

MID-TERM ACTIVITY REPORT

BIFA3_25 - Mobilizing occurrence data of alien and endemic plant species of Nepal

Guidelines on how to complete the activity report are included in italics.

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Executive summary

This is a mid-term report of a BIFA funded project on mobilizing occurrence data of alien and endemic plants of Nepal from the herbarium collections of two national institutions: National Herbarium and Plant Laboratories (KATH) of the Department of Plant Resources, and Tribhuvan University Central Herbarium (TUCH) of the Central Department of Botany, Tribhuvan University. Project activities during the reporting period (May-September 2018) were checked against the project planning and some minor changes have been mentioned in this report.

We finalized checklists of 180 alien (naturalized and invasive; excluding casual and cultivated alien plants) and 313 endemic plants of Nepal based on previous databases and publications. Among them, occurrence data of 89% (160 species) alien and 85% (266 species) endemic plants were found in GBIF database published by foreign institutions. The

KATH has 5982 herbarium specimens representing 137 species of alien plants and the TUCH has 1157 specimens representing 117 alien species. Altogether the KATH and TUCH has 7139 specimens representing 152 alien species (84.5%). Similarly, KATH and TUCH has 400 and 60 specimens of endemic species representing 127 and 11 endemic species, respectively. Altogether, there are 460 specimens representing 133 endemic species (42.5%) of Nepal in these two institutions. We could not find herbarium specimens of 28 alien and 180 endemic plants in KATH and TUCH. We also examined online herbarium database of nine foreign institutions holding collections from Nepal and found that Tokyo University, Japan (TI) has the highest number of collections of alien plants (1208 specimens representing 114 species) followed by the Royal Botanic Garden Edinburgh (RBGE) (E) (621 specimens representing 99 species).

While sorting the herbarium specimens in KATH and TUCH, we found that nearly 60% of the Nepalese endemic plants have not been represented in collections of these institutions. We will extract available information from online database of foreign institutions to fill this gap. Some of the alien species have been poorly represented in collections though they are common and widespread in Nepal. We will focus these plants during a plant collection field work to mid-western Nepal with co-funding from RBGE. We also found that many old collections do not have geographic coordinates. Since occurrence data without geographic coordinates has limited use value, we are planning for georeferencing based on the locality of the collections.

Contact information

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Introduction

A research project to mobilize occurrence data of alien and endemic plant species of Nepal is being implemented from May 2018 by the Central Department of Botany of Tribhuvan University (CDBTU) and the Department of Plant Resources (DPR) in association with Royal Botanic Garden Edinburgh, UK (RBGE). This mid-term report of the project highlights the activities completed during the reporting period (May-September 2018), major findings, the risk factors identified during the project implementation, and the activities planned to address those risks.

A seven member project management committee (approved by Office of Dean) has been formed to monitor and guide the project activities. Two meetings of the management committee were organized during the reporting period. Project coordinator has been

updating the project activities and outcome frequently by email to the project team and committee members. Technical issues that arose during activities were shared among them and resolved after their input on the issues.

The project and its objectives

A long-term objective of the project is to mobilize occurrence data of alien and endemic plant species of Nepal to fill geographic gap and inform policy process for the conservation of biodiversity. In this project, we are digitizing herbarium specimens of alien (only naturalized including invasive species) and endemic plant species of Nepal that have been deposited at National Herbarium and Plant Laboratory (KATH) and Tribhuvan University Central Herbarium (TUCH). The KATH and TUCH are the major national institutions internationally recognized for managing herbarium specimens. The project started from May 2018 and will continue for 11 months until March 2019. The project is being implemented jointly by the Central Department of Botany, Tribhuvan University (CDBTU) and the Department of Plant Resources (DPR), Ministry of Forest and Environment in association with Royal Botanic Garden Edinburgh (RBGE). The project is led by Prof. Mohan Siwakoti (Head of the CDBTU) as Principle Investigator (PI) and Mr. Sanjeev Kumar Rai (Director General, DPR) as Co-Principle Investigator (CoPI). Other members of the project team are Dr. Bharat Babu Shrestha (CDBTU; Project Coordinator), Dr. Suresh Kumar Ghimire (CDBTU), Ms Kalpana Sharma (Dhakal) (DPR) and Mr. Tirtha Raj Pandey (DPR). The project has also recruited two Research Assistants RA) – Mr. Yagya Raj Paneru and Mr. Ganesh Datt Joshi. Both RA are MSc graduates in Botany and have experiences of biodiversity database handling and computer programming. Dr. Mark Watson and Dr. Bhaskar Adhikari are participating in this project from RBGE.

