

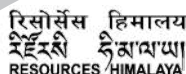


# PROCEEDINGS

## Sixth Graduate Conference - Nepal Himalayan Knowledge Conclave



August 05-06, 2020





Dr Dinesh Neupane, Conference Secretary delivering welcome speech



Prof Dr Sharada Thapaliya, Acting Vice-Chancellor, Agriculture and Forestry University delivering keynote speech



Prof Dr Hridaya Bajracharya, Vice-Chancellor, Lumbini Buddhist University delivering Seventh Graduate Conference acceptance speech



GoN-MoEST



Tribhuvan University  
IOST-CDES

# PROCEEDINGS

## Sixth Graduate Conference - Nepal Himalayan Knowledge Conclave

Sustainability through Knowledge and Innovation

August 05-06, 2020

रिसोर्स हिमालय  
रिसेर्ची देवाय्या  
RESOURCES HIMALAYA



ISETN

Institute for Social and Environmental Transition-Nepal



**Compiled by:**

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**Reviewed by:**

Members of Scientific Committee

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## Conference at a Glance

Nepali society needs visionary and creative thinkers to understand the changing social, political, cultural and economic climate. In particular, young graduates can play a significant role in sharing their ideas among their peers and other groups within society. Graduates from Nepali universities need to engage with each other and wider society to promote economic development, social welfare and environmental stewardship.

In 2015, Tribhuvan University Institute of Science and Technology- Central Department of Environmental Science (TU IOST-CDES), Resources Himalaya Foundation (RHF) and Institute for Social and Environmental Transition-Nepal (ISET-Nepal) came together to create the yearly Graduate Conference on Environment and Sustainable Development (GCESD) known as Himalayan Knowledge Conclave (HKC). Kathmandu University (KU) continues their partnership. Recently, Agriculture and Forestry University (AFU) and Mid-Western University (MWU) have joined the mission.

The Government of Nepal Ministry of Education, Science and Technology (GoN-MoEST) has generously patronized and supported the initiatives.

The conference brings together graduates to present their research and review each other's work. The conference aspires to develop leadership and public speaking skills of the participating graduates by involving them in the conference processes. The conference also provides an opportunity for networking among peers and experts. The conference is held in the first week of April every year.

Due to the COVID-19 pandemic, the conference was postponed to the first week of August and moved to a virtual platform with the online conference taking place in Zoom.

## Conference modality

Conference has aimed to establish an interdisciplinary knowledge-sharing platform for young researchers, with a particular focus on environment, resource conservation, natural science, management and economic development incorporating innovations and technologies. GoN-MoEST provides key support for the conference. The initiating institutions of the Conference consortium, TU-IOST-CDES, RHF and ISET-N provide their technical support to facilitate the conference. Nepali universities, their department and colleges assist the conference as partners. Resources Himalaya Foundation, as the conference secretariat, takes care of logistics and conference management for 2020.

**Conference Theme (2020):** Sustainability Through Knowledge and Innovation

## Thematic Areas

### A. Biodiversity, ecosystem and livelihood

- Agriculture and livestock
- Biological invasion and threats to biodiversity
- Ecosystem dynamics and restoration
- Ecotourism in and outside protected areas
- Gender and livelihood
- Plant and animal diversity
- Protected area and people
- Water and wetlands

### B. Climate change and disaster

- Climate change, global and local, scientific evidences
- Climate change impacts on social, economic and environment
- Climate change adaptation (CbA, EbA, Nature-based Adaptation), resilience
- Development and disaster, DRR
- Earthquake, landslide, flood, GLOF, drought, lightning, snow avalanches, epidemics

## **C. Economics and management**

- Capacity development/building
- Good governance
- Labour relations and human resource management
- Public administration and small business entrepreneurship
- Public spending
- Social marketing
- Rural and urban developments

## **D. Energy**

- Alternative energy, constraints and opportunities
- Energy, prosperity and infrastructure development
- Energy supply and demand
- Energy diversification and energy use efficiencies

## **E. Health and medical science**

- Disease and health
- Occupational health
- Public health and environmental pollution

## **F. Indigenous knowledge and technologies**

- Biotechnology and food technology
- Electrical, electronics and computer/information technology
- Indigenous and traditional knowledge
- Innovative technologies for industry, health, household and companies
- Nanotechnology

## **G. Pollution and control measures**

- Air, surface water and land pollution
- Groundwater pollution and control
- Remedies and pollution control technology
- Waste management

## **H. Sociology and humanities**

- Anthropology and history
- Gender and ethnicity
- Journalism
- Law and political science
- Psychology

## **I. STEM (Science, Technologies, Mathematics and Engineering)**

- Architecture and civil engineering
- Earth science including hydrology and meteorology
- Geography
- Material science
- Mathematical modelling
- Mechanical and industrial engineering
- Molecular and cellular biology
- Optimization

## **CONFERENCE TEAM**

### **Conference Advisory Committee**

- Er Ganesh Shah, Former Minister for Science, Technology and Environment
- Prof Dr Pitamber Sharma, Former Vice Chair, National Planning Commission
- Dr Sanjay Sharma, Secretary, GoN-MoEST
- Prof Dr Ram Prasad Khatiwada, Dean, Institute of Science and Technology, TU
- Prof Dr Balram Bhatta, Dean, Faculty of Forestry, AFU
- Prof Dr Kanhaiya Jha, Dean, School of Science, KU



- Mr Ajay Dixit, Executive Director, ISET-N

## **Scientific Committee**

- Prof Dr Binod Shrestha, Management
- Prof Dr Bhuminanda Devkota, Veterinary Science
- Prof Dr Damber Bahadur Nepali, Engineering
- Prof Dr Deepak Subedi, Physics
- Prof Dr Dilip Kumar Jha, Aquatic Resource
- Prof Dr Durga Devkota, Social Science
- Prof Dr Madhav Pandey, Plant Genetics
- Prof Dr Subodh Sharma, Environmental Science
- Prof Dr Sundar Man Shrestha, Plant Pathology
- Prof Dr Tara Prasad Upadhyaya, Management
- Dr Deep Narayan Shah, Freshwater Ecology
- Dr Dibas Shrestha, Hydrology and Meteorology
- Dr Jhamak Bahadur Karki, Conservation Biology
- Dr Kailash Timilsina, Demography Biology
- Dr Kamal Adhikari, Plant Biology
- Dr Narayan Prasad Koju, Wildlife Ecology
- Dr Nirajan Bhattarai, Animal Breeding 7
- Dr Ramesh Sapkota, Ecology
- Dr Ramji Bogati, Urban Planning
- Dr Rijan Bhakta Kayastha, Glaciology
- Dr Santosh Marahatta, Agronomy
- Dr Shailenda K. Jha, Engineering
- Dr Shila Maskey, Air Pollution
- Dr Shiva Chandra Dhakal, Agriculture Economics
- Mr Rabin Malla, Development Studies
- Mr Suresh Pradhan, Development Sociology
- Mr Yogendra Subedi, Economics

## **Technical Advisory Committee**

- Prof Dr Rejina Maskey, Department Head, CDES-TU
- Prof Dr Kedar Rijal, CDES-TU
- Prof Dr Dinesh Raj Bhujju, RHF
- Prof Dr Arjun Kumar Shrestha, AFU
- Mr Surendra Subedi, MoEST
- Mr Kanchan Dixit, ISET-Nepal
- Mr Ajay B. Mathema, SchEMS

## **Management Committee**

- Dr Dinesh Neupane, Conference Secretary
- Prof Dr Chhatra Mani Sharma, CDES-TU
- Mr Rajkumar Gumanju, MoEST
- Ms Anustha Shrestha, ISET-Nepal
- Ms Juna Rai, RHF
- Mr Ram Hari Timalisina, AFU-Rampur
- Mr Shreehari Bhattarai, AFU-Hetauda
- Mr Narayan Niraula, Saptagandaki Multiple Campus, Chitwan

# Message from the Vice-Chancellor

I feel very privileged to be with you in this gathering of the Sixth Graduate Conference - Himalayan Knowledge Conclave 2020 on virtual facility. Even in this unprecedented situation of COVID-19, I am glad to see that the sixth edition of this conference has been materialized. My congratulations to the organizers, for continuity of the event, despite the circumstances. This is definitely a reflection of your commitment and dedication.

Conferences are an important component of academic activities around the world. Francis Bacon, who is also known as the father of empiricism or the scientific methodology said, “Reading makes a full man; conference a ready man; and writing an exact man.” Conference, that is, conversing with others entails presenting your work or opinion and also receiving and giving feedback. Hence, it is an integral part in the process of knowledge creation.

In Nepal, we have seen conferences being organized, both within and outside the scientific community. However, we do not have an institutionalized framework for conferences, which is necessary to guarantee their regularity. I am pleased to inform you that Agriculture and Forestry University has been able to join this endeavor this year. AFU has joined the initiative to provide opportunity for networking among peers and national and international experts. Such partnership plays a vital role in providing a continued momentum, especially during this difficult time of pandemic.

Conferences provide a platform to share achievements and get updated with recent developments in the field. This conference provides a great platform to graduates and young researchers from Nepal to present their research. I am pleased to know that this conference also organizes special coaching to the presenters; these skills will definitely be helpful as they move forward in their academic careers.

In Nepal, the investment on research and development is merely 0.37% of the GDP. By UNESCO standard, it is suggested that Nations spend at least 1%

of their GDP on research and development. Without such an investment, a visible impact of science and technology is simply impossible. In my knowledge the National Policy of Science, Technology and Innovation brought by the Government of Nepal has clearly mentioned that the Government would increase its investment on R&D to reach 1% of the GDP. I would like to draw the due attention of the Government of Nepal towards this policy.

The young graduates have a great role to play in conducting research on contemporary issues and ultimately contributing toward building a prosperous Nepal. Through these platforms, students' research findings will be heard. These findings can be helpful in formulating plans and policies at the national level. I urge the government to act as a patron in this process and provide guidance to the students so that their work can be a valuable asset in formulating national plans and policies.

Research based development is the only way forward for sustainable development. Research on contemporary issues is necessary for knowledge creation. Such knowledge is needed for the government to create plans and policies in an informed manner. Hence, platforms like this are necessary for the country's growth and development. Lastly, I would like to encourage the graduates and researchers to take utmost benefit from this platform.

Once again, I express my happiness to be a part of this endeavor. Wish you all an impactful and productive learning during the conference.

**Prof Sharada Thapaliya, PhD**  
**Acting Vice-Chancellor**  
**Agriculture and Forestry University, Rampur, Chitwan**

# Message from the Secretary

Chair of the opening session - Professor Ram Prasad Khatiwada, Dean, Institute of Science and Technology, Tribhuvan University, Respected Vice Chancellor - Professor Sharada Thapaliya, Agriculture and Forestry University, faculty members, distinguished scholars and experts at the Central Department of Environmental Science, ISET Nepal, Resources Himalaya Foundation, Agriculture and Forestry University and other institutions, participants, ladies and gentlemen.

First of all, I congratulate the organizers for being able to organize the conference in a virtual mode. We were hoping that we could do this in the 'real mode', but I think we are doing pretty well and this shall serve our main purpose to a great extent.

At the Ministry of Science and Technology, I have always been supportive of this conference. I have had the opportunity to be present physically in a few past editions of the conference. It was always exciting to see promising new graduates passionately making their presentations. I am sure the conference has always been and will continue to be a great platform for graduates to network, share their work and learn from each other. This is exactly what is expected of research students. Researchers can grow and mature only through the peer-review process. This process is greatly lacking in Nepal. I thank the organizers for trying to reinforce this process among young graduates.

Coming to the theme of the conference, it covers the environment in its entirety and covers a wide array of subjects ranging from health sciences, engineering and technology to sociology, economics, management, indigenous knowledge and so on.

No matter what area of research is presented, the important thing is to promote scientific or critical thinking. I am sure the students or graduates will have a

wonderful opportunity to sharpen their skills in presentation. It will, in a way, also help graduates develop their personality and gain confidence. Once you present your research you should gain a sense of achievement.

Research, in fact, is and should be addictive. As you gain some knowledge and delve deeper into the subject, you will begin to feel how tiny you are. You will understand that there is so much to learn and that this is just the beginning. If you learn this much, then you are ready to venture into your real journey. You will look for more material to read and consume, make more contacts and try to collaborate further. Collaboration is the key in present day research. It does not matter where you are. You just need to seek out and reach out to those who have done great work in your field. In fact, as I speak here, many teams are collaborating worldwide for COVID-19 research. They are trying their best to come out with a vaccine. And one day when they succeed, it will be a result of teamwork and collaboration.

A research is considered successful if one of the following three conditions is met:

1. It clears a doubt or answers a question which had not been answered until that time
2. It helps you or someone else to produce something or apply that knowledge in something useful to the world.
3. It can be further extended or continued, so that another person or team can start from where the research had left off.

