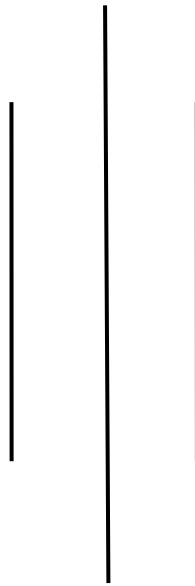


**Final Report**

**Identification and Mapping the Pocket Areas of  
Medicinal Plants in Gandaki Province**



Provincial Government  
Ministry of Forest, Environment and Soil Conservation  
**Forest Research and Training Centre**  
Pokhara, Kaski, Gandaki Province  
June, 2021

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Citation:

FRTC, 2021. Identification and Mapping the Pocket Areas of Medicinal Plants in Gandaki Province, Forest Research and Training Centre (FRTC), Pokhara, Gandaki Province.

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## Abstract

Gandaki Province is rich in biological resources. Its more than 37 % area is covered with forests. Apart from these, High Mountain regions of this province cover lot of shrublands and grasslands. This High Mountain region of the province hosts innumerable valuable medicinal plants and helps sustain the livelihoods of people living there. Since time immemorial, local people have been using these medicinal plants for health care and trade. Numerous state and non-state actors including Department of Forests and Soil Conservation, Ministry of Forest, Environment and Soil Conservation, Division Forest Office, Community Forest Users Groups, local governments, local people and community based organization have concentrated their efforts to conserve, plant, promote and harvest the medicinal plants in the province. In spite of their tireless efforts in conservation and promotion of these plants, the organizations, people and the nation could not get adequate benefits from medicinal plants. Details of locations and the pocket areas of medicinal plants are still lacking. In this scenario, this study was conducted to identify the major medicinal plants traded from Gandaki Province. Furthermore, this study identified and mapped the pocket areas of medicinal plants throughout the province. Records of Division Forest offices and Ministry of industry, tourism, forests and environment were analyzed to identify the highly traded medicinal plants of Gandaki Province. Commercial, highly traded, possibility of domestication, and abundant medicinal plants were selected for pocket area mapping. Initially, staffs of Divisional forests offices, traders and members of Community forests users group were consulted to identify the tentative pocket areas of individual medicinal plants. Then, field visits were conducted to collect the locations of medicinal plants for modeling purpose. Based on these geospatial locations and key information, pocket areas (areas having more than 10 km<sup>2</sup> suitable habitat) of medicinal plants were mapped. In addition, suitable habitat of medicinal plants planted on patches but with areas smaller than 10 km<sup>2</sup> were identified and mapped as pocket areas.

From this study, pocket areas of 15 species {Ban Lasun, Bish (*Aconitum spicatum*), Chiraito (*Swertia chiraita*), Jatamasi (*Nardostachys grandiflora*), Kurilo (*Asparagus officinalis*), Kutki (*Neopicrorrhiza scrophulariflora*), Lauth Salla (*Taxus wallichiana*), Nirmansi (*Aconitum heterophylloides*), Panchaule (*Dactylorhiza hatageria*), Satuwa (*Paris pariphylla*), Setakchini (*Moringa Oleifera*), Siltimur (*Lindera neesiana*), Tejpat (*Cinnamomum tamala*), Timur

*(Zanthoxylum piperitum)*, Yarshagumba (*Ophiocordyceps sinensis*)} were identified and mapped. Among these species, pocket areas of the majority of the species were identified around the High Mountain regions of the Province. This study also identified the pocket areas of the most of the medicinal plants inside the Dhorpatan Hunting Reserve though almost half of the reserve falls in the province. However, pocket area of Tejpat was identified and mapped in hilly areas. Based on these findings, this study recommends conserving and planting of these medicinal plants and their identified suitable habitats. It also suggests to create awareness to the collectors for sustainable harvesting, to establish the processing plants and to conduct researches to identify potential plantation sites for important medicinal plants.

## Acknowledgement

The objective of this study was to identify the pocket areas of highly traded medicinal plants of Gandaki Province. Forest Research and Training Centre, Pokhara firstly would like to thank SMART Pvt. Ltd., Kathmandu, for their crucial role in completing this research project. The FRTC also express sincere gratitude to all the distinguished personalities and representatives of Ministry of Industry, Tourism, Forest and Environment, Gandaki Province, Forest Directorate, Division Forest Office Kaski, Annapurna Conservation Area Project Pokhara, Institute of Forestry, Pokhara, Forest Seed laboratory and Storage Centre, Kaski for their valuable guidance, feedback, comments during the Inception and Provincial level workshop which were crucial to shape this report. Moreover, FRTC also like to thank Mrs. Manju KC, Assistant Research Officer, for her contribution and support to complete this study. Further, FRTC also thanks Mr. Rajesh Poudel (Assistant Training Officer), Mrs. Anshu Dhakal (Officer), Mrs. Chungla Sherpa (Ranger) for their support. In addition, special thanks goes to all the Division Forest Offices of Gandaki Province, Annapurna Conservation Area and Dhorpatan Hunting Reserve, members of community forest user groups, local peoples and local guides for sharing the valuable information during discussion and meetings to the study team.

Thank You.



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# **1. Introduction**

## **Background**

### **Medicinal plants**

Medicinal plants are those plants having therapeutic and medical importance. They are used in ethno-medicine for a long time. Of the total floral wealth of Nepal, some of the species are reported as Medicinal and Aromatic Plants (MAPs) because of their medicinal and aromatic properties. Out of 1000 plant species having known uses, over 700 species have medicinal values where nearly half of them are medically tested to find their chemical content. A total of 238 useful plant species consisting of 215 genera and 102 families were recorded and among them 192 species were frequently cited as medicinal in six protected areas of Nepal including Api Nampa Conservation Area, Khaptad National Park, Rara National Park, Shey-Phoksundo National Park, Dhorpatan Hunting Reserve, and Langtang National Park (Kunwar et al. 2014). A total of 161 plant species belonging to 86 families and 144 genera to cure 89 human ailments were used by the Tamang community in Makawanpur District of Nepal (Luitel et al. 2014). In Nepal, the maximum richness of medicinal plants was found at an elevation of 1,100 m (Acharya, Chaudhary, and Vetaas 1970).

Master Plan for Forestry Sector of Nepal 1988 identified MAPs as one of the six primary programs . MAPs, a subset of Non-Timber Forest Products (NTFPs) are vital resources for rural people providing considerable support to their livelihoods. The majority of Nepal's population depends upon traditional medicines as herbal drugs. The importance of MAPs is even higher in recent years with the expansion of the global herbal market.

Medicinal plants are also contributing to the economic sector of the country. The contribution of agriculture, forestry, and fishing on gross output has NRs. 1279443 million with a 2.64 annual growth rate (CBS 2021a) of Nepal. NTFPs contribute about 15% of Nepal's GDP (Edward 1996). Similarly, agriculture, forestry and fishing have contributed 28.30 % (at current price) of GDP in 2077/78 in Gandaki Province, which is the significant contribution of the industrial sector to the GDP of this Province (CBS 2021b). Also, these medicinal plants are listed as an economic sector of five year periodic plans of Gandaki Province (PPPC Gandaki Province 2020). This is because of diverse locality for MAPs due to transition of the eastern floristic and the western floristic

regions and their associated suitable climates. Thirty-three species are recognized as major medicinal plants of the Province (MoITFE 2018).

Medicinal plants have been used domestically as traditional medicine since long time. Use of *Cordyceps sinensis* as an aphrodisiac, *Berberis asiatica* for eye problems, *Bergenia ciliata* for disintegration of calculi, *Sapindus mukorossi* for dandruff, and *Zanthoxylum armatum* for toothache were the most frequently used plants of Nepal (Kunwar et al. 2013). In far western Nepal, medicinal herbs were the main ingredients of traditional therapies and were considered the main lifeline of people (Kunwar et al. 2013). Gender, ethnicity, household economy and food availability of the respondents were leading factors affecting the plant use knowledge (Kutal et al. 2021). Some species were highly traded. For example, the trade of *Paris polyphylla* (Satuwa) is recorded from 39 districts of Nepal (Kunwar et al. 2020).

The data of the last ten years show the trade of 54 species of medicinal plants in Gandaki Province. Attis (*Aconitum heterophyllum*), Amala (*Phyllanthus emblica*), Okhar (*Juglans regia*), Kutki (*Neopicrorrhiza scrophulariflora*), Guchchi Chyau (*Morchella esculenta*), Gurjo (*Tinospora sinensis*), Chiraito (*Swertia chiraita*), Jungali Sayapatri (*Tagetes minuta*), Jatamansi (*Nardostachys grandiflora*), Jhyau (*Lichen* spp.), Timur (*Zanthoxylum piperitum*), Tejpat (*Cinnamomum tamala*), Dhasingre (*Gaultheria fragrantissima*), Neem (*Azadirachta indica*), Padamchaal (*Rheum australe*), Pakhanbed (*Bergenia ciliata*), Panchaule (*Dactylorhiza hatageria*), Pipla (*Piper longum*), Bish (*Aconitum spicatum*), Bojho (*Acorus calamus*), Bhyakur (*Dioscorea deltoidea*), Majitho (*Rubia manjith*), Yarshagumba (*Ophiocordyceps sinensis*), Rittha (*Sapindus mukorossi*), Laghupatra (*Podophyllum hexandrum*), Lauth Salla (*Taxus wallichiana*), Sughndhawal (*Valeriana jatamansi*), Sungandhakokila (*Cinnamomum glaucescens*), Satawari (*Asparagus racemosus*), Sarpagandha (*Rauwolfia serpentina*), Satuwa (*Paris pariphylla*), Kakoli (*Fritilaria spinosa*), and Kalo Musali (*Curculigo orchioides*) were major medicinal plants traded in Gandaki Province (MoITFE 2018).

### **Pocket area of medicinal plants**

Hard and fast definition and criteria of pocket area have not been known yet. In general, area, where medicinal plants are growing in larger sizes is considered as a “Pocket area”. The Pocket area of medicinal plants varies according to the species. For example, the pocket area of

Sarpagandha may be in the Terai region whereas the pocket area of most of the medicinal plants such as Panchaule, Jatamansi, Satuwa may present in the High Mountain region. Gandaki Province covers no or minimal area of Terai, so pocket areas of medicinal plants were expected to be in upland areas. This study considers pocket area as the area having more than 10 km<sup>2</sup> suitable habitat of medicinal plants along with their recumbent presence. In addition, areas promoted in patch by Divisional forest offices as pocket but with area smaller than 10 km<sup>2</sup> area were also considered as pocket area in comprehensive consultation with DFO officials.

## **Problem statement and rationale**

Medicinal plants are an important medicinal and economic asset. The unique geographic position with altitudinal and climatic variation of Gandaki supports a wide range of flora and fauna. Out of 51 governments prioritized districts for NTFPs development program, six districts of this province are rich in medicinal/herbal wealth. The demand for medicinal plants and their derivatives is growing globally at a rate of 7-15%. The global acceptance of the utility of plant-derived drugs has driven local communities to the commercial cultivation of medicinal and aromatic crops. Over-exploitation of the medicinal plants is the major problem for their conservation and management. Despite their importance, medicinal plants are facing severe threats. Medicinal plant habitats such as primary forests become increasingly over-exploited, indigenous species become limited, and socio-cultural causes of land-use change expand in far-western Nepal (Kunwar et al. 2016). The increasing human destructive exploitation activities and economic development have placed the rich medicinal flora under considerable conversion pressure. To conserve the medicinal plants, identification and mapping of pocket areas are crucial for strategic management. Conservation strategies based on the geographic patterns of medicinal plant species richness, including recognition of meaningful floristic regions and priority areas for conservation could improve the effectiveness of policy and management of medicinal flora in this area.

Gandaki Province is rich in medicinal plants. People of the Himalayan region of this province are directly dependent on MAPs. Previously, there was no scientific study to identify and map the pocket areas of medicinal plants in the Gandaki Province. Therefore, this study is expected to fulfill this gap by identifying and mapping the pocket area of medicinal plants in the Gandaki Province.

## **Objectives of the study**

The general objective of this study was to identify and map the pocket areas of medicinal plants in Gandaki Province. The specific objectives of the study are as follows:

- i To identify the medicinal plants that are abundantly available and highly traded from the Gandaki Province.
- ii To identify the potential pocket areas of these medicinal plants in the study area.
- iii To analyze the current distribution and coverage of these medicinal plants in the study area.
- iv To map the pocket areas of these medicinal plants.

## 2. Materials and methods

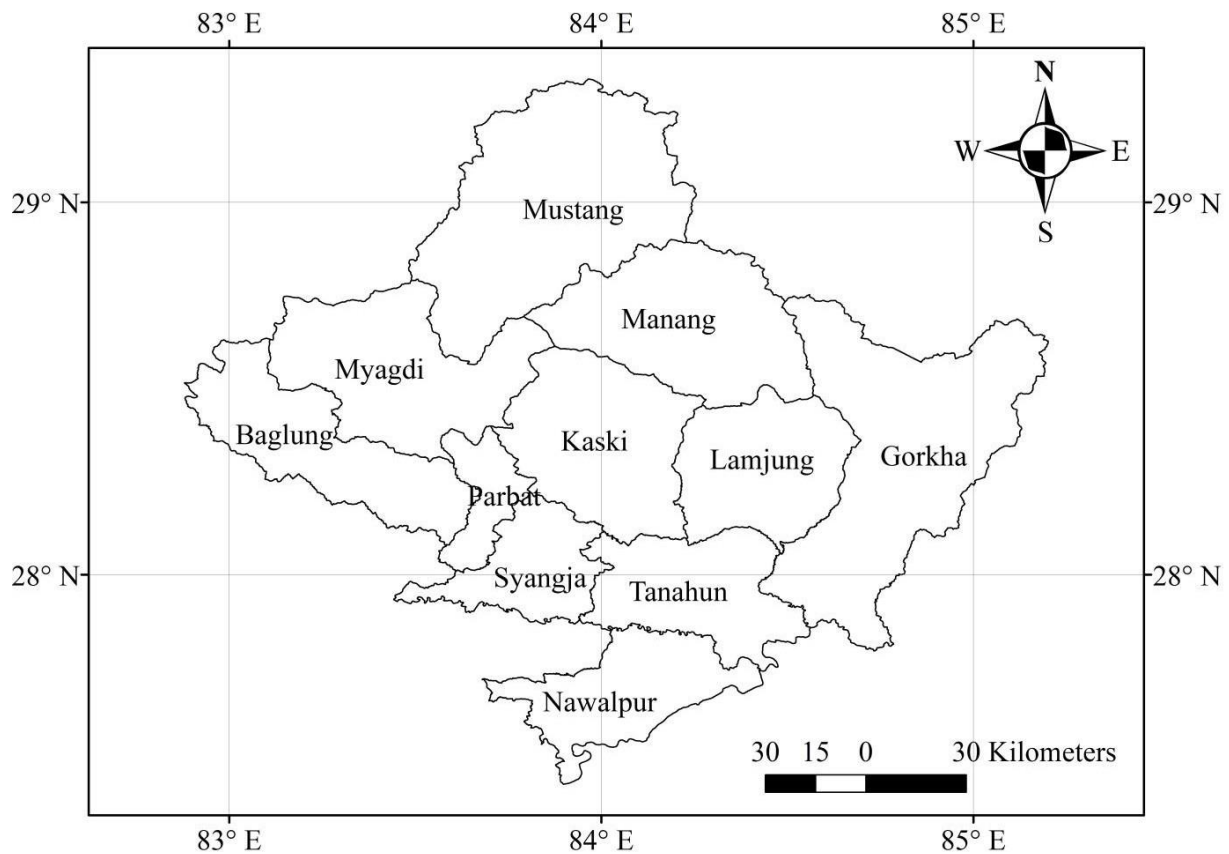
### Study area

The study was conducted in Gandaki Province of Nepal. This province lies in the central part of Nepal and covers 11 districts such as Baglung, Gorkha, Kaski, Lamjung, Manang, Mustang, Myagdi, Nawalparasi (Bardaghat Susta Purba), Parbat, Syanjya, and Tanahun, (**Figure 1**). Similarly, there are 85 local administrative bodies including 1 metropolitan city, 26 municipalities and 58 rural municipalities (MoITFE 2018).

The Gandaki Province spreads from Himal to Terai north – south direction in the central part of Nepal. The total area of this province is 21,976.34 km<sup>2</sup>, i.e. 14.93% of the total area of Nepal. Gandak canal of Narayani River, located at the height of 93 meters above sea level, is the lowest elevation of this province. Highest part of the province is the tip of the Dhaulagiri Himal. Dhaulagiri is a huge iceberg with 8,167 meters elevation, and Manasalu (8,163 meters), and Annapurna first (8,091 meters) were three peaks having height more than 8,000 m of the province. In this province, only the high Himalayan mountain range has fallen to the middle of the country. The valley having high elevation are situated in the upper part of Manang, Mustang, and Gorkha Districts (MoITFE 2018). This province consists of five distinct geographical regions including Himalaya, High Mountains, Middle Mountains, Shiwaliks and Terai.

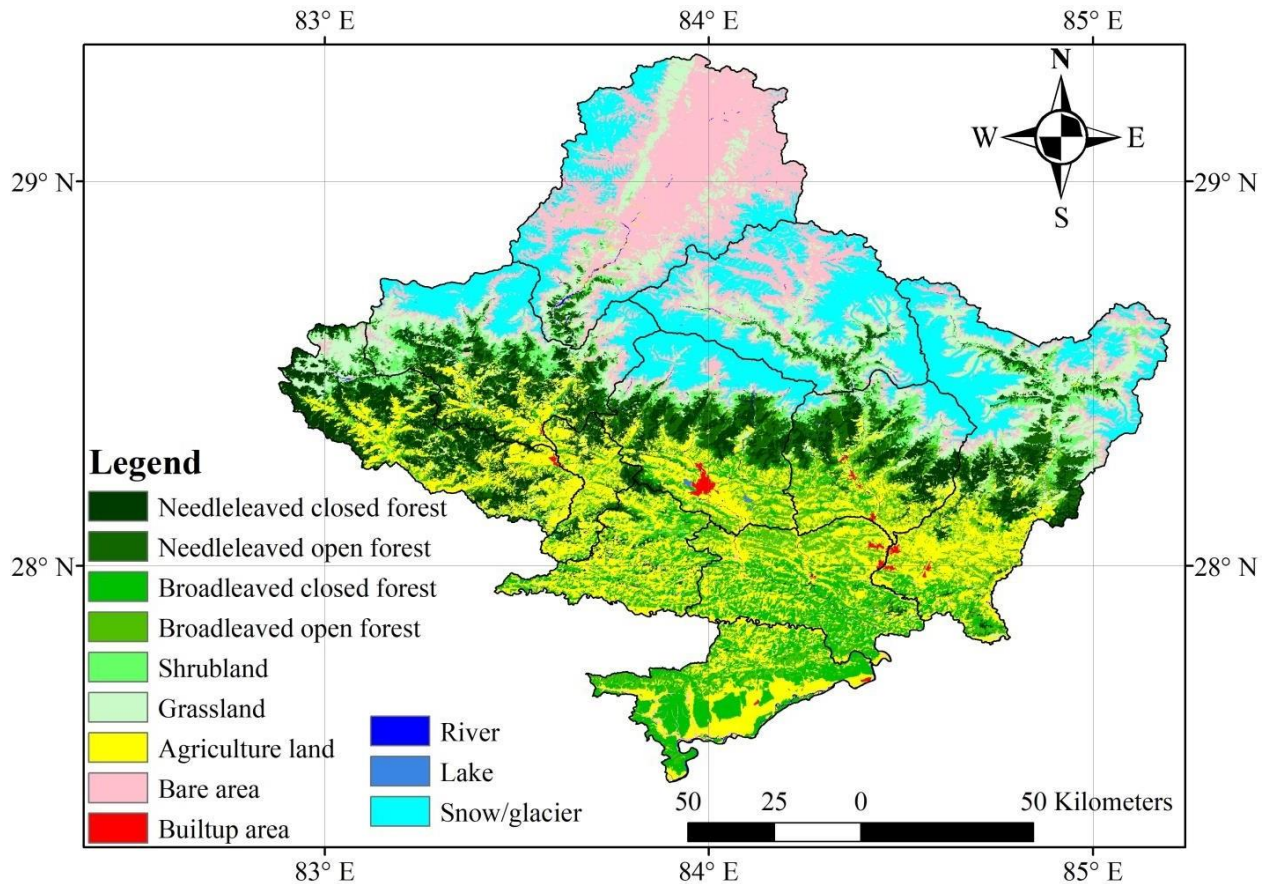
Forest covers around 37.1% area of the province (DFRS 2015; MoITFE 2018). Major trees species of the province are *Acacia catechu*, *Alnus nepalensis*, *Castanopsis indica*, *Dalbergia sissoo*, *Shorea robusta*, *Pinus roxburghii*, *P. wallichiana*, *Schima wallichii*, and *Taxus wallichiana*. The major forest management models exercised in the province are community forest management, leasehold forest management, collaborative forest management, and block forest management. A total of 3952 community forests, 1119 leasehold forests, 34 religious forests and one collaborative forest are being managed by the local communities. Guchchi Chyau (*Morchella esculenta*), Kurilo (*Asparagus officinalis*), LauthsSalla (*Taxus wallichiana*), Nirmasi (*Delphinium denudatum*), Okhar (*Juglans regia*), Pakhanved (*Bergenia ciliata*), Panchaule (*Dactylorhiza hatagiera*), Satuwa (*Paris polyphylla*), Sungadhwal (*Valeriana jatamansi*) and Timur (*Zanthoxylum piperitum*) are major medicinal plants and non-timber forests products of the province (MoITFE 2018).

This province is rich in protected areas. Protected areas (Conservation Area, Hunting Reserve, Buffer Zone and National Parks) cover around 45.68% area of this province. Annapurna Conservation Area, Manaslu Conservation Area, some parts of Dhorpatan Hunting Reserve, and some parts of Buffer Zone are the major attraction of this province. This province also covers the core zone of Chitwan National Park. Annapurna Conservation Area is famous for mountain trekking and unique landscape. Chitwan National Park is famous for rhino and tiger whilst Dhorpatan Hunting Reserve is popular for trophy hunting of blue sheep and Himalayan Tahr. Manaslu Conservation Area is famous for trekking, unique landscape, and mountain biodiversity (DNPWC 2017; MoITFE 2018). Moreover, The diversity of orchids is high especially in the Panchase forest conservation area (WWF 2013). The Kali Gandaki gorge, situated at the center of the Eastern and Western Himalayas, is a recognized north-south corridor for birds to migrate (WWF 2013).