As a part of implementing this project, a photographic facility is being set up at TUCH with financial support from BIFA grant. The digitization facilities at KATH are being upgraded adding new computers.

Activities

Description of activity	Partners involved	Contribution of activity to goals listed in table 4.3	Status of activity as of mid-term reporting
Digitizing and publishing georeferenced species occurrence data based on specimens held in Asian collections			
Updating and validation of checklists of the alien and endemic plant species	CDB-TU, DPR, RBGE	Final list of species for digitization	List of 180 alien and 313 endemic plant species finalized.
Digital photography of herbarium specimens	CDB-TU, DPR	Specimens digitized	Sorting of herbarium specimens at TUCH and KATH completed; herbarium checking by experts ongoing; scanning of herbarium specimens of endemic species started at KATH
Database preparation (data entry) and curation	CDB-TU, DPR, RBGE	Database prepared	Data published in GBIF checked for occurrence data of Nepalese alien and endemic plants;
Publication of data in GBIF.org	CDB-TU, DPR, RBGE	Publication of data	
Compiling inventories of biodiversity data holdings (for example, by implementing metadata catalogues)			
Preparation of catalogue of herbarium specimens of alien and endemic plants of Nepal	CDB-TU, DPR, RBGE	Publication of data	Herbarium information extracted from nine

			international herbaria*
Preparing <u>data papers</u>			
Drafting of data papers	CDB-TU	Publication of data paper	
Revision and submission of data paper	CDB-TU, DPR, RBGE	Publication of data paper	
Other activity types			
Field collection of plant specimens from the regions which have been poorly recorded in the past [Co-funding]	CDB-TU, DPR, RBGE	Final list of species for digitization	Two week long plant collection field work to hilly districts in mid-western Nepal (Salyan, Rukum, Jajarkot, Surkhet) started from 24 September 2018 with participants from RBGE, DPR and CDBTU.
Inception workshop at the beginning and result sharing workshop at the end of the project	CDB-TU, DPR	Digitization and publication of data	Inception workshop organized on 6 July 2018 (See Annex 1 for report of workshop)

*Name of herbaria (Herbarium code): Royal Botanic Garden, Edinburgh, Scotland, UK (E), Royal Botanic Garden, Kew UK (K), University of Tokyo (TI), University of South Florida Herbarium (USF), Moscow State University Herbarium (MW), Geneva herbarium - Conservatoire et Jardin botaniques de la Ville de Genève, Switzerland (G), Herbarium Berolinense, Germany (B), University of Vienna (WU), The Natural History Museum, London (BM)

Deliverables

a. Data

Title of dataset	Taxonomic/geographic scope	Approximate number of records (specimens)	Current format (e.g. undigitized, digitized)	Status of activity as of mid-term reporting
Invasive alien plant species of Nepal	All vascular plants; Nepal	1000	Undigitized	no result achieved yet
Naturalized plant species of Nepal	All vascular plants; Nepal	8000	Undigitized; no herbarium records for several species	no result achieved yet
Endemic flowering plants of Nepal	Flowering plants; Nepal	600	Mostly undigitized	no result achieved yet

b. Other deliverables

Occurrence data of alien plant species of Nepal [Data paper]

Occurrence data of endemic plant species of Nepal [Data paper]