At the Ministry of Education, Science and Technology we are now looking for ways to promote and reward such research. But continuity of such practice is warranted. This can only happen when young researchers come together and work as a team. The important thing is that you not only conduct research but continue it further or help others to continue from where you had left off. World over, this has become possible with professional societies forming and growing

over the years. Therefore, I have been advocating and emphasizing the growth and development of professional societies and I urge you all today to build and advance professional societies in your own fields, and associate yourself and your friends with such societies. From the government's side we are now trying to support such endeavours and I hope that over the next few years, professional societies in Nepal too grow substantially and build themselves up to gain the trust of peers - not only from Nepal but from the entire world.

With that wish I would like to end my message today. I hope you have a good learning experience. I also wish you all good luck for your future as promising researchers in your respective fields.

**Sanjay Sharma, PhD**

**Secretary, Ministry of Education, Science and Technology**

# Message from the Chair

It is my great pleasure to inform you that Tribhuvan University-Institute of Science and Technology is organizing the Sixth Graduate Conference on August 05 and 06, 2020 on a virtual platform in Zoom. Also known as the Himalayan Knowledge Conclave, the annual conference is being coordinated with the cooperation of the Government of Nepal Ministry of Education, Science and Technology with the joint support of the Central Department of Environmental Science, Resources Himalaya Foundation and Institute for Social and Environmental Transition - Nepal. Kathmandu University continues their partnership for the Sixth Graduate Conference. Recently, Agriculture and Forestry University and Mid-Western University have joined the mission.

This conference, similar to the previous four conclaves, aims to encourage leadership in young researchers focused on issues related to the environment, resource conservation, natural science, management and economic development incorporating innovations and technologies, by getting them involved in an interdisciplinary knowledge-sharing platform on those specific topics. HKC will be seeing oral presenters and poster presentations this year.

After five successful years, I am excited for the HKC to achieve new heights. I hope it can inspire budding researchers, and help them develop practical leadership skills and find other like-minded folks with whom they are able to share their experiences and have a dialogue related to the environment. On behalf of the organizing team, I would like to express sincere gratitude to all the organizations, individuals, and HKC members and delegates for their continuous support and cooperation. May the conference be motivational, productive and memorable.

**Prof Ram Prasad Khatiwada, PhD**

**Conference Chair, Sixth Graduate Conference - 2020**

**Dean, Institute of Science and Technology, Tribhuvan University**



# Conference Brief from the Organizing Secretary

Tribhuvan University - Institute of Science and Technology - Central Department of Environmental Science, Institute for Social and Environmental Transition Nepal and Resources Himalaya Foundation have been working together to organize the graduate conference known as “Himalaya Knowledge Conclave” since 2015. We are very grateful that the Government of Nepal Ministry of Education, Science and Technology has generously patronized and supported the initiative. Very encouragingly, Agriculture and Forestry University, Kathmandu University and Midwestern University have joined the initiative. We hope to have all the universities in this mission in future.

The conference brings graduates and young researchers together from Nepal to present their research, provide review and comment on each other’s work. Because of the unprecedented situation of the COVID-19 pandemic, the conference has been shifted several times and finally we are here to precede it virtually. Agriculture and Forestry University is the host of the sixth Graduate Conference and this year, Resources Himalaya Foundation premises is being used for virtual broadcasting to the participants.

The Conference Theme for 2020 is Sustainability through Knowledge and Innovation and we have included nine thematic areas: Pollution and control measures, Climate change and disasters, Ecosystem, biodiversity and livelihood, Energy, Economics and management, Indigenous Knowledge and technologies, STEM (Science, Technologies, Mathematics and Engineering), Health and medical Science, and Sociology and humanities. Initially, we received 234 abstracts for the presentation in the Sixth Graduate Conference, however, only 105 presenters confirmed their participation even in the virtual conference. The Sixth Graduate Conference has 15 sessions that include 12 technical sessions, 1 panel discussion and 1 opening session and 1 closing session. Each technical session is led by a lead presentation from recent PhD graduates. The Sixth Graduate Conference has a total of 50 poster presentations and 55 oral

presentations by Bachelors and Masters level students in addition to 12 lead presenters, 3 panelists, 12 chairs and 12 co-chairs from the USA, UK, China, Japan, Nepal, South Korea, Germany, Australia, Pakistan, Bangladesh, Kenya, Peru, Colombia, Sweden and India.

I feel glad to thank the honorable vice chancellors, deans, department heads, invited guests, presenters, and participants for their support and participation in the conference. It would not be possible without the support and help from Dr Dinesh Raj Bhujju who guided me in every single hurdle and rush hour. I also like to thank Prof Dr Rejina Maskey, Prof Dr Kedar Rijal, Prof Dr Balaram Bhatta, Mr Kanchan Mani Dixit, Prof Dr Arjun Shrestha, Dr Rijan Bhakta Kayastha for the support and help to successfully organize this conference. I would also like to express deep appreciation to Secretary Dr Sanjay Sharma and Joint Secretary Mr. Surendra Subedi from the Ministry of Education, Science and Technology for the valuable time and support. Similarly, I would like to thank the Conference Advisory Committee, Technical Advisory Committee, and Management Committee for their support and time. I would appreciate the Scientific Committee for reviewing the abstracts and making these in better shape.

There is a conference team who did a fantastic job in assisting me. I would like to applaud Ms Juna Rai and Mr Abish Man Shakya for their hard work. I am also thankful to Mr Ramhari Timalisina, Mr Narayan Niraula, Mr Ram Krishna Khanal, Mr Suresh Bhandari, Mr Dhruva Acharya, Ms Deepa Timsina and the College Representative Team who helped in reaching out to students for the conference. I special thank Ms Ashra Kunwar and her team for their valuable time and singing the beautiful songs for us during the conference.

Taking the ongoing pandemic condition in consideration it was indeed a really challenging task for us. But not to forget we have been fortunate enough to be backed by the team of very motivated and dedicated volunteers. There are 70 volunteers including RHF staff behind the scene in organizing the conference well. I thank all volunteers who supported in technicalities, hosting, operation management, co-hosting and logistic operation.

I would also like to extend a very hearty thanks to all lead, oral and poster presenters for gracing their important work and sharing their findings and opinions with us in the conference. I would like to extend my sincere thanks to all chairs, co-chairs and lead presenters of the conference for their time in the conference.

I should thank all supporters, helping hands and partners (TU-IOST-CDES, Kathmandu University, Mid-Western University, Agriculture and Forestry University, ISET-Nepal, and Resources Himalaya Foundation) for cooperation. The Seventh Graduate Conference will be held in the premises of Lumbini Buddhist University in 2021.

**Dinesh Neupane, PhD**

**Conference Secretary, Sixth Graduate Conference - 2020**

**Program Director, Resources Hiamalaya Foundation**



# HIMALAYAN KNOWLEDGE CONCLAVE

Sixth Graduate Conference 2020  
August 5-6, 2020  
Program Schedule

**HKC2020: Opening Session I (08:00 am-10:30 am)**

**Moderator: Juna Rai**

**Rapporteur: Reecha Acharya**

DAY 1: August 05, 2020 Wednesday		
OPENING SESSION		
Venue: Jumli Marshi Room	Technical I Host: Purna Man Shrestha	Co-hosts: Prizma Chapagain and Alina Shahi
<b>Time</b>		
08:00 am	Registration	
09:00 am	Welcome Speech	Dr Dinesh Neupane Conference Secretary Sixth Graduate Conference Himalayan Knowledge Conclave
09:10 am	Guests assume seats and Conference chair taking	Prof Dr Ram Prasad Khatiwada Dean, Institute of Science and Technology Tribhuvan University
09:15 am	National Anthem and Declaration of conference opening	Conference chair
09:20 am	Overview and highlights of the Graduate conference Himalaya Knowledge Conclave	Ms Juna Rai Conference Manager
09:25 am	Keynote speech	Prof Dr Sharada Thapaliya Acting Vice-Chancellor, Agriculture and Forestry University
09:40 am	Invited remark	Dr Sanjay Sharma Secretary, Ministry of Education, Science and Technology
9:55 am	Concluding remark and closing of the opening session	Conference chair
10:10 am	Tea Break	

**HKC2020 Day I (Aug 5, 2020): Technical session I (12pm-2pm)**

<b>Theme/Time</b>	<b>Biodiversity Conservation</b>	<b>Pollution and Control Measures</b>	<b>Climate Change</b>
	<p><b>Room: Jumli Marshi</b>                      Moderator: Shradha Kunwar                      Rapporteur: Prakriti Koirala                      Technical Host: Purna Man Shrestha                      Co-host 1: Prizma Chapagain; Co-host 2 Alina Shahi; Volunteer 1: Mahesh Saptoka; Volunteer 2: Sushma Timsina                      Session Chair: Dr Jinniu Wang (China)</p>	<p><b>Room: Rato Habre</b>                      Moderator: Prabhat Rai                      Rapporteur: Gauri Jayaswal                      Technical Host: Enna Mool                      Co-host 1: Pooja Manandhar ; Co-host 2 Rachana Sharma; Volunteer 1: Pooja Mahato; Volunteer 2: Mandip Kafle                      Session Chair: Prof Dr Golan Shabbir Sattar (Bangladesh)                      Session Co-chair: Dr Pushpa Acharya (Nepal)                      Lead presenter: Dr Uday K. Thapa (USA)</p>	<p><b>Room: Kande Vyakur</b>                      Moderator: Sudeeksha Basyal                      Rapporteur: Smrittee Subedi                      Technical Host: Sneha Pradhanagna                      Co-host 1: Aayasha Shrestha; Co-host 2 Bina Thapa; Volunteer 1: Onisha Mahato; Volunteer 2: Subekshya Bastakoti                      Session Chair: Dr Nivedita Mehrotra (India)</p>
12:00-12:02			
12:02-12:05	<p>Session Co-chair: Dr Dibas Shrestha (Nepal)                      Lead presenter: Dr Meena Bohora (Nepal)</p>		<p>Session Co-chair: Dr Narayan Gaire (China)                      Lead presenter: Dr Shankar Panthi (China)</p>
12:05-12:15	<p>Jagan Nath Adhikari</p>	<p>Anjali Thapaliya</p>	<p>Dinesh Thapa</p>
12:15-12:23	<p>Human-wild mammal conflict along Seti River basin in Tanahun district, Chitwan Annapurna Landscape, Nepal</p>	<p>Solid Waste Characterization and Sewage Outlet Mapping of Slums in Kathmandu, Nepal</p>	<p>Spatial distribution and landslide susceptibility modeling in Chatara-Barahakshetra, Siwalik zone, Nepal</p>
Q&A 12:23-12:27			
12:28-12:36	<p>Kishor Chandra Ghimire</p>	<p>Bhawana Sapkota</p>	<p>Pawan Rai</p>
	<p>Spatial Distribution and Diversity of Bumblebees in Chitwan Annapurna Landscape, Nepal</p>	<p>Spatial and Seasonal Water Quality Variations in Bagmati River Basin, Nepal</p>	<p>Landslide Hazard Assessment at Panchase Area of Central Nepal</p>
Q&A 12:36-12:40			
12:41-12:48	<p>Pramananda Rajbanshi</p>	<p>Dikshya Regmi</p>	<p>Rejina Prajapati</p>
	<p>Study of habitat and threats to elongated tortoise (<i>Indotestudo elongata</i>, Blyth 1854) in</p>	<p>Assessment of Heavy Metals: A Case of Ghodaghodi Lake, Western Nepal</p>	<p>Flood Hazard Mapping of Hanumante River Bhaktapur by using Hydrodynamic Model</p>

Q&A 12:48-12:52		Chure Region	Ganga Shrestha	Assessment of bacterial contamination in drinking water of schools of Tokha municipality	Rojan Lamichhane	HEC-RAS
12:53-1:00	Shradha Suman Yadav	Diet and habitat of fishing cat in and around Koshi Tappu Wildlife Reserve				Simulation of extreme rainfall event over Nepal using Weather research and Forecasting Model (WRF)
Q&A 1:00-1:04						
1:05-1:13	Sreeju Maharjan	Habitat features and threats to Hispid hare ( <i>Caprolagus hispidus</i> - Pearson,1839) habitats in Shuklaphanta National Park, Nepal	Gita Pathak	Impacts of Agricultural Runoff on Aquatic Plants in Lake Ecosystem	Sabita Nepal	Greenhouse Gas Emission from Buffalo in Terai and Midhill of Nepal
Q&A 1:13-1:17						
Poster presentation (2min for MC)						
1:20-1:25	Anil BASHYAL	Distribution Pattern and Habitat Suitability Mapping of <i>Cycas pectinata</i> in Chure Range of Makawanpur, Central Nepal	Alina Shrestha	Noise level assessment after "No Horn" declaration in Kathmandu Valley	Nisha Jha	An Assessment of Urban Flood Risk: A Case Study from Hanumante River, Bhaktapur
Q&A 1:25-1:27						
1:28-1:33	Lila Paudel	Distribution and diversity of butterflies in lowland area of western Nepal (a case study of Thakurbaba municipality-01 and Babai valley, Bardiya)	Bipana Puri	Assessment on the groundwater quality and its health impact in karsiya village, Morang district, Nepal	Pareena Khadka	Forest Carbon Stock along Altitudinal Gradient at Shiwapurinagarjun National Park (SNNP), Nepal
Q&A 1:33-1:35						
1:36-1:40	Pragya Kafle	Study of Human-	Pratik Shrestha	The Brink of Extinction:	Madan Subedi	Soil Organic Carbon