**Figure 1: Study area (Gandaki Province)**

Most of the area of the province is covered by forest and agricultural land. Major land uses of this province are agriculture lands, forests, shrub lands, grasslands, built-up areas, bare areas, lakes, rivers and snow/glaciers (**Figure 2 Source: ICIMOD**) (Uddin et al. 2015). Similarly, major forest types of the province are needle leaved forest and broad-leaved forest.



**Figure 2: Land use of Gandaki Province**

## Data collection

### Sampling/primary data collection

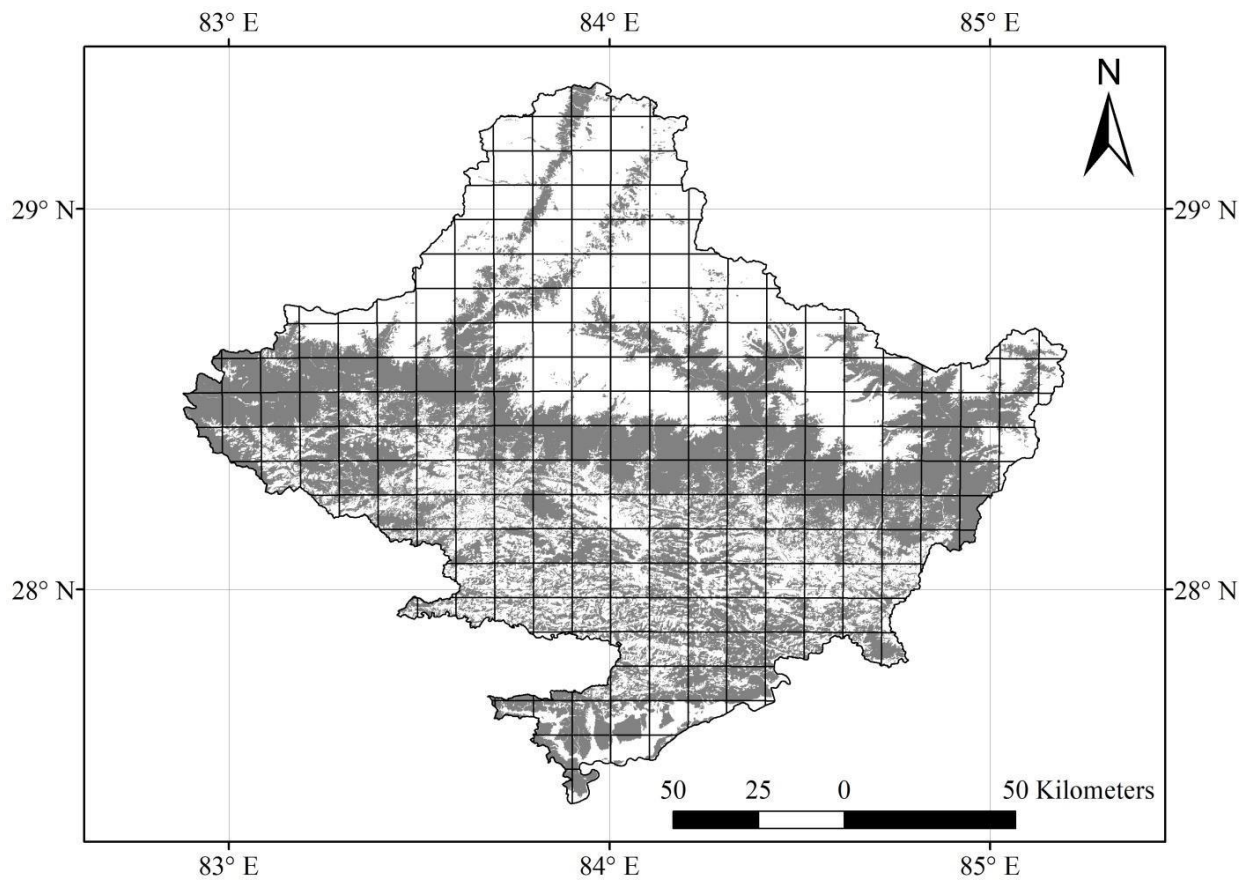
Formal and informal discussions with the concerned stakeholders such as Division Forest Offices, Forest Directorate, and community forest users group were conducted for listing the highly traded and valuable medicinal plants of the province. The participatory resource maps were prepared to identify the potential habitat and pocket areas of different species of medicinal plants. Based on the information collected during the discussions, the field survey was conducted throughout the Gandaki Province to collect the primary data for the study. The



presence of medicinal plants was recorded based on the direct sight of the particular species either in live or dead form.

Furthermore, systematic sampling was conducted throughout the province. For systematic sampling, the vegetated area (forests, shrub lands, and grasslands) were identified using the land cover map. A grid of 10 km X 10 km was prepared throughout the province (**Figure 3**).

Then, grids having the vegetation cover were identified. After that, at least one transect having 100 m length and 10 m width was allocated for data collection in identified grids.



**Figure 3: Data collection grid**

### **Desk review/ secondary data collection**

The occurrence points of medicinal plants were also compiled from researchers, research reports, published and unpublished reports of the government of Nepal (Nepal biodiversity strategy 2002), annual progress reports of divisional forests offices and operational plans of community forests. Information were collected from National Biodiversity Strategy and Action Plan (2016-2020), Chitwan Annapurna Landscape Strategy and Action Plan (2016-2025), Forest Resource assessment reports and Forest Policy (2075). Before the data analysis/habitat modeling, the secondary data were updated to include the available occurrence points from other possible sources.

Information about the pocket area was collected from all division forests offices. Locations (municipality / rural municipality and ward number) of pocket areas of NTFP were identified and maps were prepared based on these information.

## **Environmental variables**

### **Topographical variables**

Elevation was an important variable to model the habitat of flora and fauna. For this study, Digital Elevation Model (DEM) data having 30 m resolution were downloaded from the United States Geological Survey website (<https://earthexplorer.usgs.gov/>), and the slope and aspect were computed from the DEM with the help of ArcGIS software (ESRI 2017). Shapefiles of water sources especially streams were downloaded from the Geofabrik website (<https://www.geofabrik.de/data/shapefiles.html>) and converted to distance raster files using ArcGIS (ESRI 2017). Climatic variables having high resolution were not available therefore; elevation was used as a proxy of temperature for this study.

### **Vegetation-related variables**

Medicinal plants are dependent on vegetation-related variables. For instance, some species are light demanders, whereas others are shade demanders. Therefore, the inclusion of vegetation-related variables to predict habitat for this species is a prerequisite for robust modeling.

This study uses the forest cover and Enhanced Vegetation Index (EVI) for modeling purposes. Forest cover prepared by Hansen et al. (2013) was downloaded from the Global Forest Change

(GFC) website and used for the modeling. Similarly, EVI time-series data for 2018 and 2019, from images obtained by Landsat 8 were used for the modeling. The EVI was calculated/refined with the help of the Google Earth Engine.

### **Anthropogenic variables**

Several studies indicated that medicinal plants are facing anthropogenic threats such as overharvesting and immature harvesting. This study incorporated anthropogenic variables into the model. Anthropogenic variables were distance to human paths (used by humans and animals), roads (used by vehicle), distance to settlements, and land use. The location of paths and roads were obtained from the Geofabrik website (<https://www.geofabrik.de/data/shapefiles.html>). Settlement locations were obtained from the Department of Survey, Nepal. Distance raster files of paths, roads, and settlements were created using ArcGIS (ESRI 2017). Land cover and land use (LULC) data were downloaded from the International Centre for Integrated Mountain Development website (ICIMOD; <http://www.icimod.org>) (Uddin et al. 2015) and incorporated into the model.

Topographical, vegetation related and anthropogenic variables were downloaded from freely available sources and pre-processed in ArcGIS (ESRI 2017) to prepare in the required format (ASCII), extent, and spatial resolution (30 m) (**Table 1**).

**Table 1: Environmental variables for modeling**

<b>Source</b>	<b>Category</b>	<b>Variable</b>	<b>Abbreviation</b>	<b>Unit</b>
USGS	Topographic	Elevation	Elevation	m
		Slope	slope	Degree
		Aspect	Aspect	Degree
GEOFABRIK		Distance to water	dist_water	m
Landsat	Vegetation-related	Annual mean EVI	evi_mean	Dimensionless
		Standard deviation of EVI	evi_sd	Dimensionless
		Maximum EVI	evi_max	Dimensionless
		Minimum EVI	evi_min	Dimensionless
GFC		Forest Cover	Forest	Dimensionless

GEOFABRIK	Anthropogenic	Distance to settlement	dist_settle	m
		Distance to motor road	dist_motorroad	m
		Distance to path	dist_path	m
		Distance to building	dist_build	m
ICIMOD		Land use/land cover	land use	m

## Distribution modeling of medicinal plants

This study identified and mapped the pocket areas of medicinal plants whose presence were recorded in adequate amount. Species, for mapping the pocket area, were chosen based on their value, traditional use, trade amount, the possibility of farming and domestication as well as ease of cultivation. Based on these criteria, pocket areas of 15 species were identified. The Maximum Entropy (MaxEnt) was used to predict the distribution of the species by using the species occurrence points and environmental variables (Elith et al. 2006; Phillips, Anderson, and Schapire 2006). The MaxEnt is also an established and widely used tool for predicting the distribution of the species in Nepal (Aryal et al. 2016; Bista, Panthi, and Weiskopf 2018; KC et al. 2019; Panthi et al. 2019; Sharma et al. 2020; Shrestha and Bawa 2014; Thapa et al. 2018). The model used 10 replicates and 1000 background points for predictions for the modeling (Barbet-Massin et al. 2012).

## Accuracy assessment of the model

Assessment of the accuracy is an essential step to validate the models and to understand the performance of the models. A total of 70 % of the occurrence points of medicinal plants were allocated for the training dataset, and the remaining 30 % were used as a testing /validation dataset for the modeling of all species. The models were evaluated by the two methods. One method was threshold dependent, and another was threshold independent. In the threshold independent method, the area under the receiver-operator curve (AUC) of models was obtained directly from the model (Phillips et al. 2006; Wiley et al. 2003). The higher the AUC, the higher the model performance

(discrimination capacity) is. The AUC <0.7 denotes poor model performance, 0.7–0.9 denotes moderately useful model performance, and >0.9 denotes excellent model performance (Pearce and Ferrier 2000). Although AUC is a classical and widely used model evaluation parameter, it is criticized by researchers (Lobo, Jiménez-valverde, and Real 2008). So, threshold dependent accuracy assessment: True Skill Statistic (TSS) was calculated for the model evaluation (Merow, Smith, and Silander 2013). The value of TSS ( $TSS = \text{Sensitivity} + \text{Specificity} - 1$ ) ranges from -1 to 1, where values less than 0 indicate a performance no better than random and 1 indicates a perfect fit of the model (Allouche, Tsoar, and Kadmon 2006). TSS was calculated for all model outputs (0-9 replications), and the final TSS was the average of all 10 replications for all species (Jiang et al. 2014). The threshold to maximize the sum of sensitivity and specificity was used to calculate the TSS and convert the continuous probability map generated by the MaxEnt model to a binary presence/absence map (Liu, White, and Newell 2013).

## **Mapping the pocket areas of medicinal plants**

The distribution/habitats of medicinal plants were identified with the help of MaxEnt software. The identified habitats of these medicinal plants were mapped with the help of GIS software (ESRI 2017). Moreover, information about the pocket area was collected from all division forests offices. Locations (municipality / rural municipality and ward number) of pocket areas of NTFP were identified and maps were prepared based on these information. Based on the modeling and secondary information, a detailed (ward level) address of pocket areas of 15 medicinal plants was identified. If more than 10 km<sup>2</sup> habitat is suitable, and medicinal plants are present in that habitat that areas were identified as pocket areas of these medicinal plants. Furthermore, if medicinal plants were already planted on patches by the help of corresponding divisional forest offices, these areas were also identified and mapped as pocket areas although these patched were smaller than 10 km<sup>2</sup>.

### 3. Results and discussion

#### Medicinal plants of Gandaki Province

Gandaki Province is rich in biodiversity. The livelihoods of people living in the Mountain areas of this province are dependent on medicinal plants. According to the information provided by the Ministry of Industry, Tourism, Forest and Environment, Division Forest Offices, and the feasibility study entitled "Provincial Level Medicinal Plants Collection and Refinement Center", a total of 54 species of medicinal plants were in trade for the last ten years. Among them, Tejpat was a highly traded medicinal plant by volume. However, Bhutkes was traded in the least amount for the last ten years in this province (Table 2).

**Table 2: Medicinal plants of Gandaki Province traded for the last 10 years**

S.N.	Name of medicinal plants	Numbers of years of trade	Amount per year (kg)
1	Tejpat	10	10185.4
2	Musali	5	7242.6
3	Budhani Phul	2	4700
4	Chiraito	10	3493.5
5	Bis Jara	9	3327.1
6	Jatamasi	9	3216.6
7	Satuwa	9	2918.6
8	Majitho	9	2353.5
9	Sikakai	4	2352.5
10	Karaj Chulthe	7	2194.7
11	Pawanko Bokra	4	2114.7
12	Akarkara	4	2000
13	Kurilo	9	1911.3
14	Kutaki	10	1785.9
15	Kauloko Bokra	4	1626
16	Kakoli	5	1478.2
17	Timur	2	1448
18	Jimbu	4	1365.8
19	Gurjo	3	1066.3
20	Sugandhawal	9	1004.4
21	Pipala	6	958.1
22	Dhupiko Pat	8	941.6
23	Bunki Phul	2	850
24	Bishphej	6	653.3

25	Bojho	4	551.2
26	Somalata	2	500
27	Harro	1	500
28	Nagbeliko Dhulo	6	481.8
29	Ban lasun	7	458
30	Nirmansi	10	450.8
31	Padamchal	7	446.7
32	Setakchini Jara	5	404
33	Eklebir	2	400
34	Pakhanbed	5	350
35	Chyau	5	332.2
36	Nagbeli Lahara	2	300
37	Rittha	3	300
38	Tokala Patta	1	300
39	Amala	1	200
40	Barro	1	200
41	Jiwanti	2	180.5
42	Bishma	8	173.5
43	Silajit	3	152.3
44	Atis jara	8	132.8
45	Yarshagumba	7	89.3
46	Guchhi Chyau	5	68.2
47	Gamadol, Kaladana	2	55
48	Punnarba Ko Bokra	2	50
49	Chutro	2	50
50	Indereni Biu	2	16
51	Sunpati	4	14.5
52	Laghupatra	5	7.4
53	Kantakari	5	7
54	Bhutkes	4	1.7

Source (Ministry of Industry, Tourism, Forest and Environment, Gandaki Province / Forests Technician Society, Chitwan, Nepal)

## **Pocket area of medicinal plant species**

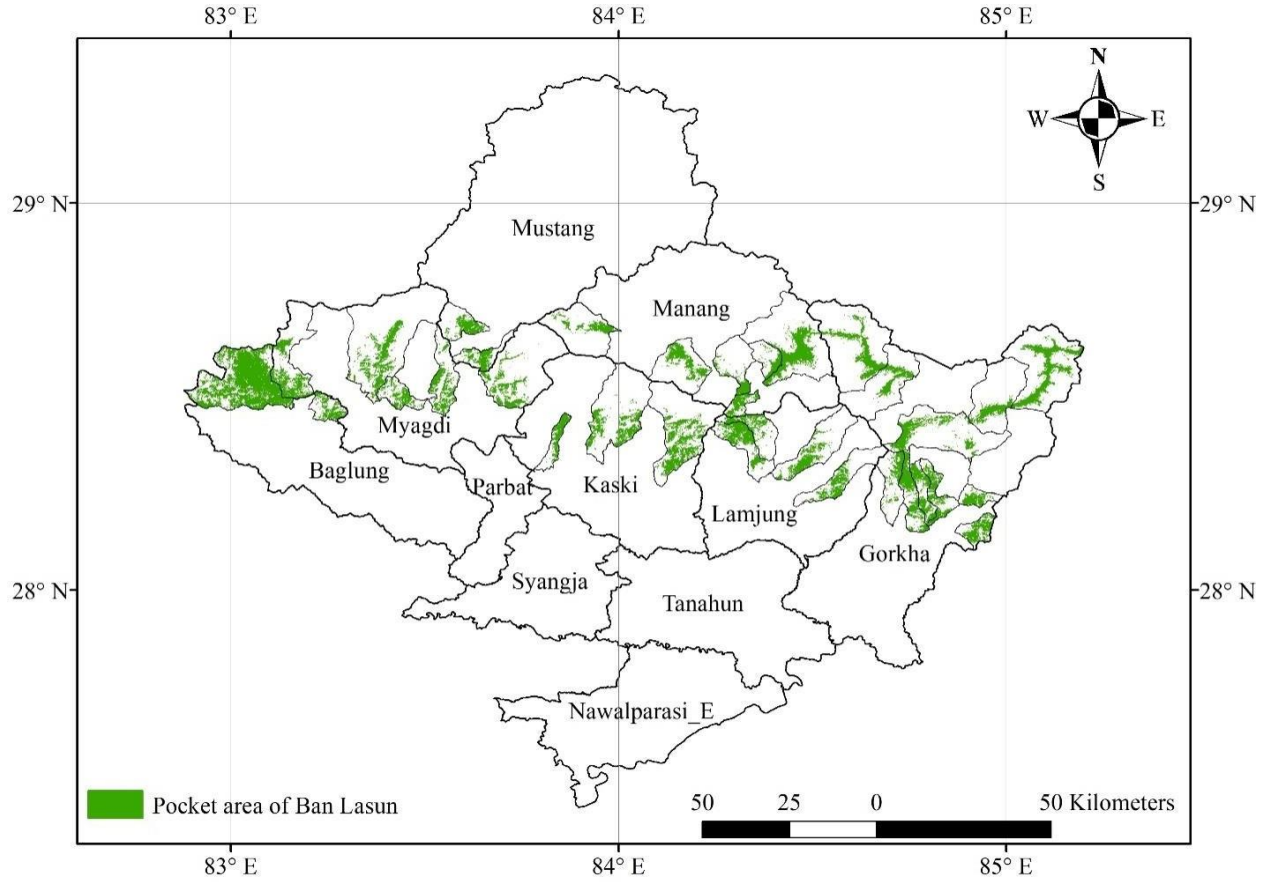
### **Ban Lasun**

This study identified a total of 738 km<sup>2</sup> area as the pocket area of Ban Lasun in 33 wards of 17 rural municipalities of seven districts of Gandaki Province (**Table 3**). The largest patch of the pocket area of this species was found inside the Dhorpatan Hunting Reserve of Baglung District (**Figure 4**). Most of the patches of pocket areas were recorded in Gorkha, Manang and Myagdi Districts.

**Table 3: Pocket area of Ban Lasun**

S.N.	District	Local levels	Ward no.	Area (km <sup>2</sup> )
1	Baglung	Dhorpatan Hunting Reserve		135
2	Baglung	Taman Khola	6	10
3	Gorkha	Aarughat	1	15
4	Gorkha	Ajirkot	1	12
5	Gorkha	Chum Nubri	1	28
6	Gorkha	Chum Nubri	2	13
7	Gorkha	Chum Nubri	3	26
8	Gorkha	Chum Nubri	6	16
9	Gorkha	Chum Nubri	7	40
10	Gorkha	Dharche	2	10
11	Gorkha	Dharche	4	17
12	Gorkha	Dharche	5	16
13	Gorkha	Sulikot	1	26
14	Kaski	Annapurna	7	13
15	Kaski	Machhapuchchhre	1	23
16	Kaski	Madi	2	32
17	Lamjung	Dordi	6	15
18	Lamjung	Marsyangdi	3	27
19	Lamjung	Marsyangdi	4	12
20	Lamjung	Marsyangdi	7	16
21	Manang	Nashong	3	12
22	Manang	Nashong	6	47
23	Manang	Nashong	7	11
24	Manang	Nashong	9	11
25	Manang	Neshyang	1	18
26	Manang	Neshyang	9	11
27	Mustang	Thasang	2	14
28	Mustang	Thasang	4	14
29	Myagdi	Annapurna	4	19
30	Myagdi	Dhaulagiri	4	28
31	Myagdi	Dhaulagiri	5	10
32	Myagdi	Dhorpatan Hunting Reserve		23
33	Myagdi	Raghuganga	7	16
<b>Total</b>				<b>738</b>





**Figure 4: Spatial distribution of pocket area of Ban Lasun**

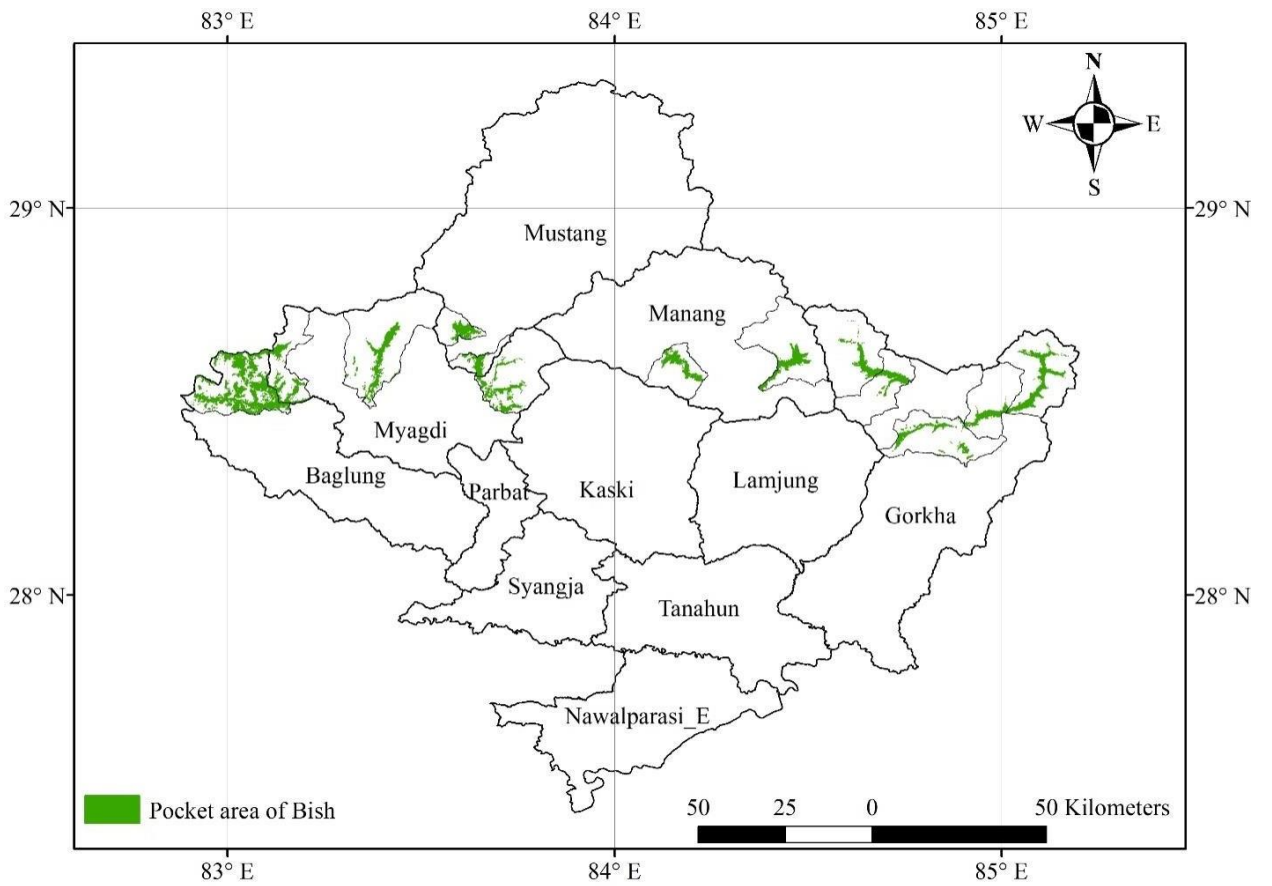
### **Bish**

This study identified a total of 218 km<sup>2</sup> area as the pocket area of Bish in 13 wards of seven rural municipalities of five districts of the Gandaki Province (**Table 4**). The largest patch of the pocket area of this species was recorded in Dhorpatan Hunting Reserve of the Baglung district (**Figure 5**). Most of the patches of pocket areas were found in Gorkha, Manang, Mustang, and Myagdi Districts.