Catalogue of herbarium specimens of alien and endemic plants of Nepal

Calendar of activities

Proposed dates	Activity	Lead partner	Notes
May 2018	Review of literatures to prepare checklist of alien (invasive and naturalized) and endemic plant species of Nepal; [inception workshop among partner institutions and other stakeholders]	CDB-TU, DPR	Inception workshop could not be organized due to delay in official process of permission from Tribhuvan University and signing on the document
June 2018	Attendance of project team member at BIFA Capacity Enhancement Workshop	CDB-TU	
July-August 2018	Inception workshop among partner institutions and other stakeholders; Examination of herbarium specimens deposited at TUCH (CDB-TU) and KATH (DPR); [Consultation with international herbaria]	CDB-TU, DPR, RBGE	Inception workshop initially scheduled for May was organized on 6 July 2018
September 2018	Consultation with international herbaria; plant collection field work; photography of herbarium specimens begins	CDB-TU, DPR, RBGE	Information from international herbarium extracted during 2 nd week of September due to delay in recruitment of Research Assistants
October-December 2018	Herbarium digitization and database management	CDB-TU, DPR	
January-February 2019	Publication of database; drafting of data paper; report writing	CDB-TU, DPR	
March 2019	Result sharing workshop; submission of report; submission of data paper	CDB-TU	

Project communications

A brief news about project objectives and activities (such as the inception workshop) will be published in a newsletter (VANASPATI) of the Central Department of Botany, Tribhuvan University which will be released in November 2018. A brief report of the inception workshop has been included in this report and we would like to publish this in project page in GBIF website. At the end the project output will be published as data paper in peer reviewed

journal, as news in national daily newspaper, and a 2-page summary for stakeholders and policy makers.

Mid-term evaluation findings and recommendations for the remaining project implementation period

A. Institutional Arrangements and Infrastructure

Approval of the Project

After the approval of the project by GBIF, the proposal with necessary documents from GBIF was sent to Office of the Dean of the Institute of Science and Technology, Tribhuvan University (TU) for approval. The document was forwarded to the central office of TU and approved by the Executive Council of TU. After that approval, Head of the Central Department of Botany (Prof. Mohan Siwakoti), TU signed on the fund transfer agreement which was then sent to GBIF.

Project Management Committee

To facilitate and guide the implementation of the project, a Project Management Committee has been formed and approved by the Office of the Dean of the Institute of Science and Technology, Tribhuvan University. The Committee has following members:

- 1) Prof. Mohan Siwakoti, Head of the Department, CDBTU – Chairman
- 2) Prof. Mohan Panthi, CDBTU – Member
- 3) Prof. Sangeeta Rajbhandari, CDBTU – Member
- 4) Dr. Suresh Kumar Ghimire, Assoc. Prof, CDBTU – Member
- 5) Ms. Kalpana Sharma(Dhakal), Scientific Officer, DPR – Member
- 6) Mr. Prakash Chandra Maharjan, Account Officer, CDBTU – Member
- 7) Dr. Bharat Babu Shrestha, Assoc. Prof, CDBTU – Member Secretary

Inception Workshop

An inception workshop of the project was organized on 6 July 2018 at the Department of Plant Resources, Thapathali, Kathmandu. The workshop was participated by 53 participants from government Ministries (Ministry of Forest and Environment, Ministry of Agriculture), Departments (Department of Forest Research and Survey, Department of National Park and Wildlife Reserve, Department of Forest), Central Department of Tribhuvan University (Botany, Zoology, Environment), Natural History Museum of Tribhuvan University, research institutions (Nepal Academy of Science and Technology, National Gene Bank), INGOs (IUCN Nepal, ICIMOD, Biodiversity International), NGO (Forest Action), etc. There were four technical papers presented during the workshop; first presentation by Dr. Bharat Babu Shrestha was about the BIFA funded project; second by Mr. Tirtha Raj Pandey was about herbarium digitization in National Herbarium and Plant Laboratory (KATH); third one by Dr. Suresh Kumar Ghimire was about Tribhuvan University Central Herbarium (TUCH); and the fourth one by Dr. Nakul Chettri was about bioinformatics and biodiversity data publishing in GBIF. Participants in general emphasized that national institutions should work collaboratively for biodiversity data management without relying heavily on external financial supports. For details of the workshop, please refer Annex 1.