Q&A 1:40-1:42	Wildlife Conflict In Buffer Zone of Chitwan National Park, Nepal	Assessment of impacts of invasive species: A case study in urban forest path of Jagdol-Yagyadol forest, Gokarna	Diana Ghale	1:43-1:47	Quantifying the Stories of Stone Spouts in the Kathmandu Valley	Characterization of fine aerosol particles in the indoor microenvironment of Panchase, Kaski, Nepal	Usha Acharya	2015 Gorkha Earthquake and its socio cultural impacts on cultural heritage.	Stocks Under Coffee Agroforestry System in Hilly Region of Western Nepal
1:50-1:55	Study on the tail regeneration ability of common house gecko ( <i>Hemidactylus frenatus</i> ) in Kirtipur, Kathmandu, Nepal	Dipesh Tandukar	Olina Shahi	1:55-1:57	Distribution, Source and Transport of Polycyclic Aromatic Hydrocarbons Along Southern Slope of Himalayan Mountains, Nepal	An assessment of future urban river flood risk in Karmanasha river, Lalitpur	Shreya K.C.		
1:58-2:00	Concluding remarks	Session Chair							
2:00	Thank you	Moderator							

### HKC2020 day1 (Aug 5, 2020): Technical Session II (3-5 pm)

Theme/Time	Agriculture and Livestock	Water and Wetlands	Sociology and Humanities
	<b>Room: Jumli Marshi Room</b> Moderator: Kanchan Kattel Rapporteur: Shreeshya Pandey Technical Host: Purna Man Shrestha Co-host 1: Sadiikshya Ghimire; Co-host 2: Miraj	<b>Room: Rato Habre Room</b> Moderator: Pragya Neupane Rapporteur: Sharbada Gurung Technical Host: Enna Mool Co-host 1: Saurav Sharma; Co-host 2: Monika	<b>Room: Kande Vyakur Room</b> Moderator: Prekshya Subedi Rapporteur: Shankar Pd. Paudel Technical Host: Sneha Pradhanagna Co-host 1: Aanjana Bhattaraj; Co-host 2



	Paudel; Volunteer 1: Arati GC; Volunteer 2: Sandhya Dahal	Gurung; Volunteer 1: Prabhat Adhikari; Volunteer 2: Ganga Poudel	Pragati Dahal; Volunteer 1: Manjita Kharel; Volunteer 2: Monika Dhakal
3:00-3:02	Session Chair: Dr Saeed Ahmad Asad (Pakistan)	Session Chair Prof Dr Tanzima Yeasmin (Bangladesh)	Session Chair: Dr. Perez Onono (Kenya)
3:02-3:05	Session Co-chair: Dr Ramji Bogati (Nepal)	Session Co-chair: Dr Basanta Adhikari (Nepal)	Session Co-chair: Dr Ramdevi Tachamo (Nepal)
3:05-3:15	Lead presenter: Dr Gandhiv Kafle (Nepal)	Lead presenter: Dr Shanker Dhakal (Nepal)	Lead presenter: Dr Sujata Sakha (Japan)
3:15-3:23	Dreesti Wasti Resource Use Efficiency of Orthodox tea in Illam district of Nepal	Dipa Rai Effect of <i>Urtica parviflora</i> roxb. on the growth performance in Nile tilapia ( <i>Oreochromis niloticus</i> Linnaeus, 1758)	Gaurav Chaudhary Role of women in household-level socio-economic decision-making processes
Q&A 3:23-3:27			
3:28-3:36	Lokendra Singh Effect of different seed rates and sowing methods on yield of sunflower ( <i>Helianthus annuus</i> ) in Kailali, Nepal.	Rita Bhatta Seasonal variation of major ions in Ghodaghodi Lake, a Ramsar site in western Nepal	Rabina Luitel Factors influencing user's preference in menstrual hygiene management products
Q&A 3:36-3:40			
3:41-3:48	Puspa Raj Dulal Nutrient Management Practices for Rice Based Systems under Different Crop Establishment Methods in Central Inner Terai, Nepal	Shristi Shrestha Ecological assessment of Bagmati river system	Santosh Pandey Effect of maternal migration on education of children in Nepal
Q&A 3:48-3:52			
3:53-4:00	Pabitra Joshi Effect of land use system on soil properties in Kanchanpur district	Sunita Shrestha Determining the relationship between benthic macroinvertebrate	Simran Adhikari A Comparative analysis of factors affecting street vendorsâ€™

Q&A 4:00-4:04					community composition and water level fluctuation in wetlands in Nepal		existence in informal activity in Kathmandu
4:05-4:13	Ramesh Rajbanshi	Avifaunal Inventory and Diversity in Kachankawal Rural Municipality, Jhapa, Nepal	Tika Regmi	Macrophytes and Water Level Fluctuation in Wetlands of Koshi Tappu Wildlife Reserve	Surendra Kumar Bohara	Perceptions of the Role of Internet Use on Sexual Health among Young People in Kathmandu	
Q&A 4:13-4:17							
Poster presentation (2min for MC)							
4:20-4:25	Swadesh Rijal	Production Economics and Determinants of Potato Production in Nuwakot, Nepal	Junu Maharjan	Bioclimatic Variables Structuring the Macroinvertebrates Assemblages in the Himalayan River Systems	Prashant Rimal	Ecological Status of <i>Tylothriton verrucosus</i> (Anderson, 1871) in Mai Pokhari and adjacent areas of Eastern Nepal	
Q&A 4:25-4:27							
4:28-4:33	Saratendra Bajal	Factors affecting adoption of farm machineries in maize zone, Rolpa, Nepal	Pratiksha Koirala	Macroinvertebrates assemblages in glacial-fed (Bheri) and rain-fed (Babai) rivers of western Nepal in the wake of inter basin water transfer	Madhu Maharjan	Behavioral Study of Northern Palm Squirrels ( <i>Funnambulus pennantii</i> Wroughton, 1905) in Shankha Park, Kathmandu, Nepal	
Q&A 4:33-4:35							
4:36-4:40	Meena Kumari Poudel	Review on major viral diseases of crop plants in	Roshni Gurung	Ecological assessment of Seti River Basin within	Rojina Ghimire	Foraging Behavior of Asian Openbill	

Q&A 4:40-4:42	Nepal	Pokhara Metropolitan City, Nepal	( <i>Asiaticus oscitans</i> ) in Rupendehi and Kapilvastu Districts of Nepal
1:43-1:47	Bhishma Raj Dahal	Shrija Tuladhar	Sandeepa Gautam
Q&A 4:47-4:49	Perception, impact and determination of climate change adaptation among the vegetable growers of Dhading district, Nepal	Preliminary Trophic Status Assessment of two Ramsar sites, Lake Rara and Lake Ghodaghodi, of Western Nepal	Elephants: A case study from Sauraha, Chitwan
4:50-4:55	Rajesh Neupane	Rubina Thapaliya	Saugat Bolakhe
Q&A 4:55-4:57	Socioeconomic Condition of Noncommercial Goat farmers of Rupandehi and Palpa District, Lumbini, Nepal	Assessment of water quality of shallow wells in Kathmandu Valley	Comparative study of human-macaque conflict in urban and rural area of central Nepal
4:58-5:00	Session Chair		
5:00	Moderator		
	Concluding remarks		
	Thank you		

### HKC 2020 Day 2: Technical session III (9:00-11:00am)

Theme/Time	Biodiversity Conservation/Forestry	Pollution and Control Measure/ STEM	Climate Change/Sociology and Humanities/Medical and Health Science
	<b>Room: Jumli Marshi Room</b> Moderator: Shradha Kunwar Rapporteur: Shreya Aryal Technical Host: Purna Man Shrestha Co-host 1: Prizma Chapagain; Co-host 2 Alina Shahi; Volunteer 1: Mahesh Saptoka; Volunteer 2: Sushma Timsina	<b>Room: Rato Habre Room</b> Moderator: Prabhat Rai Rapporteur: Anjana Pradhan Technical Host: Enna Mool Co-host 1: Pooja Manandhar ; Co-host 2 Rachana Sharma; Volunteer 1: Pooja Mahato; Volunteer 2: Diana Ghale	<b>Room: Kande Vyakur Room</b> Moderator: Sudeeksha Basyal Rapporteur: Hirendra Bista Technical Host: Sneha Pradhanagna Co-host 1: Ayasha Shrestha; Co-host 2 Bina Thapa; Volunteer 1: Onisha Mahato; Volunteer 2: Subekshya Bastakoti

9:00-9:02	Session Chair: Dr Nalini Subba Chhetri (USA)	Session Chair: Dr Sojen Pradhan (Australia)	Session Chair: Dr Kabiraj Paudel (Nepal)
9:02-9:05	Session Co-chair: Dr Raúl Loayza-Muro (Peru)	Session Co-chair: Dr Bimala Devkota (Nepal)	Session Co-chair: Dr Ibelis Blanco Rangel (Colombia)
9:05-9:15	Lead presenter: Dr Arjun Thapa (Nepal)	Lead presenter: Dr Nani Maiya Sujakhu (Nepal)	Lead presenter: Dr Puna Maya Maharjan (Korea)
9:15-9:23	Renuka Poudel	Laxmi Karki	Sadikshya Wosti
Q&A 9:23-9:27	Human-elephant interaction and factors associated with elephant ( <i>Elephas maximus</i> )	Wetland health and its economic valuation for the sustainable management of wetlands in Nepal	Dry spell impact on small farm productivity at kuleni in Nawalpur, Southern Nepal
9:28-9:36	Sanjay Kurmi	Kiran Mishra	Sharmila Nepal
Q&A 9:36-9:40	Human-Asian elephant ( <i>Elephas maximus</i> ) interaction around Parsa National Park, Nepal	Water Stress and Availability in Jhimruk Watershed, Pyuthan district, Nepal	Response of climate change on annual ring of <i>larix himalaica</i> : A case from Langtang National Park, Nepal
9:41-9:48	Tika Ram Poudel	Pratik Bajracharya	Tekendra Singh Air
Q&A 9:48-9:52	Human-wildlife conflict in Annapurna Conservation Area: a case of Lomangthang rural municipality	Water quality investigation of groundwater and surface water along Lal Bakaiya River in Rautahat and Bara District	Crop Yield and Food Security under Climate Change Scenario in Kailali, Western Nepal
9:53-10:00	Sujita Dhakal	Sarita Sapkota	Hemchandra Mahato
	Distribution and Conservation Status of Chinese Pangolin in Palungtar Municipality of	Assessment of Air Pollution Impact on Biochemical	Importance of Tree Outside of Forest (TOF) for Immediate Flood

Q&A 10:00-10:04	Gorkha District, Western Nepal.			Properties of Roadside Plants of Lalitpur District		Response/Recovery
10:05-10:13	Minu Gautam	Comparative study of active constituents of some medical plants along altitudinal gradient	Prem Narayan Paudel	Chemical composition and Bio-activities of essential oils from <i>Origianum majorana</i> and <i>Mentha arvensis</i>	Sashi Ghalan	Women in micro entrepreneurship: opportunities and challenges of women entrepreneurs in Hetauda
Q&A 10:13-10:17						
Poster presentation (2min for MC)						
10:20-10:25	Akriti Joshi	Gender Issues for Resource Management in the Buffer Zone	Archana Niraula	Multiple-Use Water Systems as an Adaptive Approach for Sustainable Water Resource Management	Uddab Poudel	Prevention of zoonotic swine influenza viral infection by development of various nano particle based influenza vaccine
Q&A 10:25-10:27						
10:28-10:33	Sumnima Ghimire	Fish Diversity and their relation to different environmental variables in Kamala River, Nepal	Babita Aryal	Groundwater Recharge Estimation Using Empirical Formulae in Tinau River Basin, Rupandehi, Butwal	Diksha Ghimire	Psychological Impact of Social Media Among Adolescents of Morang District
Q&A 10:33-10:35						
10:36-10:40	Susmita Khanal	Distribution, ethnobotanical uses and conservation status of <i>Pterocarpus marsupium</i> .	Bimal Sharma	Efficiency Assessment of Drinking Water Treatment Plant of Anarapur Drinking Water and Sanitation Organization, Gairidkot 15,	Roshana Thapa	Assessment of Impact of Climate Change on Wetland, (A case study of Rupa Wetland, Pokhara)
Q&A 10:40-10:42						