**Table 4: Pocket area of Bish**

<b>S.N.</b>	<b>District</b>	<b>Local levels</b>	<b>Ward no</b>	<b>Area (km<sup>2</sup>)</b>
1	Baglung	Dhorpatan Hunting Reserve		54
2	Gorkha	Chum Nubri	1	12
3	Gorkha	Chum Nubri	2	10
4	Gorkha	Chum Nubri	3	10
5	Gorkha	Chum Nubri	6	11
6	Gorkha	Chum Nubri	7	23
7	Manang	Nashong	6	21

8	Manang	Neshyang	1	12
9	Mustang	Thasang	2	10
10	Mustang	Thasang	4	10
11	Myagdi	Annapurna	4	13
12	Myagdi	Dhaulagiri	4	18
13	Myagdi	Dhorpatan Hunting Reserve		13
	<b>Total</b>			<b>218</b>



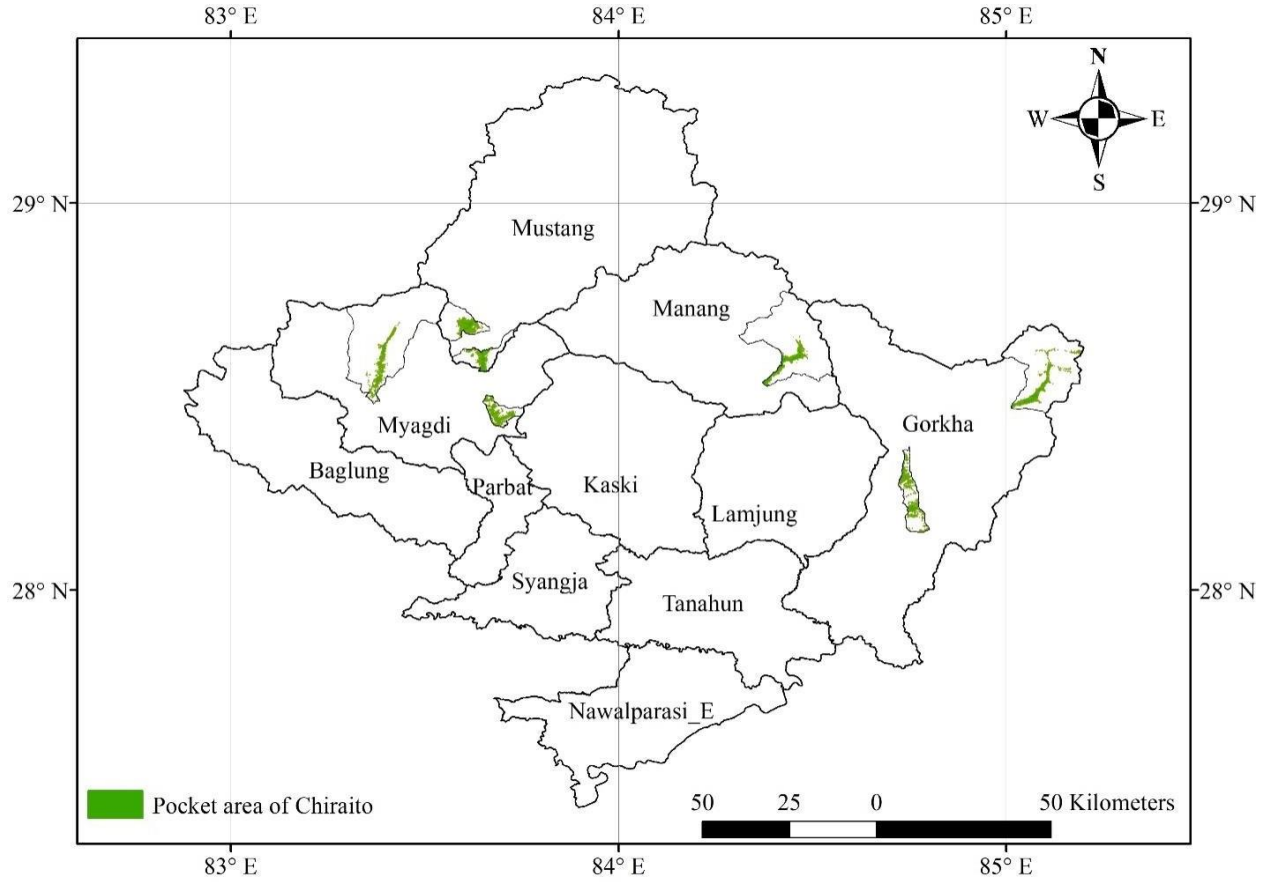
**Figure 5: Spatial distribution of pocket area of Bish**

### **Chiraito**

This study identified a total of 86 km<sup>2</sup> area as the pocket area of Chiraito in seven wards of six rural municipalities of four districts of the Gandaki Province (**Table 5**). The largest patch of the pocket area of this species was found in Chum Nubri area of Gorkha District and Nashong Rural Municipality of Manang District (**Figure 6**). Most of the patches of pocket areas were recorded in Gorkha, Mustang, and Myagdi Districts. Although modeling could not identify the pocket area of Chiraito at ward no 3 of Annapurna Rural Municipality of Kaski, the DFO Kaski initiated plantation of Chiraito at this area as pocket area of this species.

**Table 5: Pocket area of Chiraito**

<b>S.N.</b>	<b>District</b>	<b>Local levels</b>	<b>Ward no</b>	<b>Area (km<sup>2</sup>)</b>
1	Gorkha	Chum Nubri	7	15
2	Gorkha	Sulikot	1	11
3	Manang	Nashong	6	15
4	Mustang	Thasang	2	12
5	Mustang	Thasang	4	11
6	Myagdi	Annapurna	5	11
7	Myagdi	Dhaulagiri	4	11
	<b>Total</b>			<b>86</b>



**Figure 6: Spatial distribution of pocket area of Chiraito**

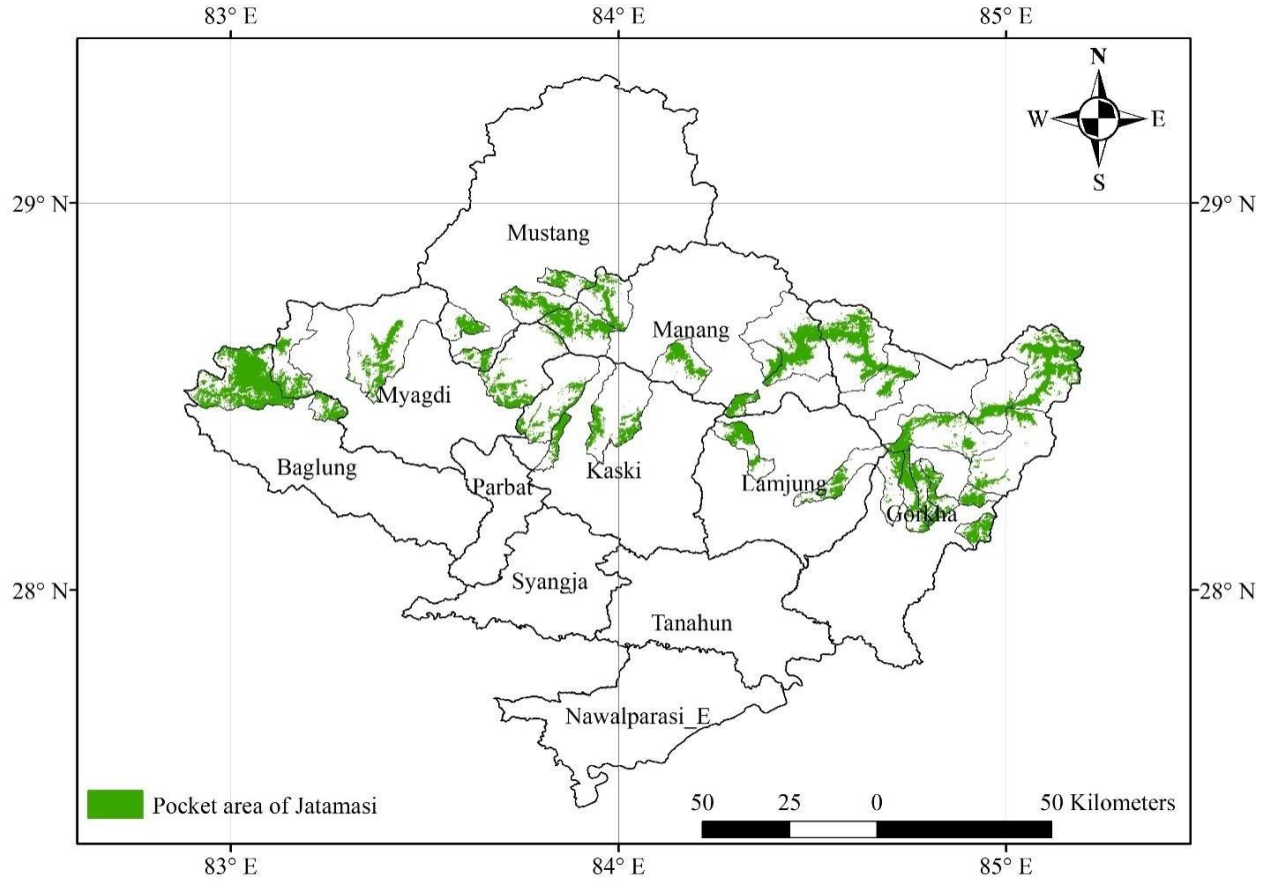
### **Jatamansi**

This study identified a total of 697 km<sup>2</sup> area as the pocket area of Jatamansi in 32 wards of 19 rural municipalities of seven districts of Gandaki Province (**Table 6**). The largest patch of the pocket area of this species was found in Dhorpatan Hunting Reserve of the Baglung District (**Figure 7**). Most of the patches of the pocket areas were recorded in Gorkha, Manang and Mustang Districts.

**Table 6: Pocket area of Jatamansi**

<b>S.N.</b>	<b>District</b>	<b>Local levels</b>	<b>Ward no</b>	<b>Area (km<sup>2</sup>)</b>
1	Baglung	Dhorpatan Hunting Reserve		73
2	Baglung	Taman Khola	6	10
3	Gorkha	Aarughat	1	14
4	Gorkha	Ajirkot	1	11
5	Gorkha	Chum Nubri	1	55

6	Gorkha	Chum Nubri	2	15
7	Gorkha	Chum Nubri	3	29
8	Gorkha	Chum Nubri	6	17
9	Gorkha	Chum Nubri	7	72
10	Gorkha	Dharche	1	12
11	Gorkha	Dharche	2	10
12	Gorkha	Dharche	4	11
13	Gorkha	Dharche	5	12
14	Gorkha	Sulikot	1	23
15	Kaski	Annapurna	7	11
16	Kaski	Annapurna	11	14
17	Kaski	Machhapuchchhre	1	21
18	Lamjung	Dordi	6	12
19	Lamjung	Marsyangdi	3	20
20	Manang	Nashong	3	14
21	Manang	Nashong	6	53
22	Manang	Nashong	7	10
23	Manang	Neshyang	1	17
24	Manang	Neshyang	8	15
25	Manang	Neshyang	9	32
26	Mustang	Barhagaun Muktihssetra	1	11
27	Mustang	Gharapjhong	5	21
28	Mustang	Thasang	2	11
29	Mustang	Thasang	4	10
30	Myagdi	Annapurna	4	18
31	Myagdi	Dhaulagiri	4	25
32	Myagdi	Dhorpatan Hunting Reserve		18
	<b>Total</b>			<b>697</b>



**Figure 7: Spatial distribution of pocket area of Jatamansi**

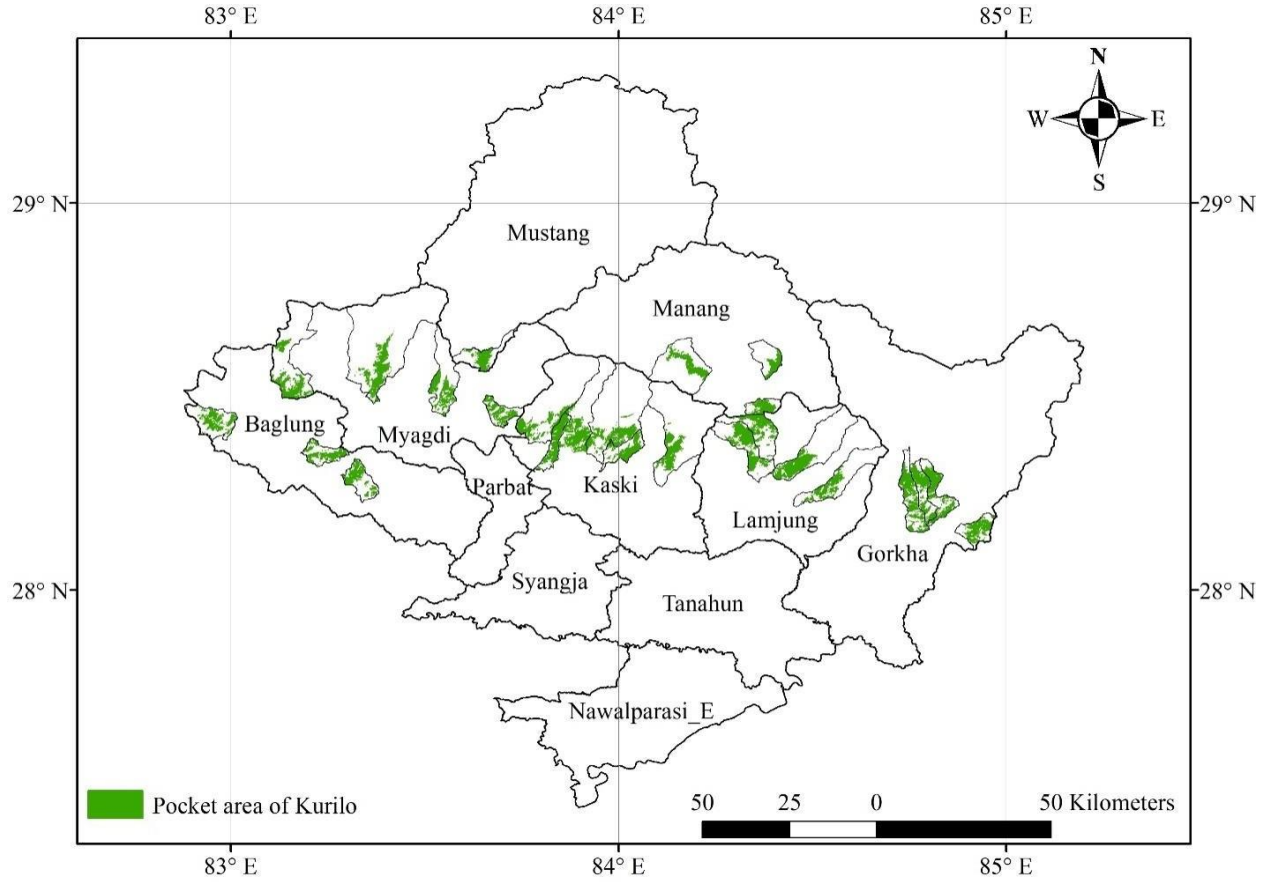
### **Kurilo**

This study identified a total of 369 km<sup>2</sup> area as the pocket area of Kurilo in 25 wards of 18 municipalities/rural municipalities of seven districts of Gandaki Province (**Table 7**). The largest patch of the pocket area of this species was in Marsyangdi Rural Municipality of Lamjung District (**Figure 8**). Most of the patches of the pocket areas were recorded in Gorkha, Kaski, Lamjung and Myagdi Districts.

**Table 7: Pocket area of Kurilo**

S.N.	District	Local levels	Ward no	Area (km <sup>2</sup> )
1	Baglung	Dhorpatan	4	11
2	Baglung	Galkot	10	10
3	Baglung	Nisikhola	6	10
4	Gorkha	Aarughat	1	12

5	Gorkha	Dharche	4	14
6	Gorkha	Dharche	5	18
7	Gorkha	Sulikot	1	20
8	Kaski	Annapurna	7	19
9	Kaski	Annapurna	11	12
10	Kaski	Machhapuchchhre	1	14
11	Kaski	Machhapuchchhre	2	12
12	Kaski	Machhapuchchhre	9	20
13	Kaski	Madi	2	17
14	Lamjung	Dordi	6	11
15	Lamjung	Marsyangdi	3	24
16	Lamjung	Marsyangdi	4	14
17	Lamjung	Marsyangdi	7	23
18	Manang	Nashong	1	11
19	Manang	Nashong	7	11
20	Manang	Neshyang	1	12
21	Mustang	Thasang	4	13
22	Myagdi	Annapurna	5	10
23	Myagdi	Dhaulagiri	4	20
24	Myagdi	Dhorpatan Hunting Reserve		16
25	Myagdi	Raghuganga	7	13
	<b>Total</b>			<b>369</b>



**Figure 8: Spatial distribution of pocket area of Kurilo**

### **Kutki**

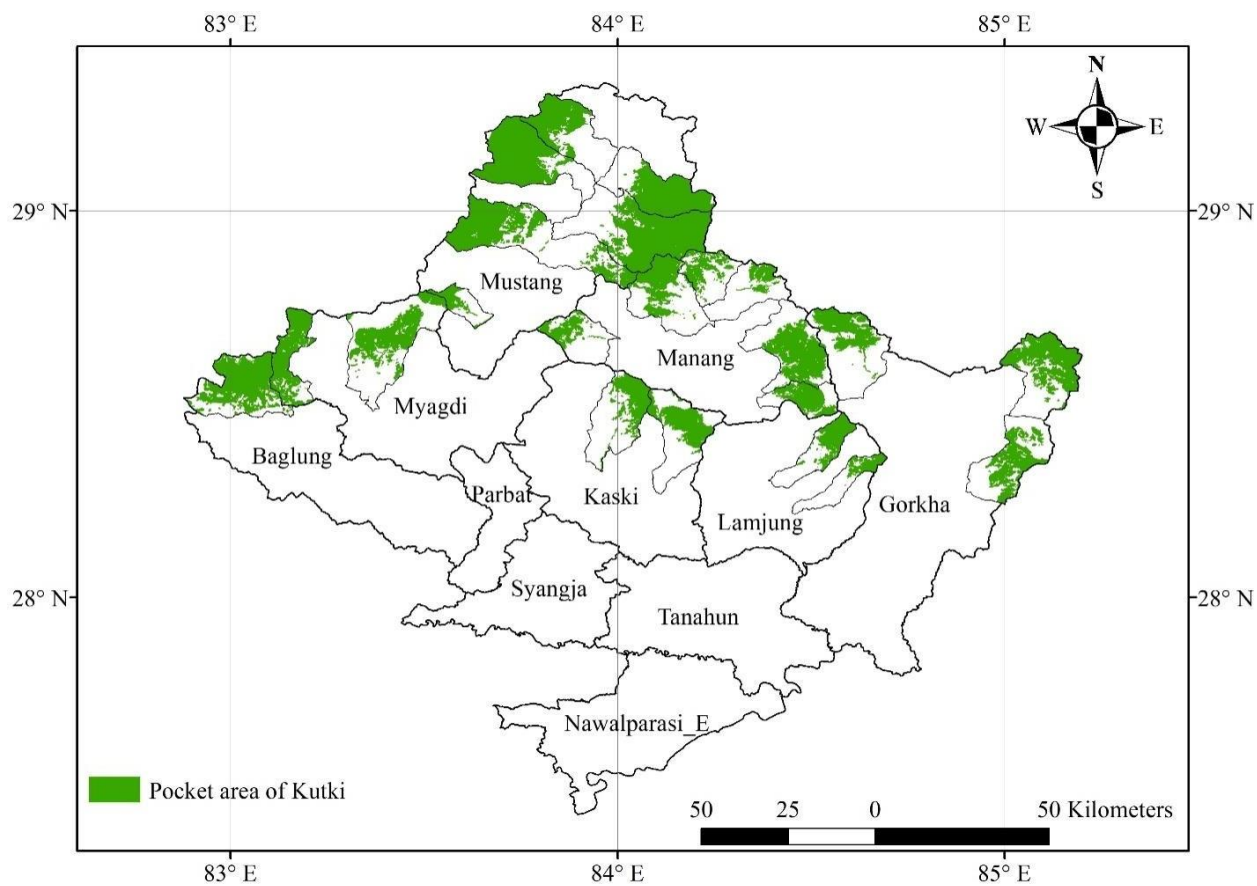
This study identified a total of 1,057 km<sup>2</sup> area as the pocket area of Kutki in 22 wards of 16 rural municipalities of seven districts of the Gandaki Province (**Table 8**). The largest patch of the pocket area of this species was in ward no 5 of Lo-Ghekar Damodar Kunda Rural Municipality of Mustang District. Most of the patches of the pocket areas were located in Manang and Mustang Districts (**Figure 9**).