Recruitment of Research Assistants

Two Research Assistants – Mr. Yagya Raj Paneru and Mr. Ganesh Datt Joshi (photographs in Annex 2) - have been appointed since August 2018 for six months to work on this project. They were selected through open competition. Vacancy announcement was published online in the website of the Central Department of Botany, TU (www.cdbtu.edu.np) and in notice boards of the collaborating institutions. There were seven applicants and all participated in interview. Based on the criteria decided by the Project Management Committee (academic excellence, desirable skill for the project, and interview), two applicants were selected. The selected candidates are MSc Botany graduates and have experiences of handling biodiversity data and are familiar with GIS and species distribution modelling.

Infrastructure Development

For herbarium photography and data entry/storage, we purchased following items:

- 1) Digital camera: Canon EOS 80
- 2) Desktop computer: Dell desktop i5 /16GB DDR4 ram/1TB/24 inch Full Hd screen/win/Graphics card nvidia/10
- 3) Barcode: 15000 pieces (10000 for TUCH and 5000 for KATH)
- 4) Barcode reader
- 5) External hard disk: 2 pcs, 1 TB, Toshiba

With these items, we are establishing herbarium photography and digitization facility at CDBTU (TUCH). From co-funding, two desktop computers (Dell All in One, 24" screen) have been added to the digitization facilities in KATH herbarium.

B. Participation in GBIF Activities

BIFA Data Mobilization Workshop, Beijing

The project coordinator Dr. Bharat Babu Shrestha participated a 'Biodiversity Information Fund for Asia (BIFA) Data Mobilization Workshop' organized by GBIF from 4-8 June 2018 at Institute of Botany, Chinese Academy of Science, Beijing, China. He also participated a GBIF Engagement Meeting on 4 June 2018 and make a presentation on project objectives and activities. The workshop was particularly important to make familiar with biodiversity data mobilization project planning, data management (sources, curation) and publishing through GBIF network (Darwin Core and Integrated Publishing Toolkit IPT).

Asia Regional Nodes Meeting, Kathmandu

The project coordinator Dr. Bharat Babu Shrestha participated a '2018 Global Biodiversity Information Facility (GBIF) Asia Regional Nodes Meeting' organized at the International Centre for Integrated Mountain Development (ICIMOD) from 17-18 September in Kathmandu. He also made a presentation on project activities during the meeting.

C. Current State of Data Availability in GBIF

After the list of alien and endemic plant species of Nepal was finalized, availability of occurrence data of these species published in GBIF was examined. The outcome has been presented briefly below.

Alien Plants of Nepal

The GBIF currently (as of 19 September 2018) has 1432 occurrence records of 160 (89% of 180 species) alien flowering plants of Nepal. Among the occurrence records, only 322 (22.5%) entries representing 84 species (47%) have geographic coordinates.

Endemic Plants of Nepal

Out of 313 species of Nepalese endemic plants, 1869 occurrence data of 266 species (85%) has been published in GBIF as of 19 September 2018. Among the occurrence data, only 670 (36 %) entries have geographic coordinates of the occurrence/collection localities.

D. Herbarium in International Institutions

We examined online database of nine institutions abroad which has herbarium specimen records of alien and endemic plants of Nepal (Table 1). Altogether 1995 records were found in these nine institutions. The University of Tokyo, Japan had the highest number of records (1208; 61% of total) representing 114 species of alien plants found in Nepal. It was followed by Royal Botanic Garden Edinburgh with 621 records (31% of total) representing 99 alien plant species. [Examining the online database of Nepalese endemic plants in foreign institutions has not been completed and thus not included in this report].