10:43-10:47 Q&A 10:47-10:49	Shalom Sapkota	Vegetation composition and regeneration status of jure landslide area	Nirdishtha Amatya	Nawalpur Environmental Implication, Technological Performance and Socio-Economic Impacts of Hydraulic Ram Pumps: In Context of Rural Nepal	Dipa Khatri	An assessment of pm2.5 particles in the ambient atmosphere of Bhadrakali and Bajrabarahi temple premises of Kathmandu Valley, Nepal
10:50-10:55 Q&A 10:55-10:57	Shiseer Khatiwada	Nature and Characteristics of Snakebites in Eastern Nepal	Biplow Sapkota	Black Soldier Fly Technology for Sustainable Feed and Food Production in Nepal	Nishan Pokhrel	Study of Avifaunal Diversity in Different Land Covers around Chitwan National Park
10:58-11:00 11:00	Session Chair Moderator	Concluding remarks Thank you				

### HKC 2020 Day 2: Technical session IV (12pm-1:30pm)

Theme/Time	Agriculture and Livestock/Conservation	Energy/Indigenous Knowledge and Technologies	Environment
	<b>Room: Jumil Marshi Room</b> Moderator: Sandhya Dahal Rapporteur: Gaurav Adhikari Technical Host: Purna Man Shrestha Co-host 1: Sadiksiya Ghimire; Co-host 2: Miraj Paudel; Volunteer 1: Arati GC; Volunteer 2: Sandhya Dahal	<b>Room: Rato Habre Room</b> Moderator: Pragya Neupane Rapporteur: Suchana Baniya Technical Host: Enna Mool Co-host 1: Saurav Sharma; Co-host 2: Monika Gurung; Volunteer 1: Prabhat Adhikari; Volunteer 2: Ganga Poudel	<b>Room: Kande Vyakur Room</b> Moderator: Prekshya Subedi Rapporteur: Manisha Basnet Technical Host: Sneha Pradhanagna Co-host 1: Aanjana Bhattacharai; Co-host 2: Pragati Dahal; Volunteer 1: Manjita Kharel; Volunteer 2: Monika Dhakal

12:00-12:02	Session Chair: Dr Poshendra Satyal (UK)	Session Chair: Dr Narayan Adhikari (Nepal)	Session Chair: Dr Gauri Shankar Bhandari (Korea)
12:02-12:05	Session Co-chair: Dr Nani Raut (Nepal)	Session Co-chair: Dr Dilip Khatiwada (Sweden)	Session Co-chair: Dr Bhesh Raj Thapa (Nepal)
12:05-12:15	Lead presenter: Dr Santosh Marahatta (Nepal)	Lead presenter: Dr Keshab Parajuli (Germany)	Lead presenter: Dr Rocky Talchabhadel (Japan)
12:15-12:23	Santosh Khanal	Mamata Aryal	Uchita Lamichhane
Q&A 12:23-12:27	Migration and Agricultural Production: Analysis of Farming Communities of Lamjung District of Nepal	Performance of Rainwater Harvesting System as a Source of Drinking Water: A Case Study	Distribution, Threat Analysis and Community Based Conservation of Pangolin (A Case Study In Rani Community Forest; Makwanpur District)
12:28-12:36	Smriti Katwal	Rita Thapa	Yogesh Joshi
Q&A 12:36-12:40	Assessment of soil quality of agricultural land in Anshikhola Watershed	Effect of biochar on agricultural soil quality and crop productivity	Optimization for overproduction of type iii polyketides in <i>e.coli</i> and metabolomics for mass spectrometry-based identification
12:41-12:48	Som Prasad Lamichhane	Suraj Neupane	Kavyaa Rizal
Q&A 12:48-12:53	Human right situation of Nepali migrant worker in Malaysia: a case study of Semeniyh Immigration Detention Camp.	Solar Powered Lift Irrigation: Energy and Water Discharge; A case of Kuleni.	Conscious Innovation: Program design, evaluation and measures of success for climate action in Kathmandu, Nepal
Poster presentation (2min for MC)			

12:56-1:01	Sallu Nepal	Field response of wheat genotypes to spot blotch under different sowing dates at rampur, chitwan, nepal	Rashmita Raut	An Assessment to Evaluate the Efficiency of Cook Stoves in Chyasingkharka-05, Kavre, Nepal	Prasesh Pote Shrestha	Environmental Impact Assessment of Municipal Solid Waste Management in Banepa, Nepal
Q&A 1:01-1:03						
1:04-1:08	Saloni Thapa	Characterization of local aromatic and small grain rice germplasm from terai region of nepal using agro-morphological traits	Mamata Sapkota	Spatial Distribution, Historical Existence of Gharial and its Conservation Impact on Local Livelihood in Rapti River of Chitwan National Park		
Q&A 1:08-1:10						
1:11-1:13	Session Chair	Concluding remarks				
1:14	Moderator	Thank you				

### HKC2020 Day2 (Aug 6, 2020): Panel Discussion

Room: Jumli Marshi

<b>Panel Discussion</b>	
<b>2:45-4:15 PM</b>	
<b>Theme: COVID-19 : Lesson for Future</b>	
Panelists: Dr Ambika Prasad Gautam, Nepal (Conservation Biology), Dr Prajal Pradhan, Germany (Agriculture and Climate Change), Dr Madhurima Bhadra, Nepal (Public Health and Development)	Moderator: Dr Prativa Pandey Rapporteur: Shradha Bhattarai, Shreya Dahal

<b>Entertainment Session (Room: Jumli Marshi)</b>	
<b>4:15-4:30</b>	
Ashra Kunwar (Singer)	

### HKC2020 day2 (Aug 6, 2020): Concluding Session

4:30 – 5:30 PM



<b>VALEDICTORY SESSION</b> Venue: Jumli Marshi Room	
<b>Time</b>	Moderator: Dr Nani Raut Rapporteur: Shreejala Maharjan, Sajina Bhandari
04:30 PM	Closing session Session Chair: Mr Surendra Subedi Joint Secretary, MOEST
04:35 PM	Remarks Mr Kanchan Dixit, Executive Director, ISET-N
04:40 PM	Remarks Prof Dr Ram B. Chhetri, Chair, RHF
04:45 PM	Remarks Dr Rijan Bhakta Kayastha, HoD, DOE-KU
04:50 PM	Remarks Mr Kamallesh DC, Acting Dean, MWU
04:55 PM	Next VII Graduate Conference proposition Prof Dr Sharada Thapaliya, Acting Vice-Chancellor Agriculture and Forestry University
05:00 PM	VII Graduate Conference acceptance Prof Dr Hridaya Bajracharya Vice-Chancellor, Lumbini Buddhist University
05:05 PM	Vote of thanks Dr Dinesh Neupane, Conference Secretary
05:15 PM	Award announcement Prof Dr Rejina Maskey Byanju, HoD, Central Department of Environmental Science, TU
05:20 PM	Valedictory Remarks Session Chair
<b>05:30 PM</b>	<b>END OF CONFERENCE</b>

# LEAD PRESENTATIONS

## LEAD 001

### In Situ Litter Decomposition and Nutrient Release from Forest Trees along an Elevation Gradient in Central Himalaya

MEENA BOHARAA,<sup>B</sup> KESHAB ACHARYA<sup>C</sup>, SABANA PERVEENC,  
KIRIL MANEVSKID,<sup>E</sup> CHUNSHENG HUA,<sup>B</sup> RAM KAILASH P. YADAV<sup>C</sup>,  
KAMALA SHRESTHA<sup>F</sup>, XIAOXIN LI<sup>A,B</sup>

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Litter plays a central role in the nutrient budgets of forests by supplying inflow to nutrient turnover through decomposition. However, studies of litter decomposition and nutrient dynamics in forest ecosystems are limited, particularly for the central Himalaya forest ecosystems with wide importance for stability and nutrient dynamics under global change. A one-year-long in-situ litter decomposition experiment was conducted with multiple tree species, dominating forests along an elevation gradient from 1300 to 2500 meters above sea level (m.a.s.l.) in central Nepal. The main aim was to examine the litter mass loss, factors affecting the decomposition process and the nutrient dynamics of the studied tree species, based on the litter bag method and physico-chemical analyses of the litter and the soil over time. The results showed that litter mass loss decreased with elevation, being the highest at low elevation (63.65%), followed by middle

(46.59%) and high elevation (44.48%). The litter from deciduous tree species decomposed more rapidly than that from evergreen species, with *Alnus* litter decomposing the fastest (1.42 yr<sup>-1</sup>) and *Pinus* litter decomposing the slowest (0.53 yr<sup>-1</sup>), whereas the other species were in the order of *Engelhardia* > *Castanopsis* > *Eurya* > *Lyonia* > *Quercus* > *Rhododendron* > *Schima*. The contents of carbon (C), nitrogen (N), phosphorus (P) and potassium (K) in the initial litter (i.e., freshly fallen leaves), as well as weather factors (precipitation and temperature) were the best predictors of litter mass loss. The nutrient release from the litter was not discerned throughout the annual decomposition process, however, the release rate at the end of the study period followed the order of P > K > C > N, indicating that litter is a potential sink of N due to its slow release rate. This study may serve as a baseline for long-term research on nutrient dynamics in forest ecosystems of central and eastern Himalaya, which is imperative for preserving biodiversity and ecosystem stability and for mitigating climate change impacts.

## LEAD 002

### Increased Frequency of Poleward Excursions by The Himalayan Subtropical Jet

**UDAY KUNWAR THAPA<sup>1,2,\*</sup>, SCOTT ST. GEORGE<sup>3</sup>, VALERIE TROUET<sup>4</sup>**

<sup>1</sup> *The University Corporation for Atmospheric Research | Cooperative Programs for the Advancement of Earth System Science (UCAR/CPAESS), Boulder, USA*

<sup>2</sup> *Bren School of Environmental Science and Management, University of California Santa Barbara, Santa Barbara, USA*

<sup>3</sup> *Department of Geography, Environment and Society, University of Minnesota, Minneapolis, USA*

<sup>4</sup> *Laboratory of Tree-Ring Research, University of Arizona, Tucson, USA*

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The subtropical jet stream (STJ) is a band of high-speed westerly winds in the upper atmosphere located near the subtropics in both hemispheres. In regions of high jet speed, synoptic-scale storms tend to form and changes in jet properties therefore affect their distribution, frequency and intensity. Since the 1980s, the STJ has generally moved poleward, but its behavior varies strongly by region and season. We studied the spring STJ over the Himalayas (Himalayan jet) and found, during 1948-2018, it is typically anchored immediately near the Himalayan foothills. In a few years, however, it has moved far north to pass over Kyrgyzstan and north-west China. A tree-ring based reconstruction of Himalayan jet latitudinal movements suggests such northerly extremes are not unprecedented over the past 400 years, but they have become more common after 1950. We also show that most parts of central Asia experienced hot and dry springs during the years of extreme poleward displacements, based on which we argue that including Himalayan jet position into forecasting models can improve the accuracy of spring weather predictions in this region. Our multi-century record can be used to test how well models simulate the Himalayan jet variability and investigate whether anthropogenic warming is the cause of the recent poleward extremes..

### LEAD 003

## Long-Term Tree Growth and Their Responses to Global Changes in the Central Himalaya, Nepal

SHANKAR PANTHI

*Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences, Yunnan, China Email: shankar.panthi@xtbg.ac.cn, shpanthi2010@gmail.com*

High-elevation forests are experiencing high rates of warming, in combination with CO<sub>2</sub> rise and drying trends. The effects of

environmental changes on tree growth in the Himalayan Mountains are also modified by elevation itself, thus complicating our ability to predict effects of future climate change. Tree-ring analysis along an elevation gradient allows quantifying effects of gradual and annual environmental changes. This study was conducted along elevational gradients in a dry (West Nepal) and a wet (East Nepal) region in the central Himalaya. The study analyzed the past climate variabilities in the central Himalaya, as well as evaluated long-term physiological (stomatal conductance, and intrinsic water-use efficiency, iWUE) and growth responses (tree-ring width) of Himalayan fir (*Abies spectabilis*) trees in response to warming, drying, and CO<sub>2</sub> rise. Historic drought and temperature variability in the central Himalaya was reconstructed using calibration-verification statistics (transfer function analysis), while the study combined dendrochronology and stable carbon isotopes ( $\delta^{13}\text{C}$ ) to quantify long-term trends in stomatal conductance (ratio of internal to ambient CO<sub>2</sub>, i.e., Ci/Ca ratio) and iWUE ( $\delta^{13}\text{C}$ -derived), growth (mixed-effects models), and evaluate climate sensitivity (correlations). Past climate reconstructions revealed the increasing drought and temperatures in recent decades in the central Himalaya. Furthermore, the findings revealed that iWUE of Himalayan fir increased over time at all elevations, with stronger increase in the dry region. Climate-growth relations of Himalayan fir showed growth-limiting effects of spring moisture (dry region) and summer temperature (wet region), and negative effects of (dry region). Negative growth trends found at lower elevations (dry and wet regions) suggests that continental-scale warming and regional drying reduced tree growth. This interpretation is supported by  $\delta^{13}\text{C}$ -derived long-term physiological responses, which are consistent with responses to reduced moisture and increased vapor pressure deficit. Positive growth trends at high elevations (wet region) suggests that warming has favored tree growth in regions where temperature most strongly limits growth. At lower elevations (dry and wet regions), the positive effects of CO<sub>2</sub> rise did not mitigate the negative effects of

warming and drying on tree growth. The results/findings of this study raise concerns on the productivity of Himalayan fir forests at low and middle (< 3,300 m) elevations as climate change progresses.