**Table 8: Pocket area of Kutki**

S.N.	District	Local levels	Ward no	Area (km <sup>2</sup> )
1	Baglung	Dhorpatan Hunting Reserve		65
2	Gorkha	Chum Nubri	1	24
3	Gorkha	Chum Nubri	7	50
4	Gorkha	Dharche	1	24
5	Kaski	Machhapuchhre	1	23
6	Kaski	Madi	2	25



7	Lamjung	Dordi	6	17
8	Lamjung	Marsyangdi	7	20
9	Manang	Narphu	3	27
10	Manang	Narphu	4	14
11	Manang	Narphu	5	19
12	Manang	Nashong	2	21
13	Manang	Nashong	6	43
14	Manang	Neshyang	9	18
15	Mustang	Barhagaun Muktikhsetra	3	121
16	Mustang	Lo-Ghekar Damodar Kunda	1	159
17	Mustang	Lo-Ghekar Damodar Kunda	4	85
18	Mustang	Lo-Ghekar Damodar Kunda	5	187
19	Mustang	Lomanthang	5	38
20	Mustang	Thasang	1	17
21	Myagdi	Dhaulagiri	4	32
22	Myagdi	Dhorpatan Hunting Reserve		28
	<b>Total</b>			<b>1057</b>



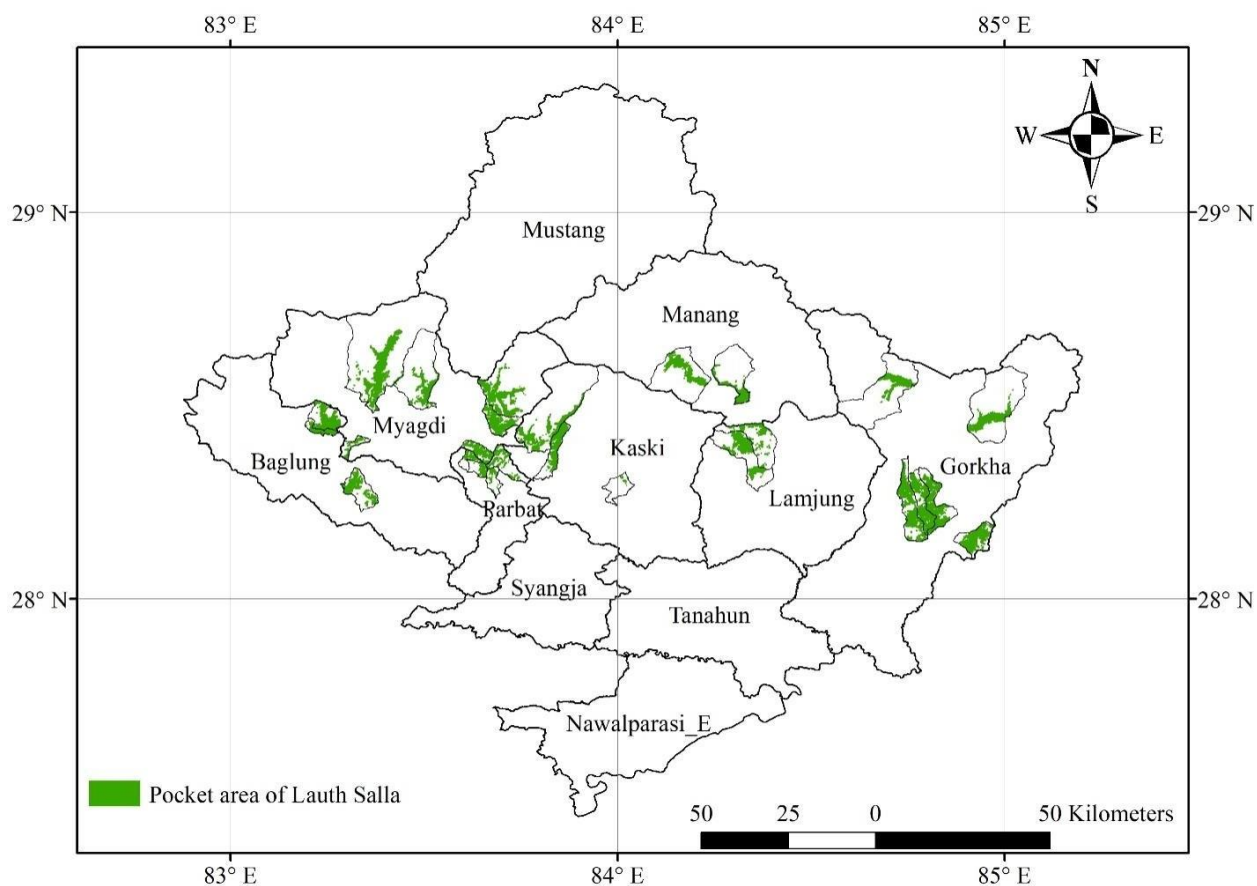
**Figure 9: Spatial distribution of pocket area of Kutki**

## Lauth Salla

This study identified a total of 238 km<sup>2</sup> area as the pocket area of Lauthsalla in 26 wards of 16 municipalities/rural municipalities of seven districts of the Gandaki Province (**Table 9**). The largest patch of the pocket area of this species was in ward no 4 of Dhaulagiri Rural Municipality of Myagdi District. Most of the patches of the pocket areas were recorded in Gorkha, Manang and Myagdi Districts (**Figure 10**).

**Table 9: Pocket area of Lauthsalla**

S.N.	District	Local levels	Ward no	Area (km <sup>2</sup> )
1	Baglung	Galkot	10	7
2	Baglung	Taman Khola	5	5
3	Baglung	Taman Khola	6	11
4	Gorkha	Aarughat	1	12
5	Gorkha	Chum Nubri	2	11
6	Gorkha	Chum Nubri	6	17
7	Gorkha	Dharche	4	14
8	Gorkha	Dharche	5	13
9	Gorkha	Sulikot	1	16
10	Kaski	Annapurna	7	12
11	Kaski	Annapurna	11	11
12	Kaski	Pokhara	16	1
13	Lamjung	Marsyangdi	3	10
14	Lamjung	Marsyangdi	4	4
15	Manang	Nashong	9	10
16	Manang	Neshyang	1	11
17	Myagdi	Annapurna	4	17
18	Myagdi	Annapurna	5	11
19	Myagdi	Annapurna	8	4
20	Myagdi	Dhaulagiri	4	26
21	Myagdi	Malika	3	2
22	Myagdi	Raghuganga	8	7
23	Parbat	Jaljala	5	1
24	Parbat	Jaljala	6	1
25	Parbat	Modi	1	3
26	Parbat	Modi	4	1
	<b>Total</b>			<b>238</b>



**Figure 10: Spatial distribution of pocket area of Lauthsalla**

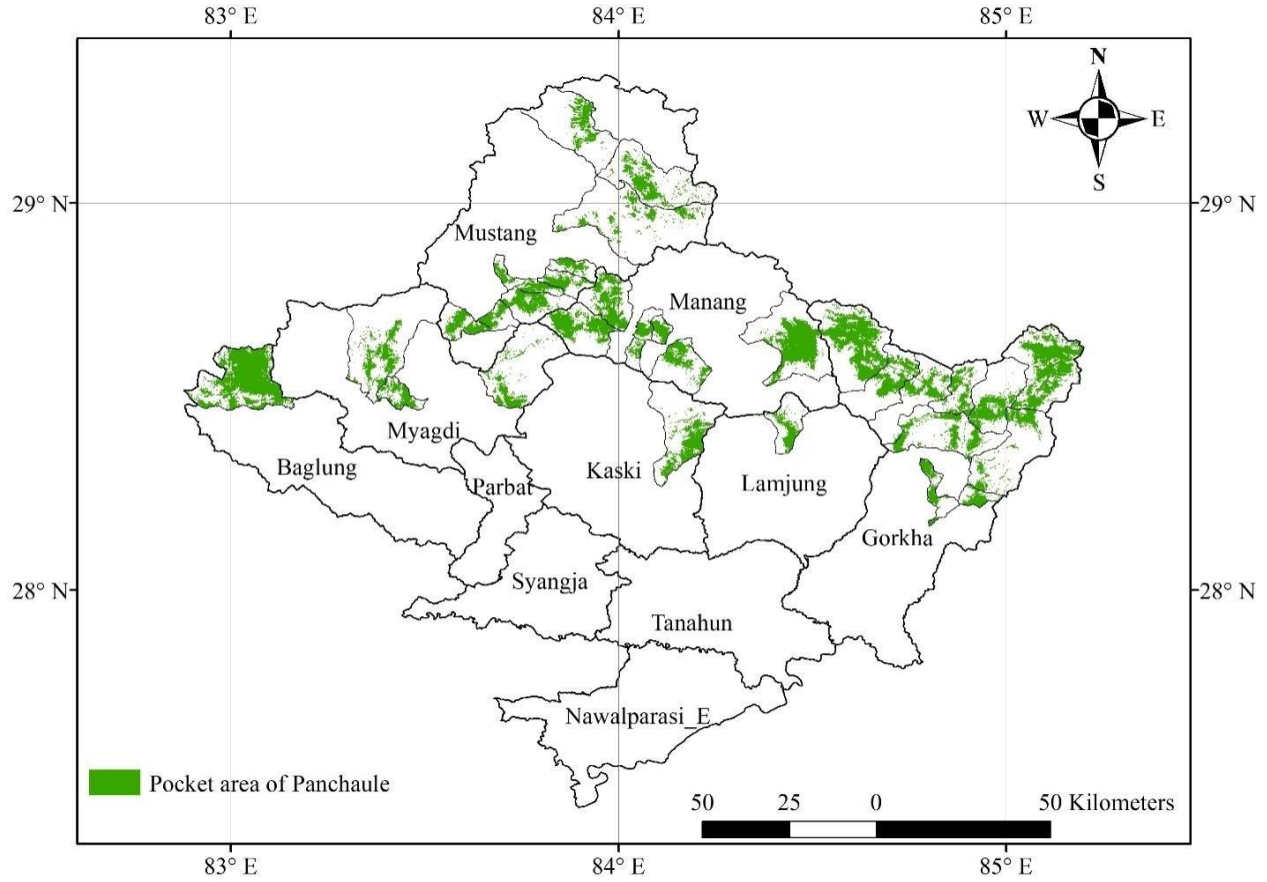
### **Panchaule**

This study identified a total of 751 km<sup>2</sup> area as the pocket area of Panchaule in 31 wards of 14 rural municipalities of seven districts of the Gandaki Province (**Table 10**). The largest patch of the pocket area of this species was inside the Dhorpatan Hunting Reserve of Baglung District. Most of the patches of pocket areas were located in Gorkha, Manang, Mustang and Myagdi Districts (**Figure 11**).

**Table 10: Pocket area of Panchaule**

<b>S.N.</b>	<b>District</b>	<b>Local levels</b>	<b>Ward no</b>	<b>Area (km<sup>2</sup>)</b>
1	Baglung	Dhorpatan Hunting Reserve		80
2	Gorkha	Chum Nubri	1	78
3	Gorkha	Chum Nubri	2	69
4	Gorkha	Chum Nubri	3	25

5	Gorkha	Chum Nubri	4	22
6	Gorkha	Chum Nubri	5	21
7	Gorkha	Chum Nubri	6	13
8	Gorkha	Chum Nubri	7	11
9	Gorkha	Dharche	1	15
10	Gorkha	Dharche	2	13
11	Gorkha	Dharche	5	10
12	Kaski	Madi	2	25
13	Lamjung	Marsyangdi	5	11
14	Manang	Nashong	6	78
15	Manang	Neshyang	1	40
16	Manang	Neshyang	3	32
17	Manang	Neshyang	5	18
18	Manang	Neshyang	8	12
19	Manang	Neshyang	9	12
20	Mustang	Barhagaun Muktikhsetra	1	13
21	Mustang	Barhagaun Muktikhsetra	2	10
22	Mustang	Lo-Ghekar Damodar Kunda	4	18
23	Mustang	Lo-Ghekar Damodar Kunda	5	11
24	Mustang	Gharapjhong	1	10
25	Mustang	Gharapjhong	4	12
26	Mustang	Gharapjhong	5	10
27	Mustang	Lomanthang	5	12
28	Mustang	Thasang	2	18
29	Myagdi	Annapurna	4	13
30	Myagdi	Dhaulagiri	4	18
31	Myagdi	Dhaulagiri	5	11
	<b>Total</b>			<b>740</b>



**Figure 11: Spatial distribution of pocket area of Panchaule**

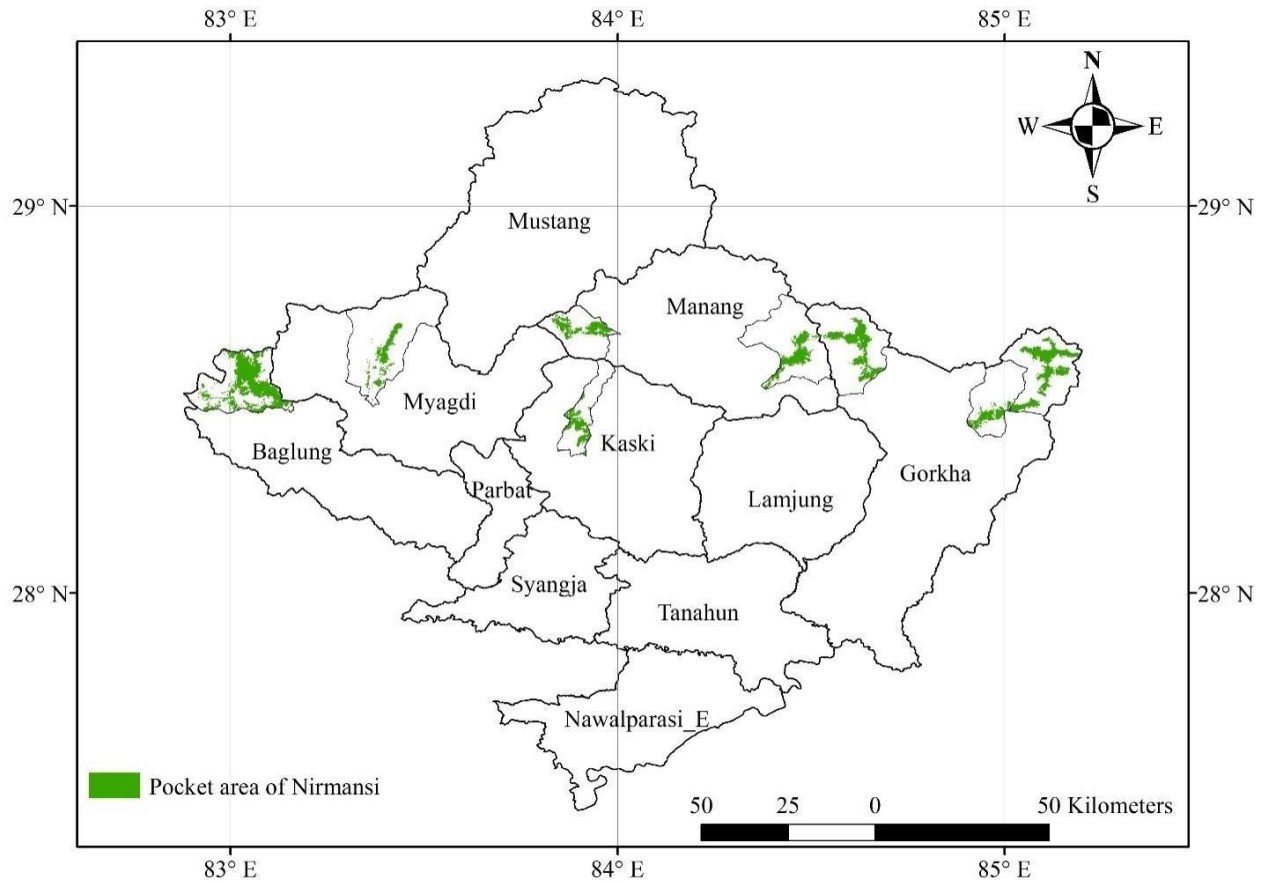
### Nirmansi

This study identified a total of 162 km<sup>2</sup> area as the pocket area of Nirmansi in eight wards of six rural municipalities of five districts of the Gandaki Province (**Table 11**). The largest patch of the pocket area of this species was in ward no 7 of Chum Nubri Rural Municipality of Gorkha District. Most of the patches of pocket areas were located in Gorkha and Manang Districts (**Figure 12**).

**Table 11: Pocket area of Nirmansi**

S.N.	District	Local levels	Ward no	Area (km <sup>2</sup> )
1	Baglung	Dhorpatan Hunting Reserve		29
2	Gorkha	Chum Nubri	1	27
3	Gorkha	Chum Nubri	6	11
4	Gorkha	Chum Nubri	7	35
5	Kaski	Machhapuchhre	9	11

6	Manang	Nashong	6	22
7	Manang	Neshyang	9	15
8	Myagdi	Dhaulagiri	4	12
	<b>Total</b>			<b>162</b>



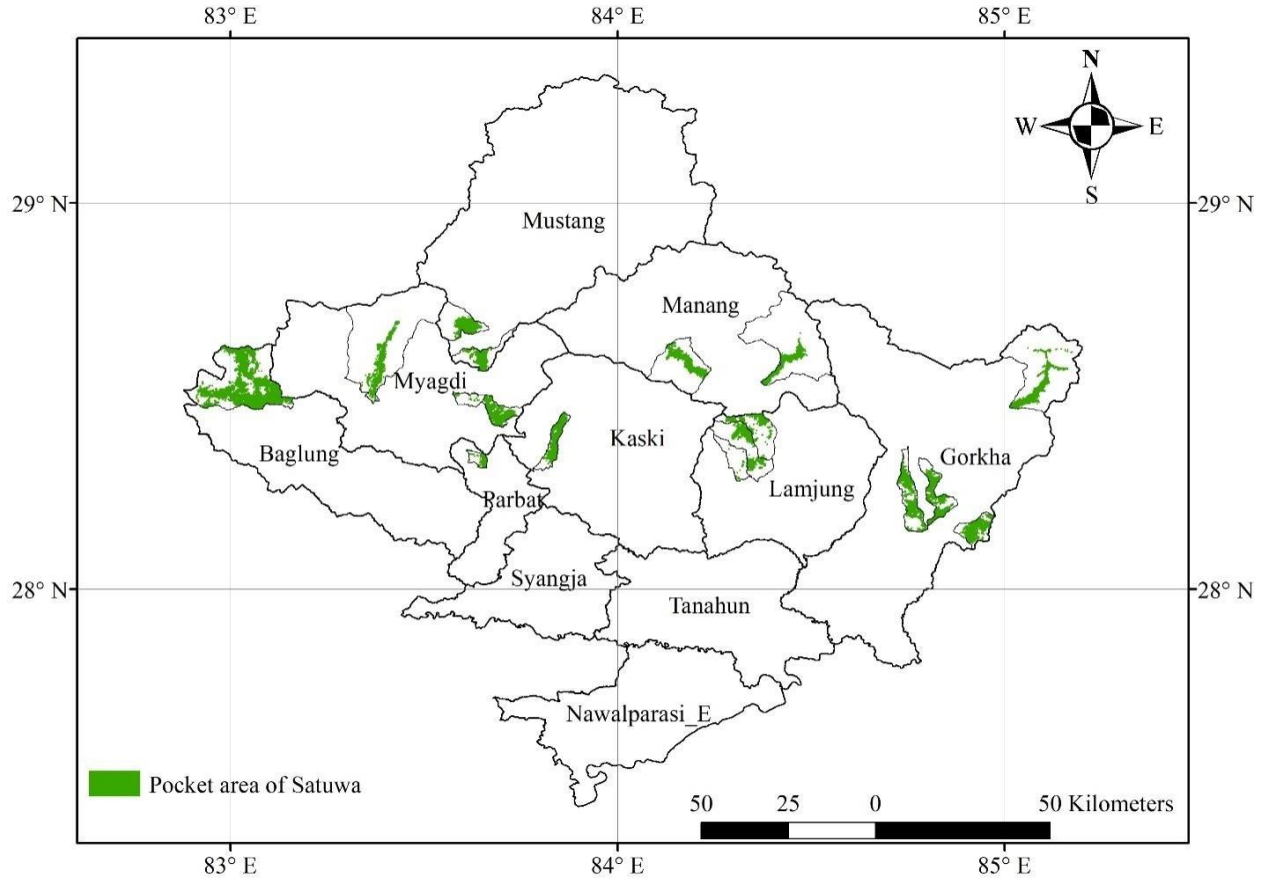
**Figure 12: Spatial distribution of pocket area of Nirmansi**

### Satuwa

This study identified a total of 167 km<sup>2</sup> area as the pocket area of Satuwa in 18 wards of 13 rural municipalities of eight districts of Gandaki Province (**Table 12**). The largest patch of the pocket area of this species was inside the Dhorpatan Hunting Reserve of Baglung District. Most of the patches of pocket areas were located in Gorkha, Manang, Myagdi and Mustang Districts (**Figure 13**).