Table 1. *Institutions holding herbarium of alien plants of Nepal*

SN	Name and address of institutions	Herbarium code	# records available online	# Species	Web link
1	Geneva herbarium - Conservatoire et Jardin botaniques de la Ville de Genève, Switzerland	G	2	1	http://www.ville-ge.ch
2	Herbarium Berolinense, Germany	B	3	2	https://www.bgbm.org
3	Moscow State University Herbarium	MW	30	23	http://herba.msu.ru/
4	Royal Botanic Garden, Edinburgh, Scotland, UK	E	621	99	https://www.rbge.org.uk/
5	Royal Botanic Garden, Kew UK	K	26	12	https://www.kew.org/
6	The Natural History Museum, London	BM	89	13	http://www.nhm.ac.uk/
7	University of Tokyo, Japan	TI	1208	114	https://www.u-tokyo.ac.jp/en/index.html

8	University of South Florida Herbarium, USA	USF	2	2	http://biology.usf.edu/cmmb/research/herbarium.aspx
9	University of Vienna, Austria	WU	14	13	https://herbarium.univie.ac.at/
Total			1995		

E. Herbarium in National Institutions

We screened herbarium specimens of alien and endemic plants present in KATH and TUCH. Checking plant identification by experts is ongoing.

Alien Plants of Nepal

The KATH has 5982 herbarium specimens representing 137 alien species (76% of 180 species) while 43 alien species have not been represented in KATH collections. The TUCH has 1157 herbarium specimens representing 117 alien species (65% of 180 species) and the remaining 63 species has not been represented in TUCH collections. When collections of KATH and TUCH was combined, 152 species (84.5%) of alien species have been represented in 7139 herbarium collections of these two institutions and remaining 28 alien species (15.5%) have not been represented in these collections. Out of 180 alien species reported from Nepal, neither herbarium specimens (in KATH and TUCH) nor occurrence records (in GBIF) of 10 species (5.5%) are available.

Endemic Plants of Nepal

Our examination so far revealed that the KATH holds about 400 specimens representing 127 endemic plants (40.6%) of Nepal. There is high possibility of finding additional specimens and species of endemic plants in KATH collections. The TUCH has 60 herbarium specimens representing 11 endemic plant species (3.5% of 313 species) of Nepal. Altogether we found 460 specimens of representing 133 species (42.5%) of Nepalese endemic plants in KATH and TUCH collections. These institutions, therefore, does not have specimens of 180 plants endemic to Nepal.

F. Plant collection field works

Plant collection fieldwork with cofounding from RBGE is going to start from 24 September 2018 for two weeks. Dr. Bhaskar Adhikar from RBGE is already in Kathmandu for preparation of the field work. Tirtha Raj Pandey from the Department of Plant Resources and Dr. Bharat Babu Shrestha from the Central Department of Botany, Tribhuvan University are participating in the field work in mid-western Nepal. This plant collection field work is focusing on alien plant species of Nepal.

G. Imaging and databasing

Imaging and databasing (digitizing occurrence data) herbarium specimens of endemic plants of Nepal has started from the second week of September in KATH (Annex 3). We are using HerbScan for scanning the herbarium images in 600 dpi.

H. Lesson learned, risks identified, and future strategies

Important lessons learned during the implementation of BIFA project are:

- Official process for granting permission from high level authorities to accept foreign grants is relatively long (>1 month) which may negatively affect the timely completion of the activities included in the proposal. However, rescheduling activities can help to meet the final timeline to complete the project.
- A significant proportion of herbarium specimens deposited at TUCH have been damaged by fungus and insect pests. Therefore, the specimens should be properly stored and regularly poisoned to avoid damage to these valuable collections.

During the implementation of the project, we identified a number of risk factors that may affect the outcome of the project and planning some strategies to minimize the impacts of these factors to the final outcome.

Table 2. Risk factors identified and strategies planned to minimize their impacts on project outcome

SN	Risk factors	Strategies to address risks
1	Low representation of invasive alien plant species in collections	Additional collections during co-funded field work in mid-western Nepal Collections from student volunteers
2	No herbarium specimens of nearly 60% of Nepalese endemic plants in KATH and TUCH	Information will be extracted from online database of foreign herbarium holding specimens of Nepalese endemic plants and will be included in catalogue.
3	Lack of geographic coordinates in old collections	Geo-referencing will be done based on the collection localities.

Annex – Sources of verification

Sources of verification are for example links to relevant digital documents, news/newsletters, brochures, copies of agreements with data holding institutions, workshop related documents, pictures, etc.