**Keywords:** Climate change, Elevation gradients, High-elevation forests, Intrinsic water-use efficiency

## LEAD 004

### Vertical Distribution of Soil Organic Carbon and Nitrogen in A Tropical Community Forest of Nepal

GANDHIV KAFLE

*College of Natural Resource Management, Faculty of Forestry, Agriculture and Forestry University, Katari, Udayapur, Nepal*

This paper reports the findings of a research conducted in Kankali community forest, Chitwan, Nepal, to quantify the vertical distribution of soil organic carbon (SOC) and nitrogen in 1 m soil profile depth. This community forest represents a tropical *Shorea robusta*-dominated community forest. It was found that the soil had 122.36 t/ha SOC and 12.74 t/ha nitrogen in 1 m soil profile in 2012, with 0.99% soil organic matter and 0.10% nitrogen concentration on average. Carbon and nitrogen ratio (C/N ratio) of the soil was found to be 9.90. Both bulk density and C/N ratio were found increasing with increase in soil depth. The SOC and nitrogen were found significantly different across different soil layers up to 1 m soil profile depth. The average pH of the forest soil was found to be 5.3. Looking into the values of stocks of SOC and nitrogen, it is concluded that Kankali community forest has played a role in global climate change mitigation by storing considerable amounts of SOC. Involvement of the local community in management of tropical forest cannot be overlooked in the process of climate change mitigation.

## LEAD 005

# **Interdisciplinary Structural Engineering (ISE) for Resilience and Sustainability-Based Prosperity (Respro): Applied to NAST's COVID-19 Mitigation Campaign (CMC)**

**SHANKER DHAKAL**

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I joined Nepal Academy of Science and Technology (NAST) in June 2020 with terms of references particularly with the goal to work on innovative R&D solutions to combat COVID-19 pandemic in Nepal (which is often referred to as COVID-19 Mitigation Campaign: CMC), a dedicated workshop and simulation laboratory, lately named as the Center of Innovation for Prosperity (CIP), was first set up starting from scratch. Then, material procurement took place in a fast track model, to start the design, production and testing of various proposed products aimed at supporting in the crisis management, in a collaborative manner by engaging capable and efficient local manpower. More than nine products were produced primarily from the resources within the collaborative CIP workshop and driven by the NAST vision of Science for Society and Innovation for Prosperity, or CIP's founding philosophy of Resilience and Sustainability-based Prosperity of Nepal (ReSPro), underpinned by the principles of Interdisciplinary Structural Engineering (ISE). The R&D campaign, currently running in its second month, eventually started to serve the top strategic institutions of the Government of Nepal such as COVID-19 Crisis Management Center (CCMC), with such high-impact projects as Mobile Swab Collection Vehicle (MSCV) in an exceptionally short period. This presentation summarizes the CMC campaign with emphasis on the aspects of engineering the COVID-19 mitigation strategies as advised by such authorities and organizations as WHO and MoHP.



## LEAD 006

# Highly Metastatic Oral Cancer Cell Exosomes Contribute to Cancer Cell Growth and Metastatic Traits by Its Cargo MicroRNA, Mir-1246, Through The Regulation Of DENND2D Gene

SUJATA SAKHA

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Metastasis is associated with poor prognosis in cancers. Exosomes are nanosized (30-120nm) diameter vesicles of endosomal origin that are released in all biological fluids including blood, urine and in vitro culture medium. They are packed with RNA and proteins and are emerging as an important mediator of intercellular communication. However, the function of exosomes remains poorly understood in cancer metastasis. Here, we demonstrate that exosomes isolated by size- exclusion chromatography from a highly metastatic human oral cancer cell line, HOC313-LM, induced cell growth through the activation of ERK and AKT as well as promoted cell motility of the poorly metastatic cancer cell line HOC313-P. MicroRNA (miRNA) array analysis identified two oncogenic miRNAs, miR-342-3p and miR-1246, that were highly expressed in exosomes. These miRNAs were transferred to poorly metastatic cells by exosomes, which resulted in increased cell motility and invasive ability. Moreover, miR-1246 increased cell motility by directly targeting the DENN/MADD Domain Containing 2D (DENND2D) gene. Taken together, our findings support the metastatic role of exosomes and exosomal miRNAs, which highlights their potential for applications in miRNA-based therapeutics.

## Genomic Evidence for Two Phylogenetic Species and Long-Term Population Bottlenecks in Red Pandas

YIBO HU<sup>1,2</sup>, ARJUN THAPA<sup>1,2\*</sup>, HUIZHONG FAN<sup>1,3</sup>, TIANXIAO MA<sup>1</sup>, QI WU<sup>1</sup>, SHUAI MA<sup>1</sup>, DONGLING ZHANG<sup>1</sup>, BING WAN

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The red panda (*Ailurus fulgens*), an endangered Himalaya-endemic mammal, has been classified as two subspecies or even two species – the Himalayan red panda (*A. fulgens*) and the Chinese red panda (*Ailurus styani*) – based on differences in morphology and biogeography. However, this classification has remained controversial largely due to lack of genetic evidence, directly impairing scientific conservation management. Data from 65 whole genomes, 49 Y-chromosomes, and 49 mitochondrial genomes provide the first comprehensive genetic evidence for species divergence in red pandas, demonstrating substantial inter-species genetic divergence for all three markers and correcting species- distribution boundaries. Combined with morphological evidence, these data thus clearly define two phylogenetic species in red pandas. We also demonstrate different demographic trajectories in the two species: *A. styani* has experienced two population bottlenecks and one large population expansion over time, whereas *A. fulgens* has experienced three bottlenecks and one very small expansion, resulting in very low genetic diversity, high linkage disequilibrium, and high genetic load.

## Farmers' Perceptions of and Adaptations to Changing Climate in the Melamchi Valley of Nepal

NANI MAIYA SUJAKHU<sup>1,2\*</sup>, SAILESH RANJITKAR<sup>1,3</sup>, RABIN RAJ NIRLA<sup>4</sup>, BHARAT K. POKHAREL<sup>4</sup>, DIETRICH SCHMIDT-VOGT<sup>1,3,5</sup>, JIANCHU XU<sup>1,3</sup>

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Knowledge of farmers' perceptions of and adaptations to climate change is important to inform policies addressing the risk of climate change to farmers. This case study explored those issues in the Melamchi Valley of Nepal through a survey of 365 households and focus group discussions in 6 communities using a Community-Based Risk Screening Tool—Adaptation and Livelihoods (CRiSTAL). Analysis of climate trends in the study area for 1979–2009 showed that mean annual temperatures rose by 1.02°C and the frequency of drought increased measurably after 2003. Farmers reported increases in crop pests, hailstorms, landslides, floods, thunderstorms, and erratic precipitation as climate-related hazards affecting agriculture. They responded in a variety of ways including changing farming practices, selling livestock, milk, and eggs, and engaging in daily wage labor and seasonal labor migration. With more efficient support and planning, some of these measures could be adjusted to better meet current and future risks from climate change.

**Keywords:** Climate change, CRiSTAL, Adaptation strategies, Melamchi Valley

## Synergistic Interaction between Auxin and Brassinosteroid in Arabidopsis Growth

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The optimal quantity of hormone is obligatory for the proper growth and development of animal and plant, however, too low or too high level of hormone often results in detrimental effects. Auxin and brassinosteroid (BR) are two essential phytohormones for the fundamental processes in plants including cell elongation, division, and differentiation. However, the underlying mechanism of synergism between auxin and BR are yet to be understood. With the experimental results founding ulliver1 (*gul1*) mutant that exhibited 3.5-folds increased hypocotyl length compared to wild type (WT) Arabidopsis, I present the mechanism of synergistic interaction between auxin and BRs. Our molecular genetics and biochemical analysis proved that an enhanced level of auxin and BR generated by mutual stimulation of biosynthesis is the underlying biochemical reason for the unique phenotype of *gul1/sur2-7* based on following findings. First, the endogenous BR levels were increased and a long hypocotyl phenotype was masked in a double mutant *gul1 dwarf4-1 (dwf4-1)* (*DWF4* encodes the rate determining enzyme in BR biosynthesis). Second, *gul1/sur2-7* had 1.6-folds greater IAA levels compared to wild-type (WT), but the degree of increase was lower than other *sur2* alleles which had upto 4.2-folds. Increased IAA induced BR biosynthesis through transcriptional induction of *DWF4*. Third, brassinolide (BL) treatment increased IAA biosynthesis through stimulating transcription of auxin biosynthetic genes, *CYP79B2* and *ASB1*. Fourth, only combined application of both auxin and BL resulted in hypocotyl length of WT being equal to *gul1/sur2-7*, but not by the treatment alone.

## LEAD 010

# Soil Nutrient Variability and Site-Specific Nutrient Management in Rice for an Intensive Rice-Based Cropping System in Western Foothills of Nepal

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Increased rice production is required to meet rising demands, but additional production should come from the sustainable intensification of existing farmlands to minimize the undesirable effects to the environment. Nitrogen (N), phosphorus (P) and potassium omission plot experiment in rice was conducted on 36 farmers' field during 2011 and 2012 in Nawalparasi district of Nepal to quantify the indigenous nutrient supply (INS) and formulation of site specific nutrient management (SSNM) nutrient dose, and SSNM dose was formulated and evaluated on seven farmers' field during 2013. N application rates were further fine-tuned by applying N fertilizer based on the crop nutrient status and crop demand using a leaf color chart (LCC). Yield responses to fertilizer application followed the order of  $N > P \geq K$ . Mean grain yields in the nutrient omission plots increased in the order of  $0 \text{ kg N ha}^{-1} (3.63 \text{ t ha}^{-1}) < 0 \text{ kg P ha}^{-1} (4.81 \text{ t ha}^{-1}) \leq 0 \text{ kg K ha}^{-1} (4.82 \text{ t ha}^{-1})$  and the resultant indigenous N, P and K supplying capacity of the soil were 53, 29 and 84 kg ha<sup>-1</sup>. With the SSNM approach, rice yield increased by 37% (1.73 t ha<sup>-1</sup>) than the current farmers' fertility management practice (FFP). SSNM harmonized uptake of major nutrients, increased panicle numbers, decreased ineffective tillers, and increased thousand grain weight. SSNM significantly decreased average N application rate by 4% and P<sub>2</sub>O<sub>5</sub> application by 28% while K<sub>2</sub>O application rate increased by 80% and increased yield by 6% as compared to recommended NPK. Further, LCC improved the grain yield by 5% (310 kg ha<sup>-1</sup>) with the same amount of N application. It

shows SSNM and LCC are the appropriate N management strategies, while appropriate K management strategies are urgently required to maintain the K content of the soil.

**Keywords:** Indigenous nutrient supply, Nitrogen use, Nutrient uptake, Site-specific nutrient management

## LEAD 011

### Circular Economy and Waste Management in Nepal

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Overflowing landfills, streets full of garbage, foul smells, and bad sights are regular phenomena for Kathmandu. While the debate and finger pointing among stakeholders goes on for decades, little has been done to understand scientifically why waste management issues persist. Besides direct health and environmental impacts of pollution, the reputation of ‘polluted city’ can also have consequences for the tourism-based economy of Nepal. “A circular economy is based on the principles of designing out waste and pollution, keeping products and materials in use, and regenerating natural systems”. The dreadful waste management situation in Nepal is a result of failing to address the problem early on. This could repeat again in the future with several new product streams entering the developing market. Increasing amount of packaging materials as well as the growing use of electrical and electronic products, electric vehicles, solar photovoltaic panels are few of the examples. They pose new challenges to the already poor waste management situation, but at the same time, offer opportunities to make use of the valuable material resources in these product streams. A good place to start will be to take inventories of

the flows and stocks of materials, which will allow estimating the potential for a circular economy in the context of Nepal. In terms of sustaining research and actions in this domain, a ‘knowledge center’ can be envisioned, which will bring together industries, academia, governments, and non-government actors. Such an initiative can also support policy makers in devising evidence-based policies for a sustainable waste and resource management in Nepal.