**Table 12: Pocket area of Satuwa**

<b>S.N.</b>	<b>District</b>	<b>Local levels</b>	<b>Ward no</b>	<b>Area (km2)</b>
1	Baglung	Dhorpatan Hunting Reserve		28
2	Gorkha	Aarughat	1	10
3	Gorkha	Chum Nubri	7	16
4	Gorkha	Dharche	5	10
5	Gorkha	Sulikot	1	11
6	Kaski	Annapurna	7	11
7	Lamjung	Marsyangdi	2	1
8	Lamjung	Marsyangdi	3	6
9	Lamjung	Marsyangdi	4	5
10	Manang	Nashong	6	15
11	Manang	Neshyang	1	10
12	Mustang	Thasang	2	11
13	Mustang	Thasang	4	11
14	Myagdi	Annapurna	2	0
15	Myagdi	Annapurna	5	11
16	Myagdi	Dhaulagiri	4	11
17	Parbat	Jaljala	6	1
	<b>Total</b>			<b>167</b>



**Figure 13: Spatial distribution of pocket area of Satuwa**

### **Setakchini**

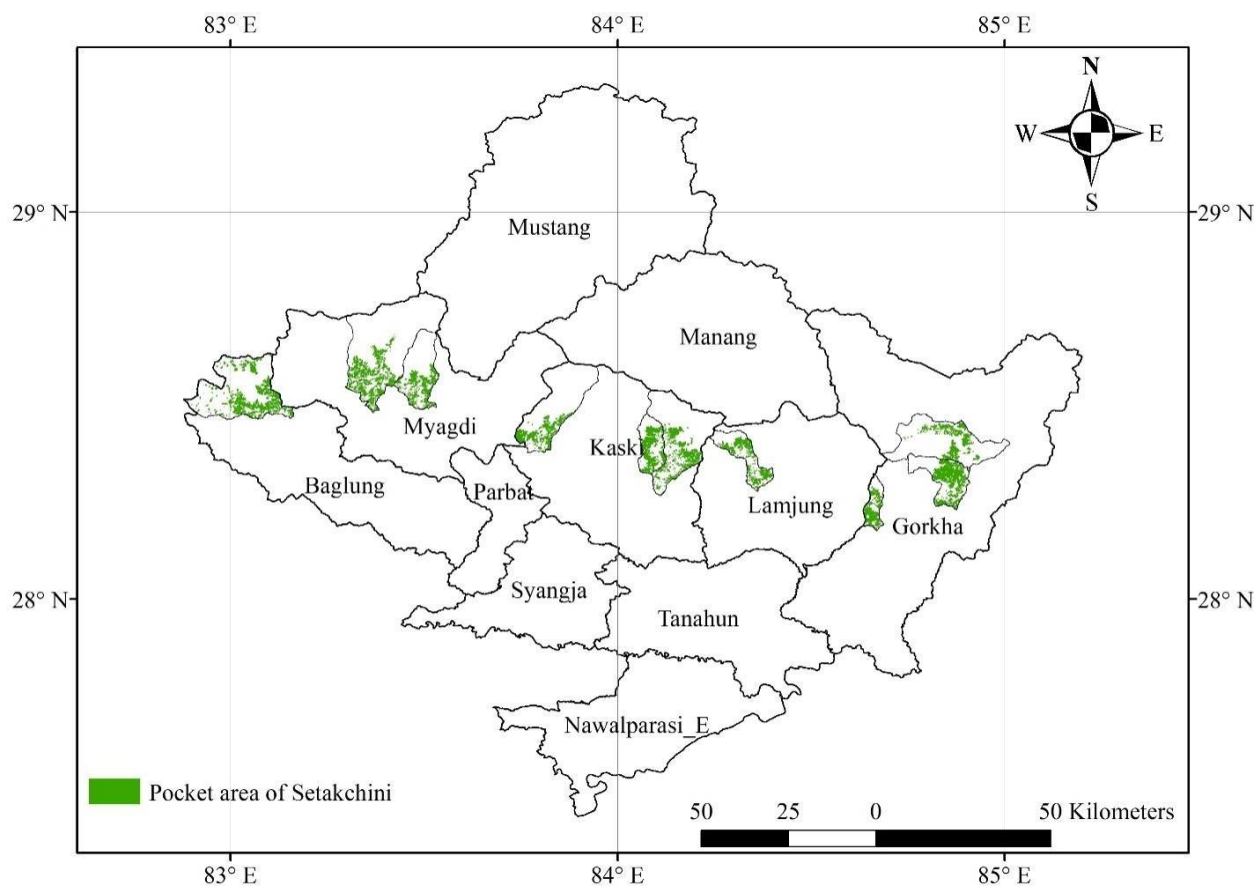
This study identified a total of 137 km<sup>2</sup> area as the pocket area of Setakchini in 10 wards of nine municipalities/rural municipalities of five districts of the Gandaki Province (**Table 13**). The largest patch of the pocket area of this species was in ward number 3 of Dharche Rural Municipality. Most of the patches of pocket areas were located in Gorkha, Kaski and Myagdi Districts (**Figure 14**).

**Table 13: Pocket area of Setakchini**

S.N.	District	Local levels	Ward no	Area (km <sup>2</sup> )
1	Baglung	Dhorpatan Hunting Reserve		16
2	Gorkha	Ajirkot	2	10
3	Gorkha	Chum Nubri	3	13
4	Gorkha	Dharche	3	21



5	Kaski	Annapurna	11	13
6	Kaski	Madi	1	14
7	Kaski	Madi	2	11
8	Lamjung	Marsyangdi	3	11
9	Myagdi	Dhaulagiri	4	16
10	Myagdi	Raghuganga	8	11
	<b>Total</b>			<b>135</b>



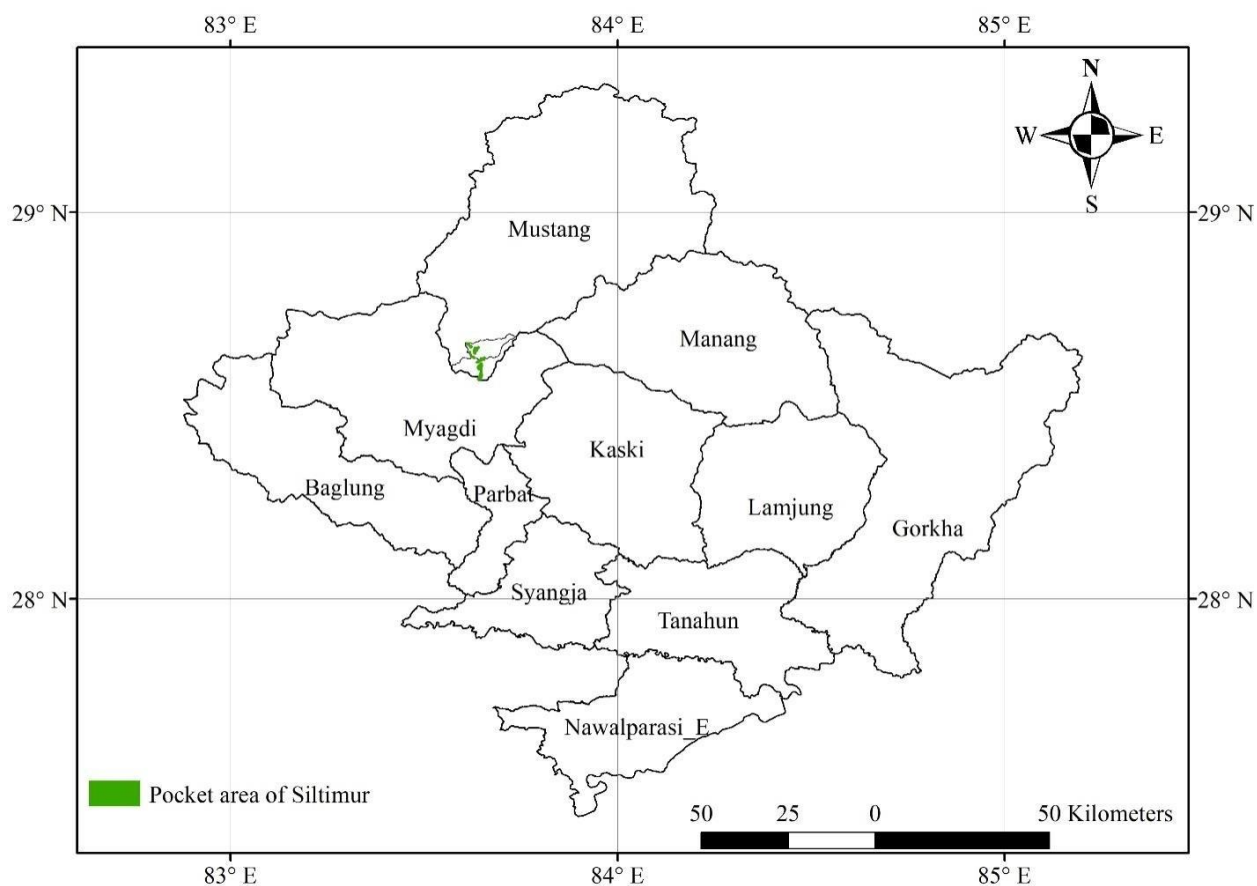
**Figure 14: Spatial distribution of pocket area of Setakchini**

### **Siltimur**

This study identified a total of 5 km<sup>2</sup> area as the pocket area of Siltimur in two wards of Thasang Rural Municipality of Mustang District of Gandaki Province (**Table 14**). The largest patch of the pocket area of this species was in ward no 4 of Thasang Rural Municipality of Mustang District (**Figure 15**).

**Table 14: Pocket area of Siltimur**

S.N.	District	Local levels	Ward no	Area (km <sup>2</sup> )
1	Mustang	Thasang	4	3
2	Mustang	Thasang	5	2
	<b>Total</b>			<b>5</b>



**Figure 15: Spatial distribution of pocket area of Siltimur**

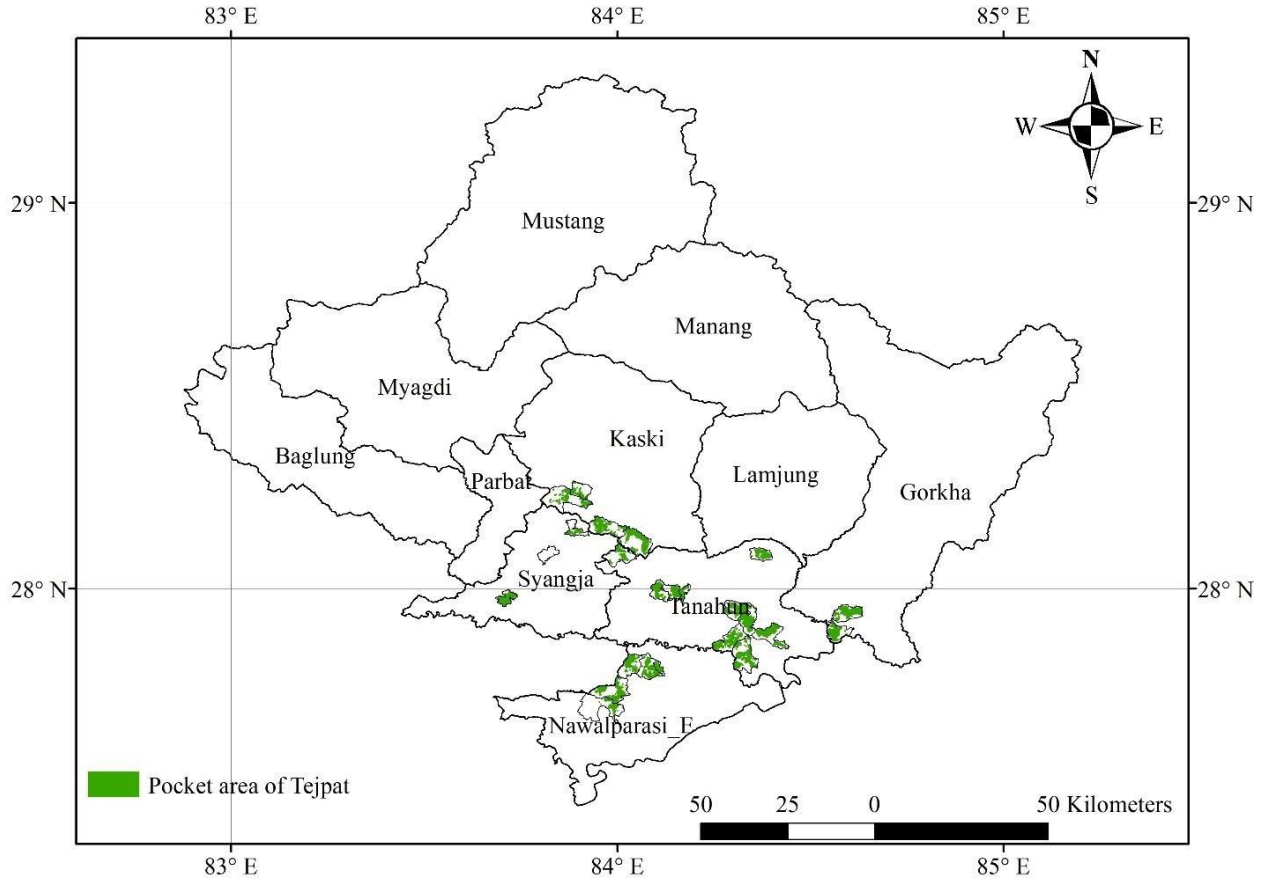
### Tejpat

This study identified a total of 88 km<sup>2</sup> area as the pocket area of Tejpat in 24 wards of 15 municipalities/rural municipalities of four districts of Gandaki Province (Table 15). The largest patch of the pocket area of this species was in Bandirpur Rural Municipality and Byas Municipality

of Tanhaun District. Most of the patches of pocket areas were located in Nawalparasi (Bardaghat Susta Purba) and Tanahun Districts (**Figure 16**).

**Table 15: Pocket area of Tejpat**

<b>S.N.</b>	<b>District</b>	<b>Local levels</b>	<b>Ward no</b>	<b>Area (km<sup>2</sup>)</b>
1	Gorkha	Sahid Lakhani	1	6
2	Gorkha	Sahid Lakhani	3	6
3	Kaski	Pokhara	21	3
4	Kaski	Pokhara	23	2
5	Kaski	Pokhara	24	1
6	Kaski	Pokhara	33	6
7	Nawalparasi_E	Bungdikali	4	3
8	Nawalparasi_E	Bungdikali	5	3
9	Nawalparasi_E	Bungdikali	6	3
10	Nawalparasi_E	Hupsekot	6	4
11	Nawalparasi_E	Madhyabindu	14	2
12	Syangja	Phedikhola	2	1
13	Syangja	Putalibazar	13	1
14	Syangja	Waling	13	6
15	Tanahun	Bandipur	6	7
16	Tanahun	Bhanu	12	3
17	Tanahun	Byas	13	7
18	Tanahun	Byas	14	6
19	Tanahun	Devghat	2	6
20	Tanahun	Myagde	3	2
21	Tanahun	Myagde	4	3
22	Tanahun	Myagde	5	3
23	Tanahun	Rhishing	3	5
24	Tanahun	Shuklagandaki	12	1
	<b>Total</b>			<b>88</b>



**Figure 16: Spatial distribution of pocket area of Tejpat**

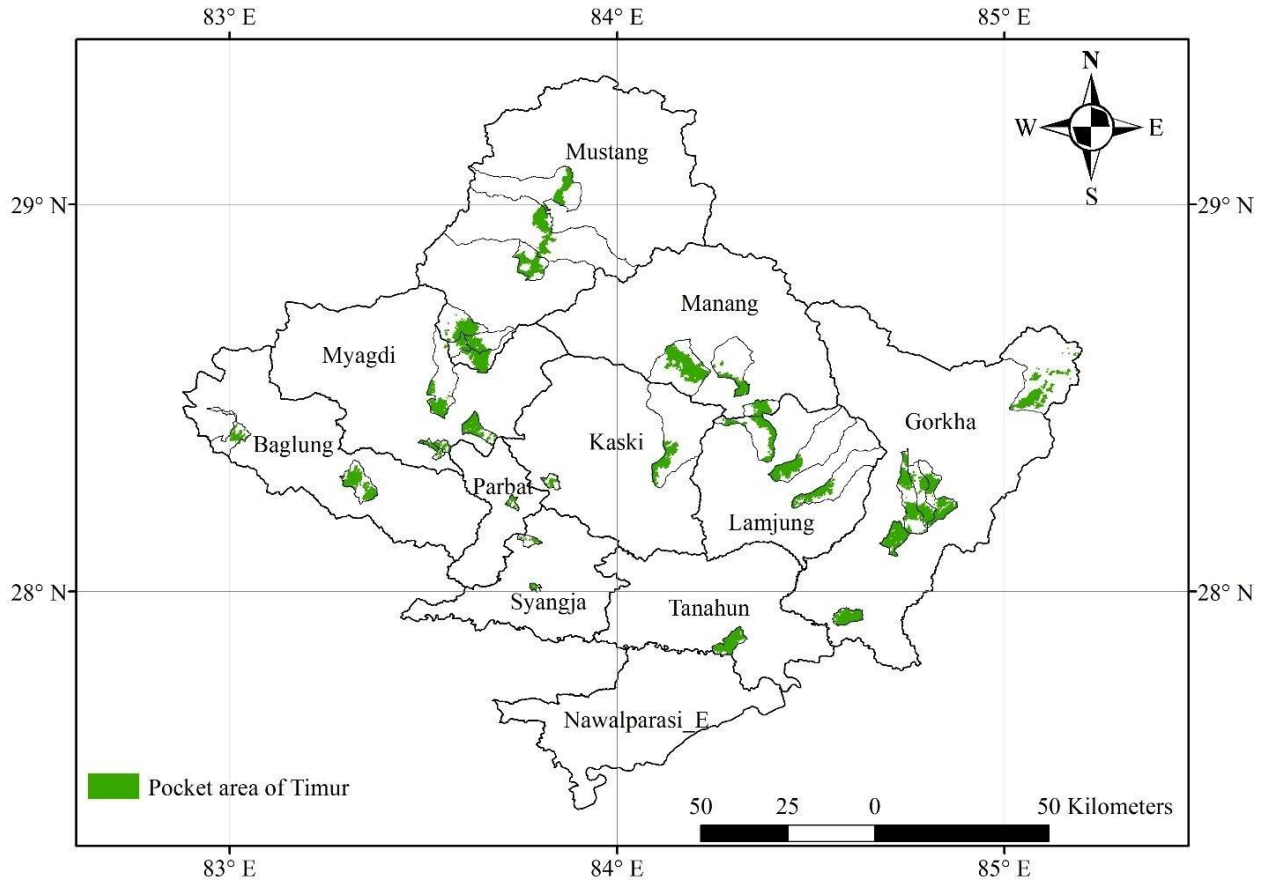
### **Timur**

This study identified a total of 309 km<sup>2</sup> area as the pocket area of Timur in 31 wards of 22 municipalities/rural municipalities of eight districts of Gandaki Province (**Table 16**). The largest patch of the pocket area of this species was in the Neshyang Rural Municipality of Manang District. Most of the patches of pocket areas were located in Gorkha and Mustang Districts (**Figure 17**).

**Table 16: Pocket area of Timur**

S.N.	District	Local levels	Ward no.	Area (km <sup>2</sup> )
1	Baglung	Galkot	10	10
2	Baglung	Nisikhola	5	2
3	Gorkha	Chum Nubri	7	14
4	Gorkha	Dharche	4	12

5	Gorkha	Dharche	5	17
6	Gorkha	Sahid Lakhan	1	11
7	Gorkha	Sulikot	1	17
8	Gorkha	Sulikot	4	15
9	Kaski	Annapurna	3	1
10	Kaski	Madi	2	12
11	Lamjung	Dordi	6	10
12	Lamjung	Marsyangdi	4	13
13	Lamjung	Marsyangdi	7	15
14	Manang	Nashong	1	10
15	Manang	Nashong	9	10
16	Manang	Neshyang	1	28
17	Mustang	Barhagaun Muktikhsetra	3	15
18	Mustang	Barhagaun Muktikhsetra	4	12
19	Mustang	Lo-Ghekar Damodar Kunda	2	13
20	Mustang	Thasang	2	12
21	Mustang	Thasang	3	4
22	Mustang	Thasang	4	15
23	Mustang	Thasang	5	5
24	Myagdi	Annapurna	7	10
25	Myagdi	Beni	5	1
26	Myagdi	Beni	9	1
27	Myagdi	Raghuganga	7	10
28	Parbat	Kushma	11	1
29	Syangja	Aandhikhola	1	1
30	Syangja	Bhirkot	4	1
31	Tanahun	Rhishing	3	13
	<b>Total</b>			<b>309</b>



**Figure 17: Spatial distribution of pocket area of Timur**

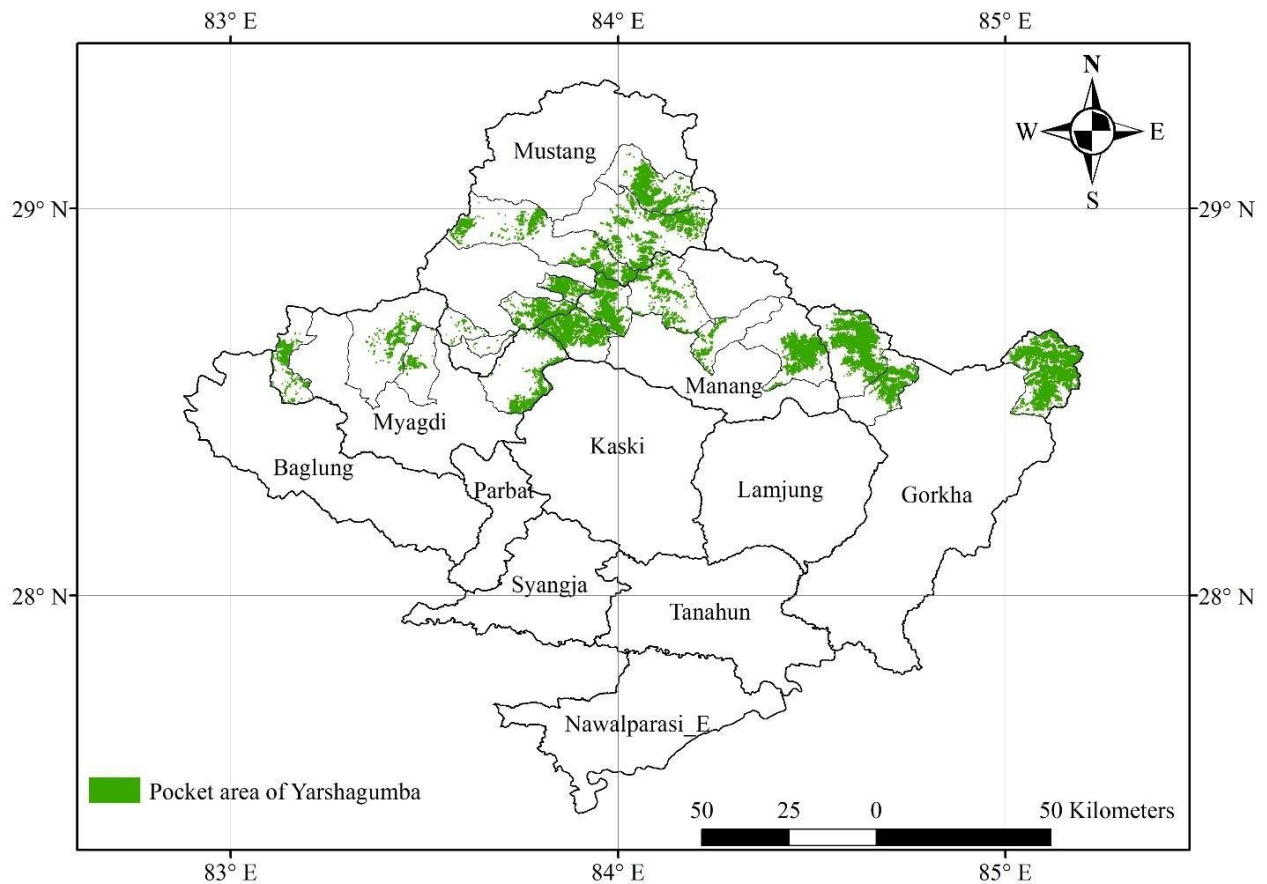
### **Yarshagumba**

This study identified a total of 386 km<sup>2</sup> area as the pocket area of Yarshagumba in 13 wards of 12 rural municipalities of four districts of Gandaki Province (**Table 17**). The largest patch of the pocket area of this species was in ward no 1 of Chum Nubri Rural Municipality in Gorkha District. Most of the patches of pocket areas were found in Gorkha, Manang and Mustang District (**Figure 18**).