Annex 1. Brief report of the inception workshop

Mobilizing Occurrence data of alien and endemic plant species of Nepal

Brief report of Inception workshop

(Prepared by Dr. Bharat Babu Shrestha, Project Coordinator)

Background

The Central Department of Botany (CDBTU, Tribhuvan University) and the Department of Plant Resources (DPR, Ministry of Forest and Environment), in collaboration with Royal Botanic Garden Edinburgh (RBGE, UK), are implementing a research project entitled '**Mobilizing occurrence data of alien and endemic plant species of Nepal**' with financial support from Biodiversity Information Fund for Asia (BIFA) program of the Global Biodiversity Information Facility (GBIF), Denmark. The major funding agency for BIFA program is the Ministry of the Environment of the Government of Japan. The main objective of the project is to digitize herbarium specimens of the alien and endemic plants of Nepal deposited at National Herbarium and Plant Laboratories (KATH) and Tribhuvan University Central Herbarium (TUCH), and publish occurrence data in open access GBIF publishing network. In addition, a herbarium collection field work has been planned in September with co-funding from RBGE. The project has started from May 2018 and will complete in March 2019 with total duration of 11 months.

The project team includes Prof. Mohan Siwakoti (Head, CDBTU; Principle investigator of the project), Mr. Sanjeev Kumar Rai (Director General, DPR; Co-principle investigator), Dr. Bharat Babu Shrestha (Associate Professor, CDBTU; Project Coordinator), Dr. Suresh Kumar Ghimire (Associate Professor, CDBTU; Plant taxonomist), Ms. Kalpana Sharma-Dhakal (Scientific Officer, DPR; Expert) and Mr. Tirtha Raj Pandey (Research Officer, KATH; Expert). Dr. Mark Watson and Dr. Bhaskar Adhikari are participants from RBGE. Two Research Assistants Mr. Yagya Raj Paneru and Mr. Ganesh Dutt Joshi have been appointed for six months.

Workshop objectives

An inception workshop of a research project was organized on July 6, 2018, Friday (Asadh 22, 2075 according to Nepali calendar) at the Department of Plant Resources, Thapathali, Kathmandu. The objectives of the workshop were as follows:

- 1) To inform the stakeholders about state of Nepalese biodiversity data publication in GBIF network
- 2) To inform the objectives, activities and output/outcome of the BIFA funded project in Nepal and seek feedbacks/comments from all stakeholders involved in biodiversity conservation and management
- 3) To share experiences of biodiversity data management in Nepal

Inaugural session

The entire program was divided into inaugural and technical sessions. The inaugural session, chaired by Prof. Mohan Siwakoti, started at 10.30 with welcome speech by Mr. Sanjeev Kumar Rai, Director General of the Department of Plant Resources. Highlighting the project objectives and activities, he emphasized the need of publishing biodiversity database and express commitment of the Department of Plant Resources to collaborate with national and international organizations to prepare and publish database related to Nepalese plant diversity. Second speaker of this session was Dr. Deepak Kharal, Director General of the Department of Forest Research and Survey (DFRS) who informed that the DFRS has drafted the national strategy for the management of invasive species and trying to approve this from the Government of Nepal. In his remarks, Professor Emirates Pramod Kumar Jha (Tribhuvan University) highlighted the importance of geographic distribution data of plant species that will be generated from the project for species distribution modelling. Professor Ram Narayan Jha, Assistant Dean, Institute of the Science and Technology (Tribhuvan University) praised the collaborative researches between university departments and government organizations. The inaugural session ended with the remarks from Prof. Mohan Siwakoti, Head of the Central Department of Botany (Tribhuvan University) and Principle Investigator of this BIFA funded project. Prof. Siwakoti emphasized on the need of mobilizing occurrence data of endemic and invasive alien plants of Nepal for meeting long-term goals of biodiversity conservation and environmental management. Mr. Pramesh Lakhey, Scientific Officer at DPR, conducted the program.