## LEAD 012

### **Projected Impacts of Climate Change on Soil Erosion across Nepal**

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This study assesses the projected impacts of climate change on soil erosion across Nepal by considering the change in erosive power of rainfall. Soil erosion is an ongoing geomorphic process for which rainfall is one of the active drivers. The significant effect of climate change on the soil erosion process is primarily controlled by the change in the erosive power of rainfall due to variations in rainfall patterns, amounts, and intensities. The current study evaluates rainfall erosivity of revised universal soil loss equation (RUSLE) for the past, present, and future scenarios. Ten General Circulation Models (GCMs) were used for the analysis of the climate projection under two representative concentration pathways (RCPs 4.5 and 8.5). The selected warming scenarios are moderate and the highest warming scenarios of the Fifth Coupled Model Intercomparison Project (CMIP5). This study provides an overview of changes in rainfall erosivity (past, present, and future) and discusses the potential impacts on soil erosion across the country.

It is observed that the rate of change in precipitation and resulting rainfall erosivity is relatively larger under RCP 8.5 than RCP 4.5. During the 2070s (2060 – 2080), annual precipitation is projected to increase by +8.1 % under RCP 8.5. The study reports that the annual rainfall erosivity is expected to increase by 27.8% in the high mountain, 17.76 % in the upper hill, 17.7% in mid-hill, 19.68% in Siwalik, and 16.5% in Terai plain of the country in the 2070s under RCP 8.5 with respect to historical time (1961-1990). The current study indicates the soil erosion will rise under the scenario of climate change in the coming days by considering the effects of the rainfall erosivity factor only. In reality, other factors such as soil type, topography, crop system, and management practices equally influence soil erosion, and they are also quite dynamic. Therefore, the combination of all these factors and the inclusion of their projected changes in the future is crucial. I believe the current assessment could be an initial step for soil managers and policymakers to improve and plan for sustainable soil management in the present and the coming days.

**Keywords:** Climate change, Rainfall erosivity, Representative concentration pathway, soil erosion



# TECHNICAL PRESENTATIONS

## **Biodiversity**

# represents the poster presentation

## Human-Wild Mammal Conflict Along Seti River Basin in Tanahun District, Chitwan Annapurna Landscape, Nepal

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Human-wildlife conflict (HWC) invites undesirable influences on human's social, economic and cultural life including the daily activities of both humans and wildlife. In human-dominated areas like Seti River basin, conflict is common with wild mammals such as leopard, wild boar, Muntjac, porcupine, etc. Human-wild mammal conflict was investigated by using 119 semi-structured questionnaires along Seti River basin in Tanahun district, Chitwan Annapurna Landscape from 2018 to 2019. Monkeys, Muntjac and Porcupines were the main crop raider that caused a total economic loss of US\$ 14.26 per household (HH). Livestock depredation was a major problem in the study area. Leopard contributed the highest cases of livestock depredation (n=66) resulting in total loss of US\$ 72.01 per HH. A total of six cases of human attacks were reported including four fatal. Leopards alone contributed 50% of the total cases followed by 33% by Himalayan black bear and 17% by wild boar. Current findings suggest further detailed study related to mitigation and preventive methods for human wild mammal conflict.

**Keywords:** Human-wildlife conflict, Seti River basin, Livestock depredation, Leopard, Fragmented landscape

## **Spatial Distribution and Diversity of Bumblebees in Chitwan Annapurna Landscape, Nepal**

**KISHOR CHANDRA GHIMIRE**

This study was conducted in Chitwan Annapurna Landscape especially in Manang and Mustang districts of Nepal. The fieldwork was carried in the summer season, 2019 across the altitudinal gradient by following accessible walking trails where the bumblebees were collected by handpicking and sweeping methods. Meanwhile, the physical variables such as altitude, temperature, and humidity were noted. As well as host plants of collected bumblebees were also recorded. This study documented 10 *Bombus* species belonging to six subgenera. *Bombus festivus* was the most abundant species representing 39.30% of total species. The highest diversity of bumblebee was found in the forest areas ( $H=2.78631$ ) while the lowest in the home gardens ( $H=1.67699$ ). Foraging of bumblebee was found to be positively correlated with altitude and humidity while negatively correlated with temperature.

**Keywords:** Landscape, Altitude, Host plants, Species diversity

## Habitat Correlates and Distribution of *Indotestudo elongata* (Blyth 1854) in Rupandehi and Palpa Districts, Nepal

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This study focused on the study of critically endangered *Indotestudo elongata* in seven community forests of Rupandehi and Palpa Districts. The study was aimed to determine the overall habitat correlates of *I. elongata* and its distribution and was completed within 75 days between April to August of 2019. It was carried out in two distinct phases viz. occurrence site selection and detail habitat study. A Visual Encounter Survey (VES) was conducted in these sites with a minimum distance of 250m between each point. Vegetation information such as canopy, ground litter, tree species, DBH of tree, height of tree were recorded within a quadrat size of (10 m\*10 m). Similarly, morphological features of species: straight carapace length (SCL), Straight carapace width (SCW), SPL (Straight plastron Length) and SPW (Straight plastron Width) were recorded using Vernier Caliper. Visual Encounter Survey was conducted with the help of local guides and their ecological knowledge to locate 13 live turtles in the study area. Higher numbers of species were recorded from Palpa CFs (n=11) in comparison to Rupandehi CFs (n=2). The habitat of *I. elongata* is found to be associated with Sal (*Shorea robusta*) dominated forest. The relationship between *I. elongata* and road trail was observed where presence of species positively associates to trails with odds ratio of 3.879 while negative relationship was observed between species and mean stand height of tree.

**Keywords:** Community forest, *Shorea robusta*, Trails, Visual encounter survey

## BIOD 004

### Diet and Habitat of Fishing Cat in and around Koshi Tappu Wildlife Reserve

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Koshi Tappu Wildlife Reserve is located entirely in the floodplains of Saptakoshi River in Sunsari and Saptari districts in Southern Nepal has a stretch of 10 km long stream, with 100 - 250 m wide permanent freshwater marshes on its fringes formed due to seepage from the Koshi River south of Prakashpur village which support dense reed-beds.. Several human-made ponds of 0.5 to 2 ha are located along the embankment in the Buffer Zone (BZ). Fishing cat (*Prionailurus viverrinus*), listed as vulnerable in the threatened group of IUCN red list category is a good swimmers with semi-webbed paws and a relatively short but muscular tail that can be used as a rudder in the water and its habitat is mostly brush or scrub near water. The major objectives of this study was firstly to identify prey categories of Fishing cat using indirect method i.e. scat analysis, secondly to understand fish harvest effort in private ponds of BZ and thirdly, to understand the influencing factors for Fishing cat presence in and around KTWR. Collection of Fishing cat scats and various environmental factors data were taken during March to April, 2019 while walking in line transect. Microhistological analysis of hair and scale samples was done comparing them with a reference slide of small rodent hair and fish scales brought from ponds of BZ. Total six prey categories cycloid scaled fish, house mouse, bird, common rat, ctenoid scaled fish and

unknown species were found in which the occurrence of cycloid scaled fish was found to be highest. Carp fishes were used as major commercial fish in the private ponds in BZ of KTWR. Based on this study of environmental variables with relation to presence/absence of Fishing, it was found that disturbance was highly negatively significant and was inversely proportional to water sources. This showed in spite of, presence of an adequate amount of water source does not always lead to abundance of Fishing cat in areas with higher disturbance.

**Keywords:** Diet, Habitat, Buffer Zone, Microhistological analysis

## BIOD 005

### **Habitat Features and Threats to Hispid Hare (*Caprolagus hispidus* - Pearson, 1839) Habitats in Shuklaphanta National Park, Nepal**

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Hispid hare (*Caprolagus hispidus*), an endangered lagomorph, is distributed along the tropical grassland ecosystem in Southern Nepal. Shuklaphanta National Park, a prime habitat of hispid hare is experiencing continuing decline in suitable habitat due to seasonal controlled burning, predation, loss of grassland and thatch collection. Prior studies have focused in certain areas of the different Phantas in the park and assessed inadequately to its habitat features. This study was carried out to assess distribution, ecological habitat features and threats to hispid hare. Strip transects nested with circular plots was the method deployed in this study. A total of 80 transects (20 m × 4

m) were laid where 16 had pellet clusters of hispid hare. Altogether 93 pellet groups were encountered within the transect constituting highest pellet groups in Haraiya phanta and Shuklaphanta. Clumped distribution pattern was observed in the field. Dense ground cover, dry area, distance away from water sources were identified as the important habitat features in hispid hare habitat. 26 species of plants were recorded in the habitat of hispid hare, which was dominated by *Imperata cylindrica* followed by *Narenga porphyrocoma* and *Saccharum spontaneum*. Controlled burning of fire and thatch cutting were the main existing threats to the species indicated from this study. Being endangered and facing such threats, hispid hare is somehow able to protect diversity, biomass and maintain a healthy grassland ecosystem.

**Keywords:** Distribution, Pellets, Species, Threats

## BIOD 006

### **Distribution Pattern and Habitat Suitability Mapping of *Cycas pectinata* in Chure Range of Makawanpur, Central Nepal**

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*Cycas pectinata* is an evergreen plant with no branches and having a single above-ground trunk. It is listed in the vulnerable category of IUCN and appendices II of CITES. The study was carried out in Chure range of Makawanpur district, Central Nepal. Field data were collected to

assess status, distribution, and habitat variables. Data were analyzed through descriptive statistics and the analytical hierarchy process in integration with ArcGIS 10.2.2 to prepare a habitat suitability map. A total of 780 individuals of *Cycas* were recorded in scattered form. The major preferred habitat of this species was forest land having an elevation range of 400 – 500 meter mostly on steep terrain with slope range from 250 to 550, nearer to small gullies and far from human influences. This study revealed that the Chure range was a suitable habitat for *Cycas* of which 40.52 % area was highly suitable, 56.08 % area was moderately suitable and 3.40 % area as less suitable. Though it is in danger of extinction, very limited research about its status, distribution, reproduction biology, and habitat suitability have been conducted. Extensive survey for scientific exploration is necessary and a conservation action plan should be formulated and implemented to conserve this historic species. This paper aims to determine the status, distribution and habitat suitability of *Cycas* in the Chure range of Makawanpur district.

**Keywords:** Scattered distribution, Suitable habitat, Vulnerable

**BIOD 007#**

## **Distribution and Diversity of Butterflies in Lowland Area of Western Nepal : A Case Study of Thakurbaba Municipality and Babai Valley, Bardiya**

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Butterflies are the most beautiful insect among all having large colored wings and conspicuous, fluttering flight. Butterflies have a



very important role in biodiversity and ecology as they are a pollinator as well as environmental indicators. Study was carried out in Thakurbaba Municipality and Babai Valley of Western Terai of Bardiya District, which covers the riverbank and forest area of Babai valley and farmland of Thakurbaba Municipality-01. Altogether 27 different species and 130 individuals were recorded from the three different habitats. Study was conducted during the winter season in the month of January to analyze the diversity and distribution of the butterflies. Nymphalidae was found to be the most abundant family whereas the family Hesperidae and Lycaenidae were least abundant. Forest had high diversity (0.87) and species richness (9.85) of butterflies during the study time period followed by the riverbank (0.86, 6.10) and farmland (0.67, 4.73), but the evenness was high in riverbank (0.89) compared to other two habitats. From the recorded data it was found that riverbank and forest had similar characteristics with each other in comparison to river and farmland & forest and farmland. Detail and regular seasonal monitoring and study are necessary to create the database of butterflies which help to recognize the butterfly fauna and their ecological significance in the study area.

**Keywords:** Butterfly, Habitat, Species

**BIOD 008#**

## **Human-Wildlife Conflict in Buffer Zone of Chitwan National Park, Nepal**

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Human-wildlife conflict is one of the major wildlife issues in and

around Chitwan National Park (CNP) resulting in injuries, deaths of human and wildlife, property loss and crop damage. This study aimed to understand the status of human-wildlife conflict in Madi and Megghauli buffer zones of CNP. A total of 120 households were selected randomly in these settlements and conducted questionnaire surveys. Secondary information was collected from CNP headquarter, Kasara. In Madi, Asian elephant (27%) was reported as the most problematic animal followed by wild boar (23%) and Rhino (22%), whereas in Megghauli, wild boar (26%) was reported as the most problem creating wild animal followed by Rhino (24%) and Elephant (22%). Frequency of visit of wildlife was found to be high during rice harvesting (October/ November). The conflict was in increasing trend in these buffer zones of CNP in the last five year. In Megghauli a greater number of respondents 48% were involved in different conservation organizations which showed the positive attitude towards the conservation of wild animals and from Madi about 32% of people are only involved in different conservation organizations. Over 2/3 of the respondents were not happy with the compensation scheme though it is provided on the basis of severity of damage. Very few respondents were interested in alternative cropping (17% in Madi and 12% in Megghauli). However, no such program has been implemented in the area. Betterment in compensation scheme and educating people and promoting alternative crops should be implemented for the long term conservation of wildlife in CNP.