**Table 17: Pocket area of Yarshagumba**

<b>S.N.</b>	<b>District</b>	<b>Local levels</b>	<b>Ward no</b>	<b>Area (km<sup>2</sup>)</b>
1	Gorkha	Chum Nubri	1	56
2	Gorkha	Chum Nubri	2	15
3	Gorkha	Chum Nubri	7	73
4	Manang	Narphu	2	3
5	Manang	Narphu	3	8
6	Manang	Nashong	6	32

7	Manang	Neshyang	8	28
8	Manang	Neshyang	9	31
9	Mustang	Barhagaun Muktikhsetra	1	12
10	Mustang	Barhagaun Muktikhsetra	3	24
11	Mustang	Lo-Ghekar Damodar Kunda	4	31
12	Mustang	Lo-Ghekar Damodar Kunda	5	26
13	Mustang	Gharapjhong	5	16
14	Mustang	Thasang	2	1
15	Mustang	Thasang	5	1
16	Myagdi	Annapurna	4	12
17	Myagdi	Dhaulagiri	4	7
18	Myagdi	Dhorpatan Hunting Reserve		8
19	Myagdi	Raghuganga	8	1
	<b>Total</b>			<b>386</b>



**Figure 18: Spatial distribution of pocket area of Yarshagumba**

## Pocket areas of medicinal plants in districts of Gandaki Province

### Baglung

Baglung District is rich in medicinal plants. This study identified the pocket area of 11 medicinal plants in this district. Among these species, the pocket area of Ban Lasun covers the largest patch (**Table 18**). Dhorpatan Hunting Reserve has the pocket areas of several high-value medicinal plants such as Ban Lasun, Bish, Jatamansi, Kurilo, Kutki, Nirmansi, Panchaule, Setakchini and Satuwa.

**Table 18: Pocket areas of medicinal plants in Baglung District**

S.N.	Name of Medicinal Plants	Local levels	Ward no	Area (km <sup>2</sup> )
1	Ban Lasun	Dhorpatan Hunting Reserve		135
	Ban Lasun	Taman Khola	6	10
	<b>Total</b>			<b>145</b>
2	Bish	Dhorpatan Hunting Reserve		54
3	Jatamansi	Dhorpatan Hunting Reserve		73
	Jatamansi	Taman Khola	6	10
	<b>Total</b>			<b>83</b>
4	Kurilo	Dhorpatan	P4	11
	Kurilo	Galkot	10	10
	Kurilo	Nisikhola	6	10
	<b>Total</b>			<b>31</b>
5	Kutki	Dhorpatan Hunting Reserve		65
6	Lauth Salla	Galkot	10	7
	Lauth Salla	Taman Khola	5	5
	Lauth Salla	Taman Khola	6	11
	<b>Total</b>			<b>23</b>
7	Nirmansi	Dhorpatan Hunting Reserve		29
8	Panchaule	Dhorpatan Hunting Reserve		80
9	Setakchini	Dhorpatan Hunting Reserve		16
10	Satuwa	Dhorpatan Hunting Reserve		28
11	Timur	Galkot	10	10
	Timur	Nisikhola	5	2
	<b>Total</b>			<b>12</b>



## Gorkha

Gorkha is a rich district in medicinal plants. This study identified the pocket area of 13 medicinal plants in this district. Among these species, the pocket area of Panchaule covers the largest patch in ward no 1 of Chum Nubri Rural Municipality (**Table 19**). Chum Nubri and Dharche Rural Municipality are the pocket area of several medicinal plants. These areas are the hub of high-value medicinal plants such as Yarshagumba, Ban Lasun, Panchaule and Kutki.

**Table 19: Pocket areas of medicinal plants in Gorkha District**

S.N.	Name of Medicinal Plants	Local levels	Ward no	Area (km <sup>2</sup> )	
1	Banlasun	Aarughat	1	15	
	Banlasun	Ajirkot	1	12	
	Banlasun	Chum Nubri	1	28	
	Banlasun	Chum Nubri	2	13	
	Banlasun	Chum Nubri	3	26	
	Banlasun	Chum Nubri	6	16	
	Banlasun	Chum Nubri	7	40	
	Banlasun	Dharche	2	10	
	Banlasun	Dharche	4	17	
	Banlasun	Dharche	5	16	
	Banlasun	Sulikot	1	26	
	<b>Total</b>				<b>220</b>
	2	Bish	Chum Nubri	1	12
Bish		Chum Nubri	2	10	
Bish		Chum Nubri	3	10	
Bish		Chum Nubri	6	11	
Bish		Chum Nubri	7	23	
<b>Total</b>				<b>67</b>	
3	Chiraito	Chum Nubri	7	15	
	Chiraito	Sulikot	1	11	
	<b>Total</b>				<b>26</b>
4	Jatamansi	Aarughat	1	14	
	Jatamansi	Ajirkot	1	11	
	Jatamansi	Chum Nubri	1	55	
	Jatamansi	Chum Nubri	2	15	
	Jatamansi	Chum Nubri	3	29	
	Jatamansi	Chum Nubri	6	17	
	Jatamansi	Chum Nubri	7	72	
	Jatamansi	Dharche	1	12	
	Jatamansi	Dharche	2	10	
	Jatamansi	Dharche	4	11	
	Jatamansi	Dharche	5	12	

	Jatamansi	Sulikot	1	23
	<b>Total</b>			<b>281</b>
5	Kurilo	Aarughat	1	12
	Kurilo	Dharche	4	14
	Kurilo	Dharche	5	18
	Kurilo	Sulikot	1	20
	<b>Total</b>			<b>64</b>
	Kutki	Chum Nubri	1	24
	Kutki	Chum Nubri	7	50
	Kutki	Dharche	1	24
	<b>Total</b>			<b>98</b>
6	Lauth Salla	Aarughat	1	12
	Lauth Salla	Chum Nubri	2	11
	Lauth Salla	Chum Nubri	6	17
	Lauth Salla	Dharche	4	14
	Lauth Salla	Dharche	5	13
	Lauth Salla	Sulikot	1	16
	<b>Total</b>			<b>83</b>
7	Nirmansi	Chum Nubri	1	27
	Nirmansi	Chum Nubri	6	11
	Nirmansi	Chum Nubri	7	35
	<b>Total</b>			<b>73</b>
8	Panchaule	Chum Nubri	1	78
	Panchaule	Chum Nubri	2	69
	Panchaule	Chum Nubri	3	25
	Panchaule	Chum Nubri	4	22
	Panchaule	Chum Nubri	5	21
	Panchaule	Chum Nubri	6	13
	Panchaule	Chum Nubri	7	11
	Panchaule	Dharche	1	15
	Panchaule	Dharche	2	13
	Panchaule	Dharche	5	10
	<b>Total</b>			<b>275</b>
9	Setakchini	Ajirkot	2	10
	Setakchini	Chum Nubri	3	13
	Setakchini	Dharche	3	21
	<b>Total</b>			<b>44</b>
10	Satuwa	Aarughat	1	10
	Satuwa	Chum Nubri	7	16
	Satuwa	Dharche	5	10
	Satuwa	Sulikot	1	11
	<b>Total</b>			<b>47</b>
11	Tejpat	Sahid Lakhan	1	6
	Tejpat	Sahid Lakhan	3	6
	<b>Total</b>			<b>12</b>

12	Timur	Chum Nubri	7	14
	Timur	Dharche	4	12
	Timur	Dharche	5	17
	Timur	Sahid Lakhan	1	11
	Timur	Sulikot	1	17
	Timur	Sulikot	4	15
	<b>Total</b>			<b>86</b>
13	Yarsgagumba	Chum Nubri	1	56
	Yarsgagumba	Chum Nubri	2	15
	Yarsgagumba	Chum Nubri	7	73
	<b>Total</b>			<b>144</b>

### Kaski

Kaski District is moderately rich in medicinal plants. This study identified the pocket area of 12 medicinal plants in this district. Among these species, Kurilo covers the largest patch and, its largest patch lies in ward no 9 of Machhapuchhre Rural Municipality (**Table 20**). Machhapuchchhre and Annapurna Rural Municipalities are the pocket area of several medicinal plants. These areas are the hub of high-value medicinal plants such as Ban Lasun, Jatamansi, Kurilo, LauthsSalla and Satuwa.

**Table 20: Pocket areas of medicinal plants in Kaski District**

S.N.	Name of Medicinal Plants	Local levels	Ward no	Area (km <sup>2</sup> )
1	Ban Lasun	Annapurna	7	13
	Ban Lasun	Machhapuchchhre	1	23
	<b>Total</b>			<b>36</b>
2	Jatamansi	Annapurna	7	11
	Jatamansi	Annapurna	11	14
	Jatamansi	Machhapuchchhre	1	21
	<b>Total</b>			<b>46</b>
3	Kurilo	Annapurna	7	19
	Kurilo	Annapurna	11	12
	Kurilo	Machhapuchchhre	1	14
	Kurilo	Machhapuchchhre	2	12
	Kurilo	Machhapuchchhre	9	20
	Kurilo	Madi	2	17
	<b>Total</b>			<b>95</b>
4	Kutki	Machhapuchchhre	1	23
	Kutki	Madi	2	25
	<b>Total</b>			<b>48</b>

5	Lauth Salla	Annapurna	7	12
	Lauth Salla	Annapurna	11	11
	Lauth Salla	Pokhara	16	1
	<b>Total</b>			<b>24</b>
6	Nirmansi	Machhapuchchhre	9	11
7	Panchaule	Madi	2	25
8	Satuwa	Annapurna	7	11
9	Setakchini	Annapurna	11	13
	Setakchini	Madi	1	14
	Setakchini	Madi	2	11
	<b>Total</b>			<b>38</b>
10	Satuwa	Annapurna	7	11
11	Tejpat	Pokhara	33	6
	Tejpat	Pokhara	21	3
	Tejpat	Pokhara	23	2
	Tejpat	Pokhara	24	1
	Tejpat	Pokhara	33	6
	<b>Total</b>			<b>19</b>
12	Timur	Annapurna	3	1
	Timur	Madi	2	12
	<b>Total</b>			<b>13</b>

### Lamjung

Lamjung District is rich in high-value medicinal plants. This study identified the pocket area of nine medicinal plants in this district. Among these species, the pocket area of Ban Lasun was the largest and, its largest patch lies in ward no 3 of Marsyangdi Rural Municipality (**Table 21**). Dordi and Marsyangdi Rural Municipalities are the pocket areas of several medicinal plants. These areas are the hub of high-value medicinal plants such as Ban Lasun, Jatamasi, Kurilo, Kutki, Satuwa, Lauth Salla, and others.

**Table 21: Pocket areas of medicinal plants in Lamjung District**

S.N.	Name of Medicinal Plants	Local levels	Ward no	Area (km <sup>2</sup> )
1	Ban Lasun	Dordi	6	15
	Ban Lasun	Marsyangdi	3	27
	Ban Lasun	Marsyangdi	4	12
	Ban Lasun	Marsyangdi	7	16
	<b>Total</b>			<b>70</b>

2	Jatamansi	Dordi	6	12
	Jatamansi	Marsyangdi	3	20
	<b>Total</b>			<b>32</b>
3	Kurilo	Dordi	6	11
	Kurilo	Marsyangdi	3	24
	Kurilo	Marsyangdi	4	14
	Kurilo	Marsyangdi	7	23
	<b>Total</b>			<b>73</b>
4	Kutki	Dordi	6	17
	Kutki	Marsyangdi	7	20
	<b>Total</b>			<b>37</b>
5	Lauth Salla	Marsyangdi	3	10
	Lauth Salla	Marsyangdi	4	4
	<b>Total</b>			<b>14</b>
6	Panchaule	Marsyangdi	5	11
7	Satuwa	Marsyangdi	2	1
	Satuwa	Marsyangdi	3	6
	Satuwa	Marsyangdi	4	5
	<b>Total</b>			<b>12</b>
8	Setakchini	Marsyangdi	3	11
9	Timur	Dordi	6	10
	Timur	Marsyangdi	4	13
	Timur	Marsyangdi	7	15
	<b>Total</b>			<b>37</b>

### **Manang**

Several medicinal plants are found in Manang District. This study identified the pocket areas of 12 medicinal plants in this district. Among these species, the pocket area of Panchaule covers the largest area and, its largest patch lies in ward no 6 of Nashong Rural Municipality (**Table 22**). Nashong and Neshyang Rural Municipalities are the pocket areas of several medicinal plants. These areas are the hub of high-value medicinal plants such as Yarshagumba, Ban Lasun, Panchaule, Kutki, and so on.

**Table 22: Pocket areas of medicinal plants in Manang District**

S.N.	Name of Medicinal Plants	Local levels	Ward no	Area (km <sup>2</sup> )
1	Ban Lasun	Nashong	3	12
	Ban Lasun	Nashong	6	47
	Ban Lasun	Nashong	7	11
	Ban Lasun	Nashong	9	11
	Ban Lasun	Neshyang	1	18
	Ban Lasun	Neshyang	9	11
	<b>Total</b>			
2	Bish	Nashong	6	21
	Bish	Neshyang	1	12
	<b>Total</b>			<b>33</b>
3	Chiraito	Nashong	6	15
4	Jatamansi	Nashong	3	14
	Jatamansi	Nashong	6	53
	Jatamansi	Nashong	7	10
	Jatamansi	Neshyang	1	17
	Jatamansi	Neshyang	8	15
	Jatamansi	Neshyang	9	32
	<b>Total</b>			
5	Kurilo	Nashong	1	11
	Kurilo	Nashong	7	11
	Kurilo	Neshyang	1	12
	<b>Total</b>			<b>34</b>
6	Kutki	Narphu	3	27
	Kutki	Narphu	4	14
	Kutki	Narphu	5	19
	Kutki	Nashong	2	21
	Kutki	Nashong	6	43
	Kutki	Neshyang	9	18
	<b>Total</b>			
7	Lauth Salla	Nashong	9	10
	Lauth Salla	Neshyang	1	11
	<b>Total</b>			<b>21</b>
8	Nirmansi	Nashong	6	22
	Nirmansi	Neshyang	9	15
	<b>Total</b>			<b>37</b>
9	Panchaule	Nashong	6	78

	Panchaule	Neshyang	1	40
	Panchaule	Neshyang	3	32
	Panchaule	Neshyang	5	18
	Panchaule	Neshyang	8	12
	Panchaule	Neshyang	9	12
	<b>Total</b>			<b>192</b>
10	Satuwa	Nashong	6	15
11	Timur	Nashong	1	10
	Timur	Nashong	9	10
	Timur	Neshyang	1	28
	<b>Total</b>			<b>48</b>
12	Yarshagumba	Narphu	2	3
	Yarshagumba	Narphu	3	8
	Yarshagumba	Nashong	6	32
	Yarshagumba	Neshyang	8	28
	Yarshagumba	Neshyang	9	31
	<b>Total</b>			<b>91</b>

### Mustang

Mustang District is also rich in high value medicinal plants. This study identified the pocket areas of 11 medicinal plants in this district. Among these species, the pocket areas of Kutki has the largest area and lies in ward no 5 of Lo-Ghekar Damodar Kunda Rural Municipality (**Table 23**). Lo-Ghekar Damodar Kunda and Thasang Rural Municipalities are pocket areas of several medicinal plants. These areas are the hub of high-value medicinal plants such as Ban Lasun, Jatamansi, Kutki, Timur, Yarshagumba, and so on.

**Table 23: Pocket areas of medicinal plants in Mustang District**

S.N.	Name of Medicinal Plants	Local levels	Ward no	Area (km <sup>2</sup> )
1	Ban Lasun	Thasang	2	14
	Ban Lasun	Thasang	4	14
	<b>Total</b>			<b>28</b>
2	Bish	Thasang	2	10
	Bish	Thasang	4	10
	<b>Total</b>			<b>19</b>
3	Chitaito	Thasang	2	12
	Chitaito	Thasang	4	11
	<b>Total</b>			<b>22</b>
4	Jatamansi	Barhagaun Muktihssetra	1	11

	Jatamansi	Gharapjhong	5	21
	Jatamansi	Thasang	2	11
	Jatamansi	Thasang	4	10
	<b>Total</b>			<b>53</b>
5	Kurilo	Thasang	4	13
6	Kutki	Barhagaun Muktihssetra	3	121
	Kutki	Lo-Ghekar Damodar Kunda	1	159
	Kutki	Lo-Ghekar Damodar Kunda	4	85
	Kutki	Lo-Ghekar Damodar Kunda	5	187
	Kutki	Lomanthang	5	38
	Kutki	Thasang	1	17
	<b>Total</b>			<b>607</b>
7	Panchaule	Loghekar Damodar Kunda	4	18
	Panchaule	Loghekar Damodar Kunda	5	11
	Panchaule	Gharapjhong	1	10
	Panchaule	Gharapjhong	4	12
	Panchaule	Gharapjhong	5	10
	Panchaule	Lomanthang	5	12
	Panchaule	Thasang	2	18
	<b>Total</b>			<b>91</b>
8	Siltimur	Thasang	4	3
	Siltimur	Thasang	5	2
	<b>Total</b>			<b>5</b>
9	Satuwa	Thasang	2	11
	Satuwa	Thasang	4	11
	<b>Total</b>			<b>21</b>
10	Timur	Barhagaun Muktihssetra	3	15
	Timur	Barhagaun Muktihssetra	4	12
	Timur	Lo-Ghekar Damodar Kunda	2	13
	Timur	Thasang	2	12
	Timur	Thasang	3	4
	Timur	Thasang	4	15
	Timur	Thasang	5	5
	<b>Total</b>			<b>76</b>
11	Yarshagumba	Barhagaun Muktihssetra	1	12
	Yarshagumba	Barhagaun Muktihssetra	3	24
	Yarshagumba	Lo-Ghekar Damodar Kunda	4	31
	Yarshagumba	Lo-Ghekar Damodar Kunda	5	26
	Yarshagumba	Gharapjhong	5	16



	Yarshagumba	Thasang	2	1
	Yarshagumba	Thasang	5	1
	<b>Total</b>			<b>112</b>

### Myagdi

Myagdi District is rich in medicinal plants. This study area identified the pocket area of 12 medicinal plants in this district. Among these species, the pocket area of Ban Lasun covers the largest area and its largest patch lies in ward no 4 of Dhaulagiri Rural Municipality (**Table 24**). Dhaulagiri and Annapurna Rural Municipalities are the pocket areas of several high-value medicinal plants. These areas are the hub of medicinal plants such as Ban Lasun, Lauthsalla, Panchaule, Yarshagumba, and so on.

**Table 24: Pocket areas of medicinal plants in Myagdi District**

S.N.	Name of Medicinal Plants	Local levels	Ward no	Area (km <sup>2</sup> )
1	Banlasun	Annapurna	4	19
	Banlasun	Dhaulagiri	4	28
	Banlasun	Dhaulagiri	5	10
	Banlasun	Dhorpatan Hunting Reserve		23
	Banlasun	Raghuganga	7	16
	<b>Total</b>			<b>97</b>
2	Bish	Annapurna	4	13
	Bish	Dhaulagiri	4	18
	Bish	Dhorpatan Hunting Reserve		13
	<b>Total</b>			<b>44</b>
3	Chiraito	Annapurna	5	11
	Chiraito	Dhaulagiri	4	11
	<b>Total</b>			<b>22</b>
4	Jatamansi	Annapurna	4	18
	Jatamansi	Dhaulagiri	4	25
	Jatamansi	Dhorpatan Hunting Reserve		18
	<b>Total</b>			<b>61</b>
5	Kurilo	Annapurna	5	10
	Kurilo	Dhaulagiri	4	20
	Kurilo	Dhorpatan Hunting Reserve		16
	Kurilo	Raghuganga	7	13
	<b>Total</b>			<b>60</b>
6	Kutki	Dhaulagiri	4	32

	Kutki	Dhorpatan Hunting Reserve		28
	<b>Total</b>			<b>60</b>
7	Lauth Salla	Annapurna	4	17
	Lauth Salla	Annapurna	5	11
	Lauth Salla	Annapurna	8	4
	Lauth Salla	Dhaulagiri	4	26
	Lauth Salla	Malika	3	2
	Lauth Salla	Raghuganga	8	7
	<b>Total</b>			<b>66</b>
8	Nirmansi	Dhaulagiri	4	12
	Panchaule	Annapurna	4	13
	Panchaule	Dhaulagiri	4	18
	Panchaule	Dhaulagiri	5	11
	<b>Total</b>			<b>42</b>
9	Setakchini	Dhaulagiri	4	16
	Setakchini	Raghuganga	8	11
	<b>Total</b>			<b>27</b>
10	Satuwa	Annapurna	2	1
	Satuwa	Annapurna	5	11
	Satuwa	Dhaulagiri	4	11
	<b>Total</b>			<b>23</b>
11	Timur	Annapurna	7	10
	Timur	Beni	5	1
	Timur	Beni	9	1
	Timur	Raghuganga	7	10
	<b>Total</b>			<b>22</b>
12	Yarshagumba	Annapurna	4	12
	Yarshagumba	Dhaulagiri	4	7
	Yarshagumba	Dhorpatan Hunting Reserve		8
	Yarshagumba	Raghuganga	8	1
	<b>Total</b>			<b>28</b>

### **Nawalparasi (Bardaghat Susta Purba)**

This study identified limited medicinal plants in Nawalparasi compared to other districts of this province. The study area identified the pocket area of only one species of Tejpat in this district. The largest patch of Tejpat is situated in ward no 6 of Hupsekot Rural Municipality whereas the least patch is in ward no 5 of Bulingtar Rural Municipality (**Table 25**).