Technical session

The technical session was chaired by Prof. Mohan Prasad Panthi of the Central Department of Botany, Tribhuvan University. There were four presentations during the technical session. First presentation was made by Dr. Bharat Babu Shrestha (coordinator of the BIFA funded project) on 'Mobilizing occurrence data of alien and endemic plant species of Nepal'. First he highlighted the value of 'big' data published in GBIF to address 'big' problems such as the increasing problems of biological invasion in the world. He also highlighted BIFA funded, both past and current, projects in Asia. Then, he reviewed Nepalese biodiversity data availability in GBIF and revealed that, in spite of 256,269 occurrence data in GBIF on

Nepalese biodiversity published by 175 publisher from 35 countries, there was no publisher from Nepal. After these background information, Dr. Shrestha presented the objectives, activities, deliverables and potential impacts of the project.

Mr. Tirtha Raj Pandey (Research officer at KATH and expert in this project) presented on 'Digitization at National Herbarium and Plant Laboratories (KATH): Preservation and Utilization'. He started presentation highlighting various targets of the Global Strategy for Plant Conservation 2011-2020 and initiatives taken by KATH to meet targets related to publishing online flora. He, then, presented the facilities at KATH and progress of herbarium digitization and database management. He also reviewed various methods of image capturing used by different international herbaria.

The third presentation was made by Dr. Suresh K Ghimire (Associate professor at the Central Department of Botany, TU and Senior expert in this project) on 'Databasing and digitization of Herbarium at Tribhuvan University Central Herbarium (TUCH)'. He informed that the TUCH has about 30,000 herbarium specimens of vascular plants and lichens collected primarily by graduate students and some project-funded field works. About 300 specimens of monocotyledons have been digitized using camera and published a catalogue of herbarium specimens at TUCH: monocotyledons.

The last presentation was on 'Bioinformatics: The changing landscape for decision making in conservation' by Dr. Nakul Chettri, Senior Biodiversity Specialist at the International Center for Integrated Mountain Development (ICIMOD), Kathmandu. The presentation started with significance of biodiversity of the Hindu Kush Himalayan (HKH) region, followed by the highlight of the roles of bioinformatics in biodiversity conservation planning. He also informed that ICIMOD has been 'Observer' in GBIF since 2009 and presented initiatives taken by ICIMOD in publishing biodiversity data of the HKH region.

Mr. Pramesh Lakhey, Scientific Officer at DPR, conducted the program.

Overall reflection and feedbacks

Presentation of technical papers were followed by open discussion among participants. Some of the participants informed various sources of occurrence data that need to be consulted for occurrence data. There was also brief discussion on the benefit and risk of publishing occurrence data, particularly of threatened mammals. But, it was generally agreed that publishing occurrence data of plant species would not harm the efforts to conserve them. Representative from government organizations expressed commitments to support

the efforts like this (BIFA funded project) for preparing and mobilizing biodiversity databases of Nepal. Some of the participants requested for formal collaboration among stakeholders for biodiversity data basing irrespective of the external financial supports for these works. Prof. Mohan Siwakoti and Mr. Sanjeev Kumar Rai responded some of the queries from the participants. The technical session ended with the remarks from the chair Prof. Mohan Prasad Panthi. Prof. Panthi requested all the stakeholders to lend support for initiative jointly taken by the Central Department of Botany TU and the Department of Plant Resources for mobilizing occurrence data of endemic and alien species. He also remarked that, though the project was small in term of budget, its value is vital and will have long-term positive impacts towards biodiversity conservation and environmental management in Nepal.

Participants

The workshop was participated by 53 participants from government Ministries (Ministry of Forest and Environment, Ministry of Agriculture), Departments (Department of Forest Research and Survey, Department of National Park and Wildlife Conservation, Department of Forest), Central Department of Tribhuvan University (Botany, Zoology, Environment), Natural History Museum of Tribhuvan University, research institutions (Nepal Academy of Science and Technology, National Gene Bank), INGOs (IUCN Nepal, ICIMOD, Biodiversity International), NGO (Forest Action), etc. Table 1 below has details of the participants.

