because it is very light in weight
- Timber can also be used for some light furniture and materials of the plough for farmers
- Leaves are useful for fodder for animals and goats, especially in the dry season where the grass is almost unavailable
- Fruits are very tasty and people eat it and comparing with the fruits of *Myrica esculenta* (Kafal)

In addition, the participant of the workshop suggested that the kernel of the fruit of *Buchanania latifolia* can be used for oil production. The oil can be used in several types of medicines. One of the participants shared that the seed oil of this species is edible and it will be cheaper than the mustard, sunflower and other oil. The kernel can be processed to produce valuable oils. Thus, the oil production is high potentiality from the kernel of the fruit of this species.

Kinds of literature like the forest act showed that there was some provision of royalty of timber and non-timber forest products in Nepal. This royalty of timber is not included in the list so this is considered as the miscellaneous species. Similarly, the royalty of fruit and leaves of this species is also not included in non-timber forest products. The interaction workshop suggested that it will be better the government decide the royalty of seed this species. It will be better to charge NPR 1 per kg in the beginning. This can be modified according to the trade status of this species.

## DISCUSSION

The *Buchanania latifolia* was dominantly found in the community forests of Banke District. The tropical Terai, Inner Terai and Chure areas are the appropriate habitats of this species<sup>19</sup>. The climate like 20-25°C in summer season 10°C and below this, around 1200-1500 mm rainfall are most favourable habitat for this species<sup>9</sup>. The forest soil is very rich in nutrient content and carbon as well. The fertile soil is favourable for this species<sup>20</sup>.

The diameter, height and crown distribution of any species shows the health condition of the species<sup>21,22</sup>. The highest DBH 35.92±0.66 cm of *Buchanania latifolia* was

recorded in Madhu community forest but it was the lowest 11.43±0.23 in Siddha Sai Kumari community forests. Similarly, the highest record 15.99±0.45 m of the height of the tree was found in Janmukhi community forest slightly greater than of Janmukhi community forest (15.63±0.31 m) but it was the lowest 10.68±.24 m in Siddha Sai Kumari community forest. The crown diameter was the highest at 7.35±0.19 m in Jaya Durga community forest but it was the lowest at 4.23±0.04 m in Siddha Sai community forest. These indicators show the health and availability of this species in community forests. The community forests, block forests and Banke national park will be a major source of seed collection of this species.

Associate species play a significant role in the composition of the plant species<sup>23</sup>. *Shorea robusta* was found to be dominant in all felling series which was followed by *Terminalia alata*, *Lagerstroemia parviflora* Roxb., *Terminalia bellirica* of natural forest in Kapilvastu District. The *Buchanania latifolia* was one of the important species in the forest<sup>24</sup>. A similar study done by several authors also found that, *Shorea robusta*, *Terminalia alata*, *Lagerstroemia parviflora* are the associate species of *Buchanania latifolia*<sup>25-27</sup>.

There are several use *Buchanania latifolia* in different countries and Nepal and one of the important use is medicinal purposes as well<sup>28</sup>. The study done in the Bardiya District related to the use of non-timber forest products showed that this species is also used as a non-timber forest product. Saroni *Buchanania latifolia* is one of the important non-timber forest products and this can be used as medicine as well<sup>29</sup>. Collection and trade of Non-Timber Forest Products (NTFPs) are a handsome source of income<sup>30,31</sup>.

Most of the people in the workshop shared that, the fruit of this species is edible and very sweet. They shared that the taste of the fruit of this species is similar to *Myrica esculenta* (Kafal). Therefore, they used this as an edible fruit. A similar finding was found in the study done in Bardiya District stating that there are many edible wild fruits in the natural forest and is one of the tasty fruit species in district<sup>25</sup>. The fruit of this species is very sweet and tasty<sup>29</sup>.

## CONCLUSION

This species is widely distributed in the community forest and block forest in the Banke District. Mostly, the plant species in this community forest was sapling and pole staged. The Diameter, height and crown diameter showed the small to medium-sized plant of *Buchanania latifolia* in the community forests. The *Shorea robusta*, *Terminalia alata*, *Lagerstroemia parviflora*, *Dillenia pentagyna*, *Terminalia bellirica* and

*Terminalia chebula* were the most common associate species in the community forests of Banke District. The community forest users and traders opined that this species is dominantly available so the kernel can be collected and traded for income generation to support the livelihood promotion of the local people. The herders can collect the seed of this species together with other non-timber plant species. Some of the important uses of this species are timber for Madal and Paduka preparation leaves for fodder in the dry season and fruits for eating. The kernel of *Buchanania latifolia* fruit can be processed to produce commercially valuable oils. Thus, the oil production is high potentiality from the kernel. Similar type of study is needed to carry out in other districts of Terai, Inner Terai and Chure area.

### SIGNIFICANCE STATEMENT

This study is one of the important innovations in forest science. The oil of *Buchanania latifolia* will be used as an oil for domestic purposes as well as industrial purpose. Thus, this can create the opportunity for income generation for the rural community. The policymaker and scientific community will use this paper for policy formulation and academic materials, respectively.

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