**Keywords:** Park-people conflict, Conservation, People's perception

## Assessment of impacts of invasive species: A case study in urban forest patch of Jagdol - Yagyadol Forest, Gokarna

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Urban forest patches are under increased pressure from invasion by alien species and are strongly affected by anthropogenic activities. The vegetation present in the matrix of urban sites is a rich source of alien invasive species. The patch experiment involved initiating invasion in different habitat types (roadside, disturbed, open boundary & dense forest). This study aims to address the impact of invasive alien species to the native species in the urban forest patch covering the area of 33.06 ha. The analysis was made at two types of forest (Pine forest & Mixed- broad leaves) within the subtropical area of the urban forest patch. Altogether seventeen native plant species and eight species of IAPS were recorded in total of 30 plots (20m\*20m) using Systematic sampling method. *Pinus roxburghii* was found to be the most dominant native tree species as a fact that the forest area of about 60% falls under pine forest type and the rest is mixed broad leaves forest. The coverage and species richness of IAPS in each sampling plot was found significantly different. The invasion of IAPS was detected more in open and disturbed sites. Relationship of the seedling & sapling diversity with respect to invasive species coverage was established, both of which showed negative correlation ( $r = -0.1$  &  $-0.083$ ) respectively. The impacts of IAPS in tree regeneration were found by suppressing the growth of saplings and seedlings. Native herb species are also found to be affected by IAPS negatively. Invasive plants often appear to be more competitive than native species. Mixtures of invasive & native species are generally less productive than monocultures of the

native species but not less than monocultures of the invasive species. Thus, controlling IAPs is critical to enhance the productivity of native species.

**Keywords:** IAPS, Species coverage, Seedling, Monoculture, Invasion

**BIOD 010#**

## **Study on the Tail Regeneration Ability of Common House Gecko (*Hemidactylus frenatus*) in Kirtipur, Kathmandu, Nepal**

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Regeneration is the ability to rebuild and restore a body's cells to its original state such that they are able to function phenotypically and anatomically as the original cells. This research focuses on the incredible regenerative ability that most living organisms possess. This research has utilized Common House Gecko (*Hemidactylus frenatus*) to obtain data of this organism to lose its tail in face of extremity by the process of 'caudal autotomy' to survive and later regrow a brand new tail with more or less similar functionality. For the conduction of this particular research, laboratory conditions were set up in Kirtipur for observation of geckos under controlled environment. Ten geckos were captured from Kirtipur by October of 2018. These geckos were kept in glass and plastic cages in a separate, secluded room where day and night cycles were controlled and water as provision was provided regularly. Filament bulb was used for illumination during night time. After the laboratory environment was set up, the tails of geckos were cut off and the growths of their new tails were noted down on the following months. Only water was provided to the geckos

after tail removal and regrowth of the tails were observed. Though new tail growth was seen, it was very limited compared to other researches. Growth of tail in geckos was seen with a maximum of 1 cm and minimum of .1 cm over the course of 14 weeks. No significant difference was found between regenerated tails with individual geckos and regenerated tails with time.

**Keywords:** Caudal autotomy, Regeneration, Geckos

# TECHNICAL PRESENTATIONS

## Pollution and Control Measures

# represents the poster presentation

## Solid Waste Characterization and Sewage Outlet Mapping of Slums in Kathmandu, Nepal

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Unplanned urbanization in Kathmandu city, the capital of Nepal, is resulting in too many environmental issues, where improper waste management and worsening water quality in Bagmati River are serious problems. To understand the status of SWM in slum areas along Bagmati River in Kathmandu, a questionnaire survey was conducted from April 21 to May 4, 2019. The average of waste characterization from all four locations revealed that the organic wastes was the highest at 60.17%. Paper and paper products (14.88%), plastics (11.16%), glass (7.7%), dirt and construction debris (5.79%), and others (0.3%) were also present. Textiles, rubber, leather, metals, and hazardous wastes were not found in the study area. Total waste generation in each site among the surveyed households were 31.06, 21.95, 23.54, and 39.1 kg d<sup>-1</sup> in Sinamangal, Thapathali, Teku and Balkhu, respectively. Average household solid waste generation rates were 165.7, 137.76, 143.64, and 251.5 g capita<sup>-1</sup> d<sup>-1</sup> in Sinamangal, Thapathali, Teku, and Balkhu, in that order. The total number of sewage outlets from Sinamangal was found to be 47 and among them 14 were active. The lab results yielded that the dissolved oxygen (DO) was very low at 0.6 mgL<sup>-1</sup> and chemical oxygen demand (COD) and biochemical oxygen demand (BOD) were the largest among four places in Balkhu. The high COD and BOD numbers indicate greater biological and chemical pollution in Bagmati River, particularly in Balkhu area. All four slums generated more biodegradable waste and waste burning is a major SWM activity, especially in Balkhu.

**Keywords:** Bagmati river, Sewage, Slum area, Water quality

## **Spatial and Seasonal Water Quality Variations in Bagmati River Basin, Nepal**

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Surface water quality deterioration is a critical issue in many countries in the world. The Bagmati River and its tributaries within Kathmandu Valley are among the most polluted rivers in the country. This study presents the assessment of seasonal and spatial variation of water qualities in the Bagmati River and its tributaries. A total of thirty-six sampling sites were selected and monitored for 18 physical and chemical parameters in winter (January) and monsoon (July) seasons of 2019. This study revealed that upstream water quality in rural areas was significantly good. In downstream, semi-urbanized and urbanized areas, the river was heavily polluted with untreated municipal and industrial wastes. COD and BOD were found higher in the urban area indicating the presence of organic pollutants in the river system. This study also revealed that the water quality of the monsoon season was comparatively better than the winter season. The WQI value of 87-24 in the sampling sites represented good to very bad quality. The Sodium adsorption ratio (SAR) and Sodium Percentage value indicated that water in Bagmati River is suitable for irrigation purposes. However, necessity of proper maintenance of treatment plants and proper planning for the restoration of the Bagmati River is essential.

**Keyword:** Anthropogenic activities, Bagmati River basin, Physico-chemical parameter



## Assessment of Heavy Metals: A Case of Ghodaghodi Lake, Western Nepal

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Lentic ecosystems are more prone to heavy metal pollution due to low capacity of self-purification and pollutant dispersal as compared to lotic systems. Macrophytes could play a vital role in remediation by bio accumulating metals from such water bodies. This study assessed the concentrations of heavy metals (Zn, Cd, Cu and Pb) in water, sediments and two dominant macrophytes in Ghodaghodi Lake by atomic absorption spectrophotometer based on acid digestion method in winter and summer season. Heavy metal concentrations in water were very low having an order of Zn>Cu>Pb>Cd in both seasons. Higher level of zinc and copper in water could be due to anthropogenic additions. Heavy metals concentration in sediments were in order of Zn>Cu>Pb>Cd in both seasons. In sediments, concentrations of all metals in winter season were greater than summer season supported by geo-accumulation index (I<sub>geo</sub> value).

In winter, Cd had the highest Igeo value classified as moderately contaminated by comparing current concentrations with pre-industrial levels along with other anthropogenic activities. Metal concentrations for two dominant macrophytes in both seasons were in the order of Zn>Pb>Cu>Cd. Ludwigia sp. showed greater trend of metals accumulation than the Nymphaea sp. in winter season. While, Nelumbo sp. was more appropriate for accumulating three metals (i.e. Cu, Cd and Pb) compared to Ludwigia sp. in the summer season. Thus, these macrophytes could be capable of accumulating heavy metals providing scope in the bioremediation field.

**Keywords:** Bioaccumulation, Geoaccumulation, Heavy metals, Macrophytes, Lentic

## POLL 004

### **Assessment of Bacterial Contamination in Drinking Water of Schools of Tokha Municipality**

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School is one of the integral parts of the community dynamics. The maximal time duration of children is spent in school. Children are more vulnerable to pathogens and every year about 1.1 million children die due to water borne disease so safe drinking water in school bears a remarkable role in children's health and education. Therefore, this study was carried to understand the quality of water supplied in schools of ward 1, 2 and 3 of Tokha Municipality. It mainly focused on analysis of bacterial contamination: Total coliforms and Fecal coliforms that are considered to be an indicator species which indicates either

water is safe or not to drink. Presence of these species indicates the presence of other disease causing organisms in the water system. Drinking water source in the study area is directly tapped from the stream (ward 1) while water sources in ward 2 and 3 are underground well and supplied by private water suppliers. Water samples from all schools (18) were sampled for the analysis. Secondly, it looked for the role and responsibility of school management towards children regarding safe water supply to ensure right to education. Almost all water samples exceeded the WHO guideline and National Drinking Water Standards. Despite some schools have purification measures however still found ineffective in eliminating coliforms. This increase threatens children's health leading to absenteeism and hinders growth and development. Hence purification methods should be adopted to remove coliforms from drinking water. Along with purification, storage tanks and other vessels should be clean time and again to remove bacteria.

**Keywords:** School, Drinking water, Total coliforms, Fecal coliforms, Purification method

## POLL 005

### **Impacts of Agricultural Runoff on Aquatic Plants in Lake Ecosystem**

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The extensive use of chemical fertilizers and pesticides in the agricultural field has increased the pollution in water bodies, which

has a direct impact on the aquatic ecosystem. However, the effect of pesticides is always linked to human health and less concern is given to the environmental effects. It is therefore necessary to study the ecological impact of pesticides for the management of lakes. For evaluating the impact on aquatic plants, four lakes from urban mid-hill areas (Lake Dipang, Khaste, Neurini, and Gunde) were studied. A total of 21 water samples were collected from different sites on the basis of land cover during January, 2020. For the study, macrophytes survey was done using the quadrats and water and sediment samples from the same site were collected. Water quality parameters such as pH, EC, TDS, and DO were measured using multiprobe and DO meter onsite and other parameters such as N, P, K, Ammonia, Sulfate, etc. were analyzed in the laboratory. Questionnaire survey with the farmers and agrovets was done to know the types of pesticide used. The study envisions understanding the impact of agricultural effluents on the wetland. Results showed that the lakes are in eutrophic condition; and the diversity of macrophyte is high in the Dipang Lake and low in the Neurini Lake, which is directly related to the concentration of N, P, K in water and sediment. Thus, this study reveals that agricultural inputs in water bodies have an influence on aquatic ecosystems.

**Keywords:** Macrophyte, Pesticide, Pokhara, Ramsar sites, Water quality

**POLL 006<sup>#</sup>**

## **Assessment of Policy Intervention for Noise Pollution Control: A Case Study of No Horn Declaration in Kathmandu Valley**

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Noise pollution is one of the growing issues in Kathmandu Valley.

To curb this problem “No Horn” regulation was implemented by Kathmandu metropolitan city in collaboration with the traffic police division from 14th of April 2017. This study aims to find out the current status of noise pollution, implementation status of “No Horn” regulation and changes in the level of noise after “No Horn” declaration. The study hypothesizes that the noise level has decreased after “No Horn” regulation. To carry out this study a sound level meter (SLM) was used and the measurements were taken manually for 7 hours in every 10 seconds interval during December 2017 to May 2018 in 12 different locations of Kathmandu valley. Horn events and reason for honking were also analyzed visually for 5 minutes in 12 locations of Kathmandu valley. The average noise level was observed 63.77 dB(A). In total 312 horn events recorded in 12 locations for every 5 minutes. The highest number of horns was used without any reason by motorcycle and scooter. The observed result of horn events indicates the regulation hasn’t been implemented as expected. The reduction of noise level was higher in low traffic areas as compared to high traffic and residential areas. While the noise level has been increased in commercial areas even after the “No Horn” declaration. Overall, the noise level after the regulation was significantly reduced by 2.0625 dB in 5% level of significance. Monitoring and controlling honking horns from two wheelers is recommended for making the initiative more effective.

**Keywords:** No horn, Noise pollution, Sound level

**POLL 007#**

## **Assessment of the Groundwater Quality and its Health Impact on Karsiya Village, Morang District, Nepal**

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Groundwater is considered as the major source for drinking in rural as well as urban areas and over 94% of the drinking water demand is met by groundwater. The study was done to assess the groundwater quality and its suitability for drinking purpose in Karsiya, Nepal. A total of 38 water samples were collected from hand pumps and used for the analysis of different physio-chemical and biological parameters. Further, a survey was conducted to determine health risk of people around the study area. Parameters such as pH, temperature, iron, electrical conductivity, total alkalinity, total hardness, coliform, chloride, arsenic, turbidity, nitrate, and total dissolved solids were analyzed. The result showed pH, EC, TDS and chloride within the range allowed by the World Health Organization (WHO) and Nepal Drinking Water Standard (NDWS). Total alkalinity ranged between 50 to 550 mg/L. Total hardness ranged from 75 to 510 mg/L. Values of nitrate concentration varied from 20 to 170 mg/L. Iron ranged between 0.3 to 4.2 mg/L. Arsenic value ranged from 0.01-0.05 mg/L, turbidity ranged from 1-49 mg/L, temperature range was 25.6- 31<sup>o</sup>c and presence of coliform was found in total 37 samples. Further, Pearson's correlation revealed EC and TDS (0.908875), to have significant relation followed by TDS and hardness (0.670158) and EC and Hardness (0.636684). The study reveals that water quality of Karsiya village is not consumable and there is an instant need to make further steps in this locality to protect the population from the adverse health impacts.