Annex Table 1. Participants of the inception workshop

SN	Name	Designation and affiliation	Email
1	Dr. Akhileshwar Lal Karna	Director General, Dept of Soil Conservation and Watershed Management, Babarmahal	karna_al@hotmail.com
2	Anil Kumar Acharya	Agriculture Biodiversity Section, Ministry of Agricultural, Land Management and Cooperatives, SinghaDarbar, Kathmandu	acharyanilkku@gmail.com
3	Dr. Anjana Devkota	Associate Prof., Central Dept of Botany, TU, Kirtipur	devkota_a@gmail.com
4	Anju Sharma	PhD Scholar, Central Department of Botany, TU	anjupoudel.ap@gmail.com
5	Dr. Bal Krishna Joshi	Sr. Scientist, National Gene Bank, Khumaltar, Lalitpur	joshibalak@yahoo.com
6	Dr. Bharat Babu Shrestha	Associate Prof., Central Department of Botany, TU	shresthabb@gmail.com
7	Prof. Bijaya Pant	Professor, Central Dept of Botany, TU, Kirtipur	pant_bijaya@yahoo.com , b.pant@cdbtu.edu.np
8	Dr. Deepak Kumar Kharal	Director General, Department of Forest Research and Survey, Babar Mahal, Kathmandu	deepak_kharal@yahoo.com
9	Dr. Devendra Gauchan	National Project Manager, Biodiversity International, UNEP GEF	d.gauchan@cgiar.org

		Project Management, Khumaltar, Lalitpur	
10	Dhananjaya Lamichhane	Undersecretary, Environment and Biodiversity Division, Ministry of Forest and Environment, Kathmandu	dlamichhane@gmail.com
11	Prof. Dharma R Dangol	Chief, Natural History Museum, Tribhuvan University, Swoyambhu	drdangol@gmail.com
12	Dol Raj Luitel	PhD Scholar, Central Dept. of Botany, TU	luiteldr2@gmail.com
13	Dr. Hari P Sharma	Assistant Prof., Central Dept of Zoology, TU	himalayanhari@gmail.com
14	Dr. Jagat Devi Ranjitkar	Weed Scientist (Retd.), National Agriculture Research Council (NARC), Khumaltar, Lalitpur	nepaljdr@yahoo.com
15	Jaishree Sijapati	Chief, Faculty of Science, Nepal Academy of Science and Technology (NAST), Khumaltar, Lalitpur	jaya_sija@hotmail.com
16	Jyoti Joshi (Bhatta)	Deputy Director, Department of Plant Resources, Thapathali	irijyoti@yahoo.com
17	KalpanaSharmaDhakal	Scientific Officer, Department of Plant Resources, Thapathali	
18	Dr. Keshav R Rajphandary	Senior Taxonomist, Kathmandu	krarajbhandari@yahoo.com
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Some glimpses of meeting in photographs



Participants of the workshop (Photo: ShishirPanthi, DPR)



Mr. Sanjeev Kumar Rai, Director General of the Department of Plant Resources, addressing the workshop. (Photo: ShishirPanthi, DPR)



Prof. Mohan Siwakoti, Head of the Central Department of Botany, Tribhuvan University, addressing the workshop. (Photo: ShishirPanthi, DPR)



Dr. Deepak Kharal, Director General of the Department of Forest Research and Survey, addressing the workshop. (Photo: Bharat B Shrestha, CDBTU)



Remarks by Dr. Ram Narayan Jha, Assistant Dean, Institute of Science and Technology, Tribhuvan University. (Photo: Bharat B Shrestha, CDBTU)



Presentation by Dr. Nakul Chettri, Senior Biodiversity Specialist at the International Center for Integrated Mountain Development (ICIMOD), Kathmandu. (Photo: Bharat B Shrestha, CDBTU)

Annex 2. Research Assistants



Mr. Yagya Raj Paneru



Mr. Ganesh Datt Joshi

Appendix 3. Digitization facilities at National Herbarium and Plant Laboratories (KATH) of the Department of Plant Resources. The HerbScan can be seen on the left side of the photo.