**Table 25: Pocket areas of medicinal plants in Nawalparasi (Bardaghat Susta Purba) District**

S.N.	Name of Medicinal Plants	Local levels	Ward no	Area (km <sup>2</sup> )
1	Tejpat	Bulingtar	5	1
	Tejpat	Bungdikali	4	3
	Tejpat	Bungdikali	5	3
	Tejpat	Bungdikali	6	3
	Tejpat	Hupsekot	6	4
	Tejpat	Madhyabindu	14	2
	<b>Total</b>			<b>16</b>

### **Parbat**

This study area identified the pocket areas of three medicinal plants in this district. Among these species, the pocket area of Lauth Salla covers the largest area and, its largest patch lies in ward no 1 of Modi Rural Municipality (**Table 26**). Pocket areas of Satuwa and Timur also were recorded in the district.

**Table 26: Pocket areas of medicinal plants in Parbat District**

S.N.	Name of Medicinal Plants	Local levels	Ward no	Area (km <sup>2</sup> )
1	Lauth Salla	Jaljala	5	1
	Lauth Salla	Jaljala	6	1
	Lauth Salla	Modi	1	3
	Lauth Salla	Modi	4	1
	<b>Total</b>			<b>6</b>
2	Satuwa	Jaljala	6	1
3	Timur	Kushma	11	1

### Syangja

This study identified the pocket area of only two medicinal plants such as Tejpat and Timur. Among them, the pocket area of Tejpat has the largest area and its largest patch lies in ward no 13 of Waling Municipality (**Table 27**). Pocket areas of Timur are found in small patches.

**Table 27: Pocket areas of medicinal plants in Syangja District**

S.N.	Name of Medicinal Plants	Local levels	Ward no	Area (km <sup>2</sup> )
1	Tejpat	Waling	13	6
	Tejpat	Phedikhola	2	1
	Tejpat	Putalibazar	13	1
	Tejpat	Waling	13	6
	<b>Total</b>			<b>13</b>
2	Timur	Aandhikhola	1	1
	Timur	Bhirkot	4	1
	<b>Total</b>			<b>2</b>

### Tanahun

This study identified the pocket area of only two medicinal plants such as Tejpat and Timur. Among these species, the pocket area of Tejpat has the largest area and its largest patch lies in ward no 6 of Bandipur Rural Municipality and ward no 13 of Byas Municipality (**Table 28**). The pocket area of Timur was found in ward no 13 of Rhishing Rural Municipality.

**Table 28: Pocket areas of medicinal plants in Tanahun District**

S.N.	Name of Medicinal Plants	Local levels	Ward no	Area (km <sup>2</sup> )
1	Tejpat	Bandipur	6	7
	Tejpat	Bhanu	12	3
	Tejpat	Byas	13	7
	Tejpat	Byas	14	6
	Tejpat	Devghat	2	6
	Tejpat	Myagde	3	2
	Tejpat	Myagde	4	3
	Tejpat	Myagde	5	3
	Tejpat	Rhishing	3	5

	Tejpat	Shuklagandaki	12	1
	Total			42
2	Timur	Rhishing	3	13

## 4 Conclusions

Gandaki Province is rich in medicinal plants. The data of the last ten years show the trade of more than 54 species of medicinal plants from the province. Among these traded medicinal plants, Yarshagumba, Guchhi Chyau, and Ban Lasun are high-value species. This study identified the High Mountain region of the Gandaki Province as a suitable habitat of medicinal plants. Out of 15 species (Ban Lasun, Bish, Chiraito, Jatamansi, Kurilo, Kutki, Lauthsalla, Nirmansi, Panchaule, Satuwa, Setakchini, Siltimur, Tejpat, Timur, and Yarshagumba), the pocket areas of the majority of the species were identified around High Mountain region of the province. This province also covers some parts of the Dhorpatan Hunting Reserve. This study identified Dhorpatan Hunting Reserve (Baglung and Myagdi Districts); Chum Nubri Rural Municipality of Gorkha District; and Nasong and Nesyang Rural Municipalities of Manang District as the pocket areas of most of the medicinal plants. Unlike other medicinal plants, pocket areas of the Tejpat were identified and mapped around the hilly regions of the province. This study concludes that the High Mountain region of the Gandaki Province is a suitable area for conservation, cultivation and promotion of medicinal plants. Out of 15 species, pocket areas of Kutki occupies the largest area (1,057 km<sup>2</sup>) suitable area whilst Siltimur occupies the smallest area (5 km<sup>2</sup>).

## 5 Recommendations

This study identified the highly traded medicinal plants of Gandaki Province and pocket areas of these medicinal plants. Furthermore, this study also mapped the pocket areas of medicinal plants throughout the province. This study has made the following recommendations for conservation, cultivation, promotion, value addition, and sustainable use of medicinal plants in Gandaki Province.

- The provincial government should focus on conservation, cultivation, and promotion of medicinal plants in identified pocket areas. Significant consideration should be given to the pocket area as it shades a large volume of medicinal plants allowing traders/collectors to collect such medicinal plants from specific locations ensuring easy transportation.
- Identified pocket areas should be protected for conservation of the medicinal plants. If pocket area is conserved, medicinal plants will be conserved and local people get benefited from the medicinal plants.
- Medicinal plants can grow outside the pocket area too. Therefore, stakeholders should plan to develop these areas as pocket areas of the medicinal plants.
- Awareness programs should be conducted to conserve, plant, and take sustainable benefits from medicinal plants. It helps local people to get optimum benefits from medicinal plants.
- Till now medicinal plants are exported in crude form, and locals have been selling medicinal plants at a nominal rate. Therefore, stakeholders should establish the processing plants to make the refined products from medicinal plants so local people can get employment and a high return.
- Complete harvesting without leaving seeds/rhizomes/roots for future propagation may lead to the extinction of medicinal plants. Concerned authorities and stakeholders should focus on sustainable harvesting and stop premature harvesting. Collectors should be aware of sustainable harvesting practices and techniques.

- Research on identification of cultivation sites for important medicinal plants needs the topmost priority. During that research, different plantation sites should be identified for high value as well as high care demanding (water, manure, tillage, weeding) and low value with less care demanding.



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# Appendices

## Field photos



Data collection staff at Division Forest Office, Baglung



Rhododendraon species



Data collection staff at Division Forest Office, Manang



Data collection staff at Division Forest Office, Parbat





Data collection staff at Division Forest Office, Tanahun



Timur palnt



Taking GPS points of medicinal plants

### Geographic locations of medicinal plants used for modeling

S.N.	Species	X	Y
1	Ban Lasun	84.79722	28.32080
2	Ban Lasun	84.79722	28.32080
3	Ban Lasun	84.79722	28.32080
4	Ban Lasun	84.76875	28.32495
5	Ban Lasun	84.76875	28.32495
6	Ban Lasun	84.76875	28.32495
7	Ban Lasun	84.39124	28.46652
8	Ban Lasun	84.38946	28.46670
9	Ban Lasun	84.38836	28.46712
10	Ban Lasun	84.38914	28.46865
11	Ban Lasun	84.38010	28.47057
12	Ban Lasun	84.38369	28.47067
13	Ban Lasun	84.37629	28.47102
14	Ban Lasun	84.38150	28.50245
15	Ban Lasun	84.38200	28.50328
16	Ban Lasun	84.37829	28.50343
17	Ban Lasun	84.37690	28.50410
18	Ban Lasun	84.38268	28.50460
19	Ban Lasun	84.38270	28.50460
20	Ban Lasun	84.38350	28.50610
21	Ban Lasun	84.38510	28.50630
22	Ban Lasun	84.38488	28.50784
23	Ban Lasun	84.37097	28.50827
24	Ban Lasun	84.37082	28.50898
25	Ban Lasun	84.37103	28.51028
26	Ban Lasun	84.47712	28.51094
27	Ban Lasun	84.36677	28.51227
28	Ban Lasun	84.36178	28.51765
29	Ban Lasun	84.36122	28.51995
30	Ban Lasun	84.46121	28.52190
31	Ban Lasun	84.36079	28.52197
32	Ban Lasun	84.35962	28.52316
33	Ban Lasun	84.35902	28.52421
34	Ban Lasun	84.35975	28.52542
35	Ban Lasun	84.36049	28.52601
36	Ban Lasun	84.36149	28.52640
37	Ban Lasun	84.36373	28.52790

38	Ban Lasun	84.36569	28.53050
39	Ban Lasun	84.36735	28.53310
40	Ban Lasun	82.93751	28.53490
41	Ban Lasun	84.37095	28.53649
42	Ban Lasun	84.37732	28.54185
43	Ban Lasun	84.37843	28.54264
44	Ban Lasun	84.37977	28.54339
45	Ban Lasun	84.38064	28.54404
46	Ban Lasun	82.93498	28.54590
47	Ban Lasun	83.20679	28.55185
48	Ban Lasun	83.20606	28.55229
49	Ban Lasun	84.39171	28.55480
50	Ban Lasun	83.18998	28.55548
51	Ban Lasun	84.39750	28.56071
52	Ban Lasun	84.39988	28.56196
53	Ban Lasun	84.40452	28.56488
54	Ban Lasun	84.40779	28.56938
55	Ban Lasun	84.35396	28.57075
56	Ban Lasun	84.42069	28.59120
57	Ban Lasun	84.42132	28.59220
58	Ban Lasun	84.42296	28.59328
59	Ban Lasun	84.42512	28.59385
60	Ban Lasun	84.42776	28.59407
61	Ban Lasun	84.44723	28.59421
62	Ban Lasun	84.44346	28.59465
63	Ban Lasun	84.43128	28.59475
64	Ban Lasun	84.42936	28.59476
65	Ban Lasun	84.43352	28.59625
66	Ban Lasun	84.45108	28.59671
67	Ban Lasun	84.45792	28.59939
68	Ban Lasun	84.46500	28.60321
69	Ban Lasun	84.46754	28.60682
70	Ban Lasun	84.47019	28.60934
71	Ban Lasun	84.70819	28.60941
72	Ban Lasun	84.47149	28.61030
73	Ban Lasun	84.47326	28.61269
74	Ban Lasun	84.47311	28.61347
75	Ban Lasun	84.47329	28.61616
76	Ban Lasun	84.46752	28.65118
77	Ban Lasun	84.46863	28.65855

78	Ban Lasun	84.46934	28.66158
79	Ban Lasun	84.47009	28.66493
80	Bish	84.37047	28.51063
81	Bish	84.38169	28.50275
82	Bish	84.37658	28.47106
83	Bish	84.37880	28.46993
84	Bish	84.38676	28.46853
85	Bish	84.37095	28.53649
86	Bish	84.37095	28.53649
87	Bish	84.36987	28.53477
88	Bish	84.36735	28.53310
89	Bish	84.36569	28.53050
90	Bish	84.36079	28.52197
91	Bish	84.36197	28.51959
92	Bish	84.36222	28.51760
93	Bish	84.37692	28.54167
94	Bish	84.37784	28.54244
95	Bish	84.39462	28.55704
96	Bish	84.42358	28.59336
97	Bish	84.43352	28.59618
98	Bish	84.44041	28.59560
99	Bish	84.45784	28.59762
100	Bish	84.45792	28.59939
101	Bish	84.45995	28.60043
102	Bish	84.47414	28.61061
103	Bish	84.47326	28.61269
104	Bish	84.47329	28.61616
105	Bish	83.16090	28.60450
106	Chiraito	83.80062	28.19327
107	Chiraito	83.83732	28.20008
108	Chiraito	84.91703	28.21252
109	Chiraito	84.75048	28.22089
110	Chiraito	84.79490	28.22726
111	Chiraito	84.70559	28.25125
112	Chiraito	84.65850	28.25199
113	Chiraito	84.39094	28.46667
114	Chiraito	84.38676	28.46853
115	Chiraito	84.37899	28.46947
116	Chiraito	84.38010	28.47057
117	Chiraito	84.37888	28.47062

118	Chiraito	84.38199	28.47066
119	Chiraito	84.37802	28.47075
120	Chiraito	84.38180	28.47170
121	Chiraito	84.38105	28.50230
122	Chiraito	84.37651	28.50445
123	Chiraito	84.38226	28.50697
124	Chiraito	84.37254	28.50700
125	Chiraito	84.37097	28.50827
126	Chiraito	84.36190	28.50835
127	Chiraito	84.37088	28.50983
128	Chiraito	84.36200	28.51020
129	Chiraito	84.37103	28.51028
130	Chiraito	84.37047	28.51063
131	Chiraito	84.36920	28.51099
132	Chiraito	84.36116	28.51132
133	Chiraito	84.36900	28.51190
134	Chiraito	84.36677	28.51227
135	Chiraito	84.36575	28.51243
136	Chiraito	84.36743	28.51255
137	Chiraito	84.36137	28.51285
138	Chiraito	84.36063	28.52088
139	Chiraito	84.35908	28.52335
140	Chiraito	84.36103	28.52659
141	Chiraito	84.36243	28.52686
142	Chiraito	84.36373	28.52790
143	Chiraito	84.36443	28.52888
144	Chiraito	84.36593	28.53170
145	Chiraito	84.36987	28.53477
146	Chiraito	84.37079	28.53545
147	Chiraito	84.37166	28.53568
148	Chiraito	84.37220	28.53600
149	Chiraito	84.37084	28.53628
150	Chiraito	84.37280	28.53660
151	Chiraito	84.37316	28.53718
152	Chiraito	84.37400	28.53830
153	Chiraito	84.37509	28.53943
154	Chiraito	84.37560	28.53960
155	Chiraito	84.37641	28.54087
156	Chiraito	84.37732	28.54185
157	Chiraito	84.37977	28.54339

158	Chiraito	84.38064	28.54404
159	Chiraito	84.38497	28.54960
160	Chiraito	84.38899	28.55371
161	Chiraito	84.39171	28.55480
162	Chiraito	84.39462	28.55704
163	Chiraito	84.39556	28.55877
164	Chiraito	84.39672	28.56023
165	Chiraito	84.40890	28.56040
166	Chiraito	84.39784	28.56071
167	Chiraito	84.39857	28.56179
168	Chiraito	84.39988	28.56196
169	Chiraito	84.40452	28.56488
170	Chiraito	84.40528	28.56594
171	Chiraito	84.38399	28.56596
172	Chiraito	84.40738	28.56859
173	Chiraito	84.40811	28.57147
174	Chiraito	84.40756	28.57240
175	Chiraito	84.42069	28.59120
176	Chiraito	84.42215	28.59283
177	Chiraito	84.42409	28.59347
178	Chiraito	84.42848	28.59403
179	Chiraito	84.42672	28.59407
180	Chiraito	84.42733	28.59407
181	Chiraito	84.44141	28.59517
182	Chiraito	84.43261	28.59537
183	Chiraito	84.44120	28.59555
184	Chiraito	84.43352	28.59618
185	Chiraito	84.43352	28.59625
186	Chiraito	84.45693	28.59786
187	Chiraito	84.45792	28.59939
188	Chiraito	84.46367	28.60163
189	Chiraito	84.47019	28.60934
190	Chiraito	84.70819	28.60941
191	Chiraito	84.47368	28.61209
192	Chiraito	84.06500	28.19050
193	Chiraito	84.03550	28.18340
194	Gucchi Chyau	84.37692	28.54167
195	Gucchi Chyau	84.37881	28.54277
196	Gucchi Chyau	84.37897	28.54311
197	Gucchi Chyau	84.38070	28.54388



198	Gucchi Chyau	84.38064	28.54404
199	Gucchi Chyau	84.38662	28.55062
200	Gucchi Chyau	84.39673	28.56019
201	Gucchi Chyau	84.39857	28.56179
202	Gucchi Chyau	84.40251	28.56398
203	Gucchi Chyau	84.40534	28.56527
204	Gucchi Chyau	84.40596	28.56694
205	Gucchi Chyau	84.40779	28.56938
206	Gucchi Chyau	84.41839	28.58928
207	Gucchi Chyau	84.42069	28.59120
208	Gucchi Chyau	84.42215	28.59283
209	Gucchi Chyau	84.42465	28.59385
210	Gucchi Chyau	84.42568	28.59385
211	Gucchi Chyau	84.42672	28.59407
212	Gucchi Chyau	84.42819	28.59415
213	Gucchi Chyau	84.43204	28.59480
214	Gucchi Chyau	84.43695	28.59660
215	Gucchi Chyau	84.44041	28.59560
216	Gucchi Chyau	84.44298	28.59447
217	Gucchi Chyau	84.44579	28.59427
218	Gucchi Chyau	84.45108	28.59671
219	Gucchi Chyau	84.45407	28.59711
220	Gucchi Chyau	84.45786	28.59829
221	Gucchi Chyau	84.45995	28.60043
222	Gucchi Chyau	84.46808	28.60761
223	Gucchi Chyau	84.36852	28.53382
224	Gucchi Chyau	84.36689	28.53280
225	Gucchi Chyau	84.36298	28.52528
226	Gucchi Chyau	84.36690	28.53280
227	Gucchi Chyau	84.36300	28.52530
228	Gucchi Chyau	84.38365	28.50688
229	Gucchi Chyau	84.38369	28.47067
230	Gucchi Chyau	84.38224	28.50738
231	Gucchi Chyau	84.37988	28.46995
232	Gucchi Chyau	84.36178	28.51905
233	Gucchi Chyau	84.36164	28.51744
234	Gucchi Chyau	84.36624	28.51193
235	Gucchi Chyau	84.36751	28.51322
236	Gucchi Chyau	84.36743	28.51255
237	Gucchi Chyau	84.36955	28.51129

238	Gucchi Chyau	84.37099	28.50973
239	Gucchi Chyau	84.37086	28.50854
240	Gucchi Chyau	84.37103	28.50821
241	Gucchi Chyau	84.37103	28.50822
242	Gucchi Chyau	84.37143	28.50743
243	Gucchi Chyau	84.37254	28.50700
244	Gucchi Chyau	84.37518	28.50539
245	Gucchi Chyau	84.37770	28.50397
246	Gucchi Chyau	84.37900	28.50330
247	Gucchi Chyau	84.37928	28.50328
248	Gucchi Chyau	84.38150	28.50245
249	Gucchi Chyau	84.38204	28.50360
250	Gucchi Chyau	84.38261	28.50463
251	Gucchi Chyau	84.38328	28.50556
252	Gucchi Chyau	84.37880	28.46993
253	Gucchi Chyau	84.38140	28.47115
254	Gucchi Chyau	84.28801	28.46754
255	Gucchi Chyau	84.39124	28.46652
256	Gucchi Chyau	84.42409	28.53819
257	Gucchi Chyau	84.37297	28.53756
258	Gucchi Chyau	84.36443	28.52888
259	Gucchi Chyau	84.36310	28.52724
260	Gucchi Chyau	84.36243	28.52686
261	Gucchi Chyau	84.36103	28.52659
262	Gucchi Chyau	84.36069	28.52209
263	Gucchi Chyau	84.36060	28.52052
264	Gucchi Chyau	84.38071	28.50231
265	Gucchi Chyau	84.38061	28.50330
266	Gucchi Chyau	84.38544	28.50659
267	Gucchi Chyau	84.37228	28.53610
268	Gucchi Chyau	84.40836	28.57001
269	Gucchi Chyau	84.40050	28.56164
270	Gucchi Chyau	84.39672	28.56023
271	Gucchi Chyau	84.41070	28.57209
272	Gucchi Chyau	84.38070	28.50230
273	Gucchi Chyau	84.38060	28.50330
274	Gucchi Chyau	84.38540	28.50660
275	Gucchi Chyau	84.37230	28.53610
276	Gucchi Chyau	84.40840	28.57000
277	Gucchi Chyau	84.40050	28.56160

278	Gucchi Chyau	84.39670	28.56020
279	Gucchi Chyau	84.41070	28.57210
280	Jatamashi	84.36956	28.51164
281	Jatamashi	84.37088	28.50983
282	Jatamashi	84.37271	28.50686
283	Jatamashi	84.37651	28.50445
284	Jatamashi	84.38365	28.50630
285	Jatamashi	84.38839	28.46914
286	Jatamashi	84.35975	28.52542
287	Jatamashi	84.36049	28.52182
288	Jatamashi	84.42725	28.59431
289	Jatamashi	84.43061	28.59505
290	Jatamashi	84.43352	28.59618
291	Jatamashi	84.43695	28.59660
292	Jatamashi	84.43879	28.59598
293	Jatamashi	84.44141	28.59474
294	Jatamashi	84.45002	28.59588
295	Jatamashi	84.45407	28.59711
296	Jatamashi	84.45784	28.59762
297	Jatamashi	84.46235	28.60115
298	Jatamashi	84.46584	28.60380
299	Jatamashi	84.46702	28.60595
300	Jatamashi	84.46808	28.60761
301	Jatamashi	84.46998	28.60879
302	Jatamashi	84.47421	28.61140
303	Jatamashi	84.47329	28.61616
304	Jatamashi	84.78258	28.32166
305	Jatamashi	85.07673	28.56618
306	Jatamashi	84.95571	28.53499
307	Jatamashi	84.66509	28.51915
308	Jatamashi	84.70723	28.34796
309	Jatamashi	85.06767	28.36179
310	Jatamashi	84.38204	28.50360
311	Kurilo	84.37762	28.47075
312	Kurilo	84.37879	28.46984
313	Kurilo	84.37181	28.53680
314	Kurilo	84.36603	28.53180
315	Kurilo	84.37640	28.47080
316	Kurilo	84.37680	28.47120
317	Kurilo	84.37760	28.47080

318	Kurilo	84.38130	28.47090
319	Kurilo	84.37180	28.53680
320	Kurilo	84.37000	28.53500
321	Kurilo	84.36600	28.53180
322	Kurilo	84.38455	28.50653
323	Kurilo	84.38226	28.50697
324	Kurilo	84.37802	28.47075
325	Kurilo	84.37991	28.47007
326	Kurilo	84.38010	28.47057
327	Kurilo	84.38088	28.47043
328	Kurilo	84.38125	28.47081
329	Kurilo	84.38212	28.47095
330	Kurilo	84.38369	28.47067
331	Kurilo	84.38369	28.47068
332	Kurilo	84.38717	28.46994
333	Kurilo	84.38839	28.46914
334	Kurilo	84.38676	28.46814
335	Kurilo	84.38947	28.46698
336	Kurilo	84.39057	28.46675
337	Kurilo	84.42409	28.53819
338	Kurilo	84.43352	28.59618
339	Kurilo	84.43695	28.59660
340	Kurilo	84.43879	28.59598
341	Kurilo	84.44298	28.59447
342	Kurilo	84.45108	28.59671
343	Kurilo	84.45309	28.59655
344	Kurilo	83.82574	28.12210
345	Kurilo	83.79447	27.89618
346	Kutki	84.46094	28.52245
347	Kutki	84.46669	28.51679
348	Kutki	84.46090	28.52240
349	Kutki	84.46670	28.51680
350	Kutki	84.69092	28.35240
351	Kutki	84.72311	28.35365
352	Kutki	84.77781	28.36067
353	Kutki	85.05164	28.36884
354	Kutki	84.69092	28.35240
355	Kutki	84.72311	28.35365
356	Kutki	84.77781	28.36067
357	Kutki	85.05164	28.36884

358	Loth Salla	84.36776	28.51232
359	Loth Salla	84.36798	28.51234
360	Loth Salla	84.37025	28.50752
361	Loth Salla	84.37690	28.51226
362	Loth Salla	84.40816	28.56960
363	Loth Salla	84.39380	28.55596
364	Loth Salla	84.36780	28.51230
365	Loth Salla	84.36800	28.51230
366	Loth Salla	84.37020	28.50750
367	Loth Salla	84.37690	28.51230
368	Loth Salla	84.36677	28.51227
369	Loth Salla	84.37518	28.50539
370	Loth Salla	84.38455	28.50653
371	Loth Salla	84.38279	28.50708
372	Loth Salla	84.38226	28.50697
373	Loth Salla	84.38224	28.50738
374	Loth Salla	84.37629	28.47102
375	Loth Salla	84.37899	28.46947
376	Loth Salla	84.38315	28.47037
377	Loth Salla	84.38719	28.46808
378	Loth Salla	84.39124	28.46652
379	Loth Salla	84.42409	28.59347
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381	Loth Salla	84.36987	28.53477
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383	Loth Salla	84.36593	28.53170
384	Loth Salla	84.36569	28.53050
385	Loth Salla	84.36512	28.52969
386	Loth Salla	84.36443	28.52888
387	Loth Salla	84.36243	28.52686
388	Loth Salla	84.35975	28.52542
389	Loth Salla	84.35962	28.52316
390	Loth Salla	84.36122	28.51995
391	Loth Salla	84.36197	28.51959
392	Loth Salla	84.36158	28.51756
393	Loth Salla	84.36246	28.51763
394	Loth Salla	84.37641	28.54087
395	Loth Salla	84.38064	28.54404
396	Loth Salla	84.39462	28.55704
397	Loth Salla	84.39788	28.56065

398	Loth Salla	84.40111	28.56279
399	Loth Salla	84.40222	28.56397
400	Loth Salla	84.40528	28.56594
401	Loth Salla	84.40738	28.56859
402	Loth Salla	84.40811	28.57147
403	Loth Salla	84.41915	28.58918
404	Loth Salla	84.42132	28.59220
405	Loth Salla	84.42215	28.59283
406	Loth Salla	84.42296	28.59328
407	Loth Salla	84.42409	28.59347
408	Loth Salla	84.42465	28.59385
409	Loth Salla	84.43204	28.59480
410	Loth Salla	84.43261	28.59537
411	Loth Salla	84.43352	28.59618
412	Loth Salla	84.43621	28.59653
413	Loth Salla	84.43695	28.59660
414	Loth Salla	84.43879	28.59598
415	Loth Salla	84.44141	28.59517
416	Loth Salla	84.44723	28.59421
417	Loth Salla	84.44896	28.59484
418	Loth Salla	84.45309	28.59655
419	Loth Salla	84.45693	28.59786
420	Loth Salla	84.45792	28.59939
421	Loth Salla	84.46429	28.60273
422	Loth Salla	84.46500	28.60321
423	Loth Salla	84.46608	28.60500
424	Loth Salla	84.46702	28.60595
425	Loth Salla	84.46754	28.60682
426	Loth Salla	84.46808	28.60761
427	Loth Salla	84.47019	28.60934
428	Loth Salla	84.47149	28.61030
429	Loth Salla	84.47326	28.61269
430	Loth Salla	84.47372	28.61464
431	Loth Salla	84.47322	28.61550
432	Loth Salla	84.41020	28.57300
433	Loth Salla	84.41020	28.57303
434	Loth Salla	84.83087	28.25242
435	Loth Salla	84.91584	28.30354
436	Loth Salla	84.69888	28.31236
437	Loth Salla	84.87185	28.31955

438	Loth Salla	84.83735	28.22985
439	Loth Salla	84.79746	28.21962
440	Loth Salla	84.81973	28.19052
441	Nirmansi	84.37271	28.50686
442	Nirmansi	84.38224	28.50738
443	Nirmansi	84.38456	28.50774
444	Nirmansi	84.38260	28.50450
445	Nirmansi	84.38490	28.50630
446	Nirmansi	84.38330	28.50000
447	Nirmansi	84.37770	28.50397
448	Nirmansi	84.37900	28.50330
449	Nirmansi	84.39057	28.46675
450	Nirmansi	84.45002	28.59588
451	Nirmansi	84.45407	28.59711
452	Nirmansi	84.45995	28.60043
453	Nirmansi	84.46235	28.60115
454	Nirmansi	84.46429	28.60273
455	Nirmansi	84.46500	28.60321
456	Nirmansi	84.46608	28.60500
457	Nirmansi	84.46754	28.60682
458	Nirmansi	84.46808	28.60761
459	Nirmansi	84.47019	28.60934
460	Nirmansi	84.47421	28.61140
461	Nirmansi	84.47368	28.61209
462	Nirmansi	84.47372	28.61464
463	Nirmansi	84.47329	28.61616
464	Nirmansi	85.05971	28.35972
465	Nirmansi	84.77637	28.31148
466	Nirmansi	84.68578	28.53083
467	Paanch Aule	84.45995	28.60043
468	Paanch Aule	84.46235	28.60115
469	Paanch Aule	84.46330	28.60128
470	Paanch Aule	84.46367	28.60163
471	Paanch Aule	84.46500	28.60321
472	Paanch Aule	84.46608	28.60500
473	Paanch Aule	84.46702	28.60595
474	Paanch Aule	84.47149	28.61030
475	Paanch Aule	84.47414	28.61061
476	Paanch Aule	84.47326	28.61269
477	Paanch Aule	84.47372	28.61464

478	Paanch Aule	84.47329	28.61616
479	Paanch Aule	84.69228	28.34698
480	Paanch Aule	84.77415	28.33201
481	Paanch Aule	85.04713	28.37454
482	Paanch Aule	84.60345	28.62206
483	Paanch Aule	84.69228	28.34698
484	Paanch Aule	84.77415	28.33201
485	Paanch Aule	85.04713	28.37454
486	Paanch Aule	84.60345	28.62206
487	Paanch Aule	84.38402	28.50734
488	Paanch Aule	84.38479	28.50746
489	Paanch Aule	84.46934	28.66158
490	Paanch Aule	84.38400	28.50730
491	Paanch Aule	84.38480	28.50750
492	Paanch Aule	84.46930	28.66160
493	Paanch Aule	84.35757	28.56575
494	Paanch Aule	84.36218	28.57976
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496	Paanch Aule	84.46752	28.65118
497	Paanch Aule	84.47415	28.66294
498	Paanch Aule	84.46863	28.65855
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502	Paanch Aule	84.47750	28.51060
503	Paanch Aule	84.46750	28.65120
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505	Paanch Aule	84.46860	28.65850
506	Paanch Aule	84.47430	28.66340
507	Paanch Aule	84.37271	28.50686
508	Paanch Aule	84.37386	28.50636
509	Paanch Aule	84.38105	28.50230
510	Paanch Aule	84.38397	28.50726
511	Paanch Aule	84.38435	28.50746
512	Paanch Aule	84.38484	28.50751
513	Paanch Aule	84.38462	28.50711
514	Paanch Aule	84.38279	28.50708
515	Paanch Aule	84.38224	28.50738
516	Paanch Aule	83.10495	28.51569
517	Satuwa	84.06500	28.19050



518	Satuwa	84.36685	28.51171
519	Satuwa	84.37028	28.51066
520	Satuwa	84.37075	28.51013
521	Satuwa	84.38327	28.50622
522	Satuwa	84.37791	28.50388
523	Satuwa	84.37724	28.50417
524	Satuwa	84.37926	28.50327
525	Satuwa	84.38540	28.50658
526	Satuwa	84.38168	28.50221
527	Satuwa	84.37910	28.50344
528	Satuwa	84.38051	28.47055
529	Satuwa	84.38103	28.47048
530	Satuwa	84.38124	28.47101
531	Satuwa	84.38245	28.47113
532	Satuwa	84.38165	28.47828
533	Satuwa	84.38209	28.47131
534	Satuwa	84.38216	28.47110
535	Satuwa	84.38196	28.47076
536	Satuwa	84.38192	28.47067
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538	Satuwa	84.38181	28.47008
539	Satuwa	84.38129	28.46987
540	Satuwa	84.38089	28.46974
541	Satuwa	84.38046	28.46950
542	Satuwa	84.38088	28.47046
543	Satuwa	84.38133	28.47070
544	Satuwa	84.38144	28.47124
545	Satuwa	84.38172	28.47147
546	Satuwa	84.38179	28.47137
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548	Satuwa	84.38172	28.47110
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555	Satuwa	84.38201	28.47011
556	Satuwa	84.38144	28.47893
557	Satuwa	84.38157	28.47001

558	Satuwa	84.38134	28.46999
559	Satuwa	84.38060	28.47015
560	Satuwa	84.37185	28.53671
561	Satuwa	84.37176	28.53682
562	Satuwa	84.37166	28.53672
563	Satuwa	84.37150	28.53681
564	Satuwa	84.36792	28.53343
565	Satuwa	84.35958	28.52247
566	Satuwa	84.35989	28.52188
567	Satuwa	84.40786	28.56899
568	Satuwa	84.40795	28.56830
569	Satuwa	84.40744	28.56685
570	Satuwa	84.40684	28.56619
571	Satuwa	84.40498	28.56441
572	Satuwa	84.40475	28.56451
573	Satuwa	84.40289	28.56358
574	Satuwa	84.40253	28.56353
575	Satuwa	84.40221	28.56347
576	Satuwa	84.40036	28.56152
577	Satuwa	84.39279	28.56137
578	Satuwa	84.39302	28.56091
579	Satuwa	84.39412	28.55589
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586	Satuwa	84.37790	28.50390
587	Satuwa	84.37720	28.50420
588	Satuwa	84.37870	28.50300
589	Satuwa	84.38520	28.50700
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591	Satuwa	84.38530	28.50700
592	Satuwa	84.38550	28.50690
593	Satuwa	84.38540	28.50660
594	Satuwa	84.38330	28.50590
595	Satuwa	84.38170	28.50220
596	Satuwa	84.38050	28.47060
597	Satuwa	84.38100	28.47050

598	Satuwa	84.38120	28.47100
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601	Satuwa	84.38210	28.47130
602	Satuwa	84.38220	28.47110
603	Satuwa	84.38200	28.47080
604	Satuwa	84.38190	28.47070
605	Satuwa	84.38190	28.47050
606	Satuwa	84.38180	28.47010
607	Satuwa	84.38130	28.46990
608	Satuwa	84.38090	28.46970
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612	Satuwa	84.38140	28.47120
613	Satuwa	84.38170	28.47150
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615	Satuwa	84.38170	28.47120
616	Satuwa	84.38170	28.47110
617	Satuwa	84.38170	28.47100
618	Satuwa	84.38200	28.47070
619	Satuwa	84.38190	28.47050
620	Satuwa	84.38170	28.47050
621	Satuwa	84.38170	28.47020
622	Satuwa	84.38180	28.47010
623	Satuwa	84.38200	28.47010
624	Satuwa	84.38140	28.47890
625	Satuwa	84.38160	28.47000
626	Satuwa	84.38130	28.47000
627	Satuwa	84.38060	28.47010
628	Satuwa	84.37190	28.53670
629	Satuwa	84.36790	28.53340
630	Satuwa	84.35960	28.52250
631	Satuwa	84.35990	28.52190
632	Satuwa	84.40790	28.56900
633	Satuwa	84.40790	28.56830
634	Satuwa	84.40740	28.56690
635	Satuwa	84.40680	28.56620
636	Satuwa	84.40500	28.56440
637	Satuwa	84.40470	28.56450

638	Satuwa	84.40290	28.56360
639	Satuwa	84.40250	28.56350
640	Satuwa	84.40220	28.56350
641	Satuwa	84.40040	28.56150
642	Satuwa	84.39280	28.56140
643	Satuwa	84.39300	28.56090
644	Satuwa	84.39410	28.55590
645	Satuwa	84.41010	28.57400
646	Satuwa	84.41050	28.57160
647	Satuwa	84.36624	28.51193
648	Satuwa	84.36677	28.51227
649	Satuwa	84.36751	28.51322
650	Satuwa	84.36947	28.51173
651	Satuwa	84.36956	28.51164
652	Satuwa	84.36948	28.51139
653	Satuwa	84.36970	28.51110
654	Satuwa	84.37047	28.51063
655	Satuwa	84.37088	28.50983
656	Satuwa	84.37108	28.50959
657	Satuwa	84.37103	28.50922
658	Satuwa	84.37082	28.50898
659	Satuwa	84.37103	28.50822
660	Satuwa	84.37254	28.50700
661	Satuwa	84.38169	28.50275
662	Satuwa	84.38200	28.50328
663	Satuwa	84.38226	28.50697
664	Satuwa	84.37592	28.47098
665	Satuwa	84.37888	28.47062
666	Satuwa	84.38315	28.47037
667	Satuwa	84.38676	28.46814
668	Satuwa	84.39094	28.46667
669	Satuwa	84.42409	28.59347
670	Satuwa	84.42409	28.53819
671	Satuwa	84.37297	28.53756
672	Satuwa	84.36852	28.53382
673	Satuwa	84.36735	28.53310
674	Satuwa	84.36569	28.53050
675	Satuwa	84.36443	28.52888
676	Satuwa	84.36373	28.52790
677	Satuwa	84.36149	28.52640

678	Satuwa	84.36103	28.52659
679	Satuwa	84.35902	28.52421
680	Satuwa	84.35908	28.52335
681	Satuwa	84.36079	28.52215
682	Satuwa	84.36079	28.52197
683	Satuwa	84.36049	28.52182
684	Satuwa	84.36060	28.52052
685	Satuwa	84.36122	28.51995
686	Satuwa	84.36178	28.51905
687	Satuwa	84.36158	28.51756
688	Satuwa	84.37641	28.54087
689	Satuwa	84.38064	28.54404
690	Satuwa	84.38497	28.54960
691	Satuwa	84.39111	28.55441
692	Satuwa	84.39462	28.55704
693	Satuwa	84.39673	28.56019
694	Satuwa	84.39788	28.56065
695	Satuwa	84.39810	28.56093
696	Satuwa	84.40111	28.56279
697	Satuwa	84.40222	28.56397
698	Satuwa	84.40452	28.56488
699	Satuwa	84.40534	28.56527
700	Satuwa	84.40596	28.56694
701	Satuwa	84.40779	28.56938
702	Satuwa	84.40811	28.57147
703	Satuwa	84.41915	28.58918
704	Satuwa	84.42132	28.59220
705	Satuwa	84.42155	28.59248
706	Satuwa	84.42215	28.59283
707	Satuwa	84.42296	28.59328
708	Satuwa	84.42358	28.59336
709	Satuwa	84.42409	28.59347
710	Satuwa	84.42450	28.59358
711	Satuwa	84.42512	28.59385
712	Satuwa	84.42568	28.59385
713	Satuwa	84.42594	28.59387
714	Satuwa	84.42629	28.59411
715	Satuwa	84.42819	28.59415
716	Satuwa	84.42848	28.59403
717	Satuwa	84.42936	28.59476

718	Satuwa	84.43261	28.59537
719	Satuwa	84.43772	28.59642
720	Satuwa	84.43968	28.59559
721	Satuwa	84.44041	28.59560
722	Satuwa	84.44120	28.59555
723	Satuwa	84.44141	28.59474
724	Satuwa	84.44346	28.59465
725	Satuwa	84.44579	28.59427
726	Satuwa	84.44723	28.59421
727	Satuwa	84.45792	28.59939
728	Satuwa	84.45995	28.60043
729	Satuwa	84.46367	28.60163
730	Satuwa	84.46429	28.60273
731	Satuwa	84.46584	28.60380
732	Satuwa	84.46702	28.60595
733	Satuwa	84.46998	28.60879
734	Satuwa	84.70819	28.60941
735	Satuwa	84.47414	28.61061
736	Satuwa	84.47311	28.61347
737	Satuwa	84.75107	28.23432
738	Satuwa	84.89383	28.20812
739	Satuwa	84.82566	28.23645
740	Satuwa	84.05560	28.21590
741	Satuwa	84.06500	28.19050
742	Satuwa	84.88644	28.29198
743	Setakchini	84.80412	28.21806
744	Setakchini	84.89277	28.22625
745	Setakchini	84.66286	28.26913
746	Setakchini	84.84366	28.23084
747	Setakchini	83.05684	28.49108
748	Tejpat	84.36525	27.94776
749	Tejpat	84.36688	27.94911
750	Tejpat	84.36534	27.94828
751	Tejpat	84.36543	27.94866
752	Tejpat	84.36765	27.94914
753	Tejpat	84.36988	27.94999
754	Tejpat	84.36811	27.95154
755	Tejpat	84.36742	27.95146
756	Tejpat	84.39984	27.91831
757	Tejpat	84.39948	27.91845

758	Tejpat	84.39948	27.91845
759	Tejpat	84.39938	27.91826
760	Tejpat	84.39948	27.91845
761	Tejpat	84.39923	27.91827
762	Tejpat	84.39948	27.91845
763	Tejpat	84.39915	27.91837
764	Tejpat	84.39948	27.91845
765	Tejpat	84.39914	27.91848
766	Tejpat	84.39918	27.91852
767	Tejpat	84.39928	27.91856
768	Tejpat	84.39941	27.91860
769	Tejpat	84.39948	27.91845
770	Tejpat	84.39973	27.91860
771	Tejpat	84.39995	27.91863
772	Tejpat	84.40004	27.91862
773	Tejpat	84.40012	27.91865
774	Tejpat	84.40015	27.91865
775	Tejpat	84.40019	27.91864
776	Tejpat	84.40019	27.91859
777	Tejpat	84.40021	27.91856
778	Tejpat	84.40017	27.91847
779	Tejpat	84.40007	27.91844
780	Tejpat	84.39995	27.91838
781	Tejpat	84.39990	27.91835
782	Tejpat	84.39983	27.91835
783	Tejpat	84.39418	27.91828
784	Tejpat	84.39409	27.91823
785	Tejpat	84.39396	27.91813
786	Tejpat	84.39388	27.91806
787	Tejpat	84.39379	27.91799
788	Tejpat	84.39404	27.91795
789	Tejpat	84.39380	27.91788
790	Tejpat	84.39366	27.91786
791	Tejpat	84.39404	27.91795
792	Tejpat	84.39358	27.91783
793	Tejpat	84.39356	27.91784
794	Tejpat	84.39350	27.91788
795	Tejpat	84.39349	27.91794
796	Tejpat	84.39349	27.91799
797	Tejpat	84.39354	27.91802

798	Tejpat	84.39357	27.91814
799	Tejpat	84.39367	27.91823
800	Tejpat	84.39372	27.91827
801	Tejpat	84.39379	27.91832
802	Tejpat	84.39381	27.91833
803	Tejpat	84.39380	27.91839
804	Tejpat	84.39385	27.91838
805	Tejpat	84.39390	27.91840
806	Tejpat	84.39398	27.91839
807	Tejpat	84.39405	27.91841
808	Tejpat	84.39404	27.97952
809	Tejpat	84.39420	27.91836
810	Tejpat	84.39442	27.91832
811	Tejpat	84.39404	27.91795
812	Tejpat	83.82574	28.12210
813	Tejpat	83.82276	27.99586
814	Tejpat	84.03726	27.80499
815	Tejpat	84.39380	27.91839
816	Tejpat	84.39941	27.91860
817	Tejpat	84.36534	27.94828
818	Tejpat	84.03490	28.18230
819	Timur	84.06110	28.21290
820	Timur	84.06220	28.19470
821	Timur	84.06190	28.15400
822	Timur	84.16350	28.18400
823	Timur	84.14490	28.16030
824	Timur	84.19030	28.17120
825	Timur	84.19500	28.16150
826	Timur	84.37274	28.53653
827	Timur	84.37269	28.53658
828	Timur	84.37236	28.53616
829	Timur	84.38952	28.56610
830	Timur	84.39388	28.55589
831	Timur	84.39379	28.55573
832	Timur	84.39342	28.55555
833	Timur	84.36393	27.94740
834	Timur	84.36528	27.94773
835	Timur	84.36629	27.94855
836	Timur	84.36680	27.94925
837	Timur	84.36736	27.94925



838	Timur	84.36770	27.94929
839	Timur	84.36933	27.95001
840	Timur	84.36944	27.95068
841	Timur	84.36950	27.95067
842	Timur	84.36664	27.94952
843	Timur	84.36682	27.94929
844	Timur	84.36671	27.94961
845	Timur	84.36667	27.94956
846	Timur	84.36754	27.94917
847	Timur	84.36741	27.94919
848	Timur	84.33128	27.94840
849	Timur	84.37270	28.53650
850	Timur	84.37270	28.53660
851	Timur	84.37240	28.53620
852	Timur	84.38950	28.56610
853	Timur	84.39390	28.55590
854	Timur	84.39380	28.55570
855	Timur	84.39340	28.55560
856	Timur	84.36624	28.51193
857	Timur	84.37658	28.47106
858	Timur	84.37899	28.46947
859	Timur	84.38088	28.47043
860	Timur	84.38158	28.47109
861	Timur	84.38759	28.46984
862	Timur	84.28801	28.46754
863	Timur	84.38835	28.46734
864	Timur	84.38886	28.46678
865	Timur	84.37297	28.53756
866	Timur	84.37095	28.53649
867	Timur	84.36987	28.53477
868	Timur	84.36735	28.53310
869	Timur	84.36512	28.52969
870	Timur	84.36049	28.52601
871	Timur	84.35962	28.52316
872	Timur	84.36197	28.51959
873	Timur	84.36178	28.51765
874	Timur	84.37843	28.54264
875	Timur	84.37881	28.54277
876	Timur	84.37897	28.54311
877	Timur	84.37977	28.54339

878	Timur	84.38064	28.54404
879	Timur	84.38064	28.54404
880	Timur	84.38899	28.55371
881	Timur	84.39556	28.55877
882	Timur	84.39673	28.56019
883	Timur	84.39750	28.56071
884	Timur	84.40111	28.56279
885	Timur	83.82574	28.12210