**Keywords:** Karsiya, Groundwater, Parameters, Health effects, Correlation

## The Brink of Extinction: Quantifying the Stories of Stone Spouts in the Kathmandu Valley

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Stone spouts were one of the traditional water management techniques which served as primary water sources in the Kathmandu Valley from 550 C.E to the mid-1900s. These stone spouts (also known as “dhunge dharas”) are channelized water spouts which use shallow aquifers and springs as their source. These aquifers were recharged by precipitation and state canals (Raj-kulos). However, excessive groundwater extractions, depleting groundwater table, destruction of state canals, and concretization of recharge areas due to rapid urbanization have collectively led towards drying up of these stone spouts. The main objective of our research was to analyze the present conditions of stone spouts in the Kathmandu Valley. We analyzed water quantity and quality (temperature and electrical conductivity) of more than 200 stone spouts inside the Kathmandu Valley during pre-monsoon (September-October 2017) and post-monsoon (April-May 2018) using an android application called Open Data Kit (ODK). From the study, we concluded that stone spouts located in natural land uses (forests and shrublands) had significant amounts of flow while those located in city lowlands were mostly dry or had comparatively very less flow. These traditional stone spouts are no longer capable of meeting water demand of the Valley. However, if managed properly, they could still serve as one of the major water sources of Kathmandu Valley.

**Keywords:** Stone spouts, Groundwater, Discharge

## Characterization of Fine Aerosol Particles in the Indoor Microenvironment of Panchase, Kaski, Nepal

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Particulate matter with a diameter less than 2.5  $\mu\text{m}$  (PM<sub>2.5</sub>) of indoor microenvironment has become a critical issue in the field of atmospheric environmental research because of its possible adverse influence on human health. Most particles emitted from biomass burning are less than 2.5  $\mu\text{m}$  in diameter and are formed mainly from condensation of pyrolysis products, atmospheric oxidation of emitted volatile organic gases and complex growth processes that form chained soot particles. In rural areas, traditional stoves are often used in poorly ventilated kitchens and for relatively long durations. Particles emitted from cooking also readily infiltrate into living rooms, thereby extending the risks to the occupants. In this study, real time measurements of PM<sub>2.5</sub>, PM<sub>10</sub>, PM<sub>1</sub> and CO<sub>2</sub> concentrations were conducted using Air Visual Pro (IQAir, Switzerland) in the indoor environment of the living room of a homestay at Panchase village of Kaski district. Panchase represents a mountain ecosystem that links the lowland with the high Himalayas of Annapurna range. For comparison, the measurements of above parameters were also conducted in the outdoor environment of the village using the same instrument. A total of 3 days' samples including indoor and outdoor environment of the selected place were measured. The preliminary study showed that the maximum hourly average PM<sub>2.5</sub> particle concentrations in all the indoor samples were significantly higher than the outdoor samples at Panchase (Maximum PM<sub>2.5</sub> concentrations: 506.0~987.0 vs.141.0  $\mu\text{g}/\text{m}^3$ ), indicating that the burning of biomass during cooking activities and conventional



room heater were responsible for the elevated PM<sub>2.5</sub> concentrations in indoor microenvironment of the village.

**Keywords:** Indoor aerosol, PM<sub>2.5</sub>, Panchase village

## POLL010<sup>#</sup>

### **Distribution, Source and Transport of Polycyclic Aromatic Hydrocarbons Along Southern Slope of Himalayan Mountains, Nepal**

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Polycyclic aromatic hydrocarbons (PAHs) are semi-volatile and persistent organic compounds with carcinogenic and mutagenic effects. This study describes how the Environmental Protection Agency prioritized, 15PAHs are transported from lowland to the high Himalayan mountains of Nepal as well as seasonal and altitudinal variation in air along the transect of the southern slope of Nepal from 2012 to 2014 (Focused mainly on the observation of transport mechanism of semi volatile pollutants from low land to high mountain of Nepal which is caused by the atmospheric circulation so the data retrieval time is independent for the research objectives). Sampling was conducted at

seven sites along the south–north transect of the Himalayan region which included Simara, Kathmandu, Daman, Syabru Besi, Rimche, Kyanjing Gumba, and Yala Peak. Sample collection was performed using resin based (XAD-PAS) passive air sampler. The concentration of PAHs in summer ranges from 0.7ngm<sup>-3</sup>-68.2 ngm<sup>-3</sup> (15.8±24.1 ngm<sup>-3</sup>) and in winter it ranges from 0.4 ngm<sup>-3</sup>-121.9 ngm<sup>-3</sup> (29.3 ±41.5 ngm<sup>-3</sup>). The concentration of PAHs was higher during winters in the lowland e.g. Simara, Kathmandu and Syafrubesi whereas during summer, the concentration was higher in the high altitude regions eg. Rimche and Kyanging Gumba, indicating local emissions even at high altitudes. The compositions of all PAHs was almost similar in Kathmandu Valley and remotely located Yala Peak indicating long range transport of these compounds during summer, while in winter, the composition of Yala closely matched with the composition at Rimche which showed local short transport in the high altitude region.

**Keywords:** Polycyclic aromatic hydrocarbons, Long range transport, Semi-volatile, XAD-PAS.

# TECHNICAL PRESENTATION

## Climate Change

# represents the poster presentation

## Spatial Distribution and Susceptibility Modeling of Landslides in the Chatara-Barahakshetra Area, Siwalik Zone, Nepal

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The hilly regions of Nepal are potential for land-sliding in the rainy season. Lying between two major thrusts: Main Frontal Thrust (MFT) and Main Boundary Thrust (MBT), the rocks of Siwalik zone are very weak and fragile and shallow and deep landslides are very common in this zone during rainfall. This study aims to develop a remote sensing based spatial landslide inventory, analyzing their spatial distribution and develop the landslide susceptibility map by the means of frequency ratio model. This study utilized the remote sensing and GIS to develop a landslide susceptibility map. Total of 382 landslide polygons were mapped from Google earth and by field verification. The result from five classified nearby watersheds of Chatara-Barahakshetra showed that landslides distributed unevenly between watershed four (24.60%), watershed two and watershed three (21.72%) equally, watershed three (16.23%) and watershed one (15.70%). The watershed three has high landslide density of 5.03 per sq. km and high landslide ratio of 0.019 whereas watershed one has lowest landslide density of 1.57 per sq. km and lowest landslide ratio of 0.003 compared to others. The validation results showed that the success rate curve with 72.55 percentage of the area lying under the curve and the prediction rate curve with 71.73 percentage of the area lying under the curve indicating that prediction ability of the frequency ratio model. These landslide susceptibility maps can be used as a

planning tool by prioritizing areas for controlling the landslide effects and frequency ratio model will be a suitable model for the landslide susceptibility.

**Keywords:** Factor map, Frequency ratio, Landslide inventory, Susceptibility, Validation

## CLIM 002

### Landslide Hazard Assessment at Panchase Area of Central Nepal

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Numerous slope failures were noticed in the Panchase region posing threat to peoples and biodiversity present there. Considering the need to manage such landslide risks, this research was intended to find out the spatial extent of various levels of landslide hazard in the Panchase area. The research site, with an area of 278.324 Km<sup>2</sup>, consists of parts of Kaski, Parbat, and Syangja districts. The hazard analysis was carried out using the Statistical Index Method which is the measure of ratio of landslide density in a particular category of a factor to that of landslide density in the whole experimental area. The method produced weight values for each factor class where positive value generated areas of higher hazard and vice versa. Inventory resulted into 556 landslides measuring 1.511 km<sup>2</sup> indicating the occurrence of 2 landslides in every unit km<sup>2</sup> area. 13% (36.18 km<sup>2</sup>) of the total experimental area falls under a very high hazard zone. Similarly, areas occupied by high

hazard and moderate hazard zones were of 77.66 km<sup>2</sup> (28%), and 81.83 km<sup>2</sup> (29%) respectively. The validation of resulted hazard map showed 82.8% of area under the curve is determined from the receiver operator characteristic curve. This indicated the hazard assessment process being acceptable and replicable. The factor classes like: near the steams, near the roads, barren or grassland, land with phyllite bedrocks, land receiving rainfalls greater than 4000 mm, lands with elevation range from 1000 m to 1500 m, slopes steeper than 30°, and south facing slope had greater influence in higher hazard.

**Keywords:** Area under curve, Hazard zonation, Landslide inventory, Slope failures, Statistical index method

## CLIM 003

### Flood Hazard Mapping of Hanumante River Bhaktapur by Using Hydrodynamic Model HEC-RAS

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Flood is a devastating natural hazard. With increased encroachment in the Hanumante River, the risk of flood is increasing. Bhaktapur had been suffered from two massive flood in Hanumante River on 27th August 2015 and 12th July 2018 causing loss and damage on human lives, domestic lives and huge economic values. The objectives of this study are to prepare and analyze the flood hazard map and to assess probable flood vulnerability. The study was carried out in Hanumante river basin, delineated at upstream to Manohara and Hanumante confluence. The methodology of this research involves

watershed area delineation, hydrological analysis and floodplain mapping using HEC-RAS model with HEC-GEORAS interface and Arc-GIS and both primary and secondary data analysis for vulnerability assessment. The analysis shows that the total inundated area are 130ha, 155ha, 167ha, 185ha and 196ha at different return periods 2, 5, 10, 50 and 100 years respectively. The inundated areas at different hazard classes Low (0-1) m, Moderate (1-2) m, Significant (2-3) m and Extreme (>3m) are 353.71ha, 265.57ha, 142.02ha and 71.58ha respectively. The vulnerability analysis with different land classes shows that the agricultural land-valley and residential area seems to be most vulnerable. The number of vulnerable houses are 523, 756, 1304, 1577 and 1747 while the number of vulnerable populations are 2405, 3475, 5997, 7252 and 8036 at consecutive return periods. The study reflects that Bhaktapur, Madhyapur Thimi and Suryabinayak municipalities are prone to Hanumante flood hazard. This study will be useful for policymakers on planning developmental activities on floodplain areas and further research to take necessary measures to reduce vulnerability to flood.

**Keywords:** Flood, Hazard mapping, Vulnerability, Hanumante River

## CLIM 004

### Simulation of extreme rainfall event in Nepal using Weather Research and Forecasting Model

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The reliable prediction model is helpful to minimize the impacts

associated with such extreme rainfall events. The Weather Research and Forecasting (WRF) model is one such that uses a three nested domain with the horizontal resolution of 27, 9, and 3 km, respectively. In the present study, numerical simulations of extreme rainfall events mainly central and eastern regions of Nepal during 11-12 July, 2019 are performed using the version 4.0.3. During the event maximum rainfall 436.1 mm/day was observed at Tulsi station, which caused damages to the lives and properties in central and eastern regions of Nepal through flood and landslides. Sensitivity of eight microphysics schemes was tested to find the optimal scheme for the study region for extreme rainfall events. The model results are compared with available surface observation, Integrated Multi-satellite Retrievals for Global Precipitation Measurement (IMERG) data, and with the INSAT-3D satellite images. By considering the better performing microphysics scheme as a reference, large scale characteristics and meso-scale dynamics were investigated. From the satellite images, there was a tremendous amount of cloud over central and eastern parts of Nepal and northern part of India. Almost all of the used microphysics schemes were generally able to capture the event; although the exact location and intensity varied from scheme to scheme. The Milbrandt scheme showed the better correlation, which was reliable with the observation, and suggested an association with northward movement of the monsoonal trough at lower level and southward expansion of the westerly trough at upper level.

**Keywords:** WRF, Extreme rainfall, Microphysics, Central and Eastern Nepal, Monsoon



## Enteric Methane Emission from Buffalo in Terai and Hilly Region of Nepal

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Buffalo rearing is commonly practiced by Nepali farmers. Researchers have found that livestock farming has contributed to 14.5% of global greenhouse gas emissions. This study had developed country-specific emission factors for buffalo and estimated the total amount of methane gas emitted by the buffalo population maintained by the farmers of the Terai and Hilly regions of Nepal. This study was carried out following IPCC guidelines in 2006. Based on the age group and gender, the population was divided into five main categories: a) Calf, b) Heifer, c) Steer bull, d) Mature female, e) Mature male. From each category thirty samples were acquired in both Terai and Hilly regions. The mature weight of calf, heifer, steer bull, mature female, and the mature male was found to be 44.62 kg, 239.46 kg, 149.79 kg, 440.53 kg, and 457.32 kg respectively in Chitwan district and Kavre it was found to be 58.19 kg, 199.18 kg, 165.94 kg, 421.87 kg, 425.63 kg respectively. The emission factor (kg CH<sub>4</sub>/animal/season) in the calf, heifer, steer bull, mature female, the mature male was 2.67, 9.32, 5.80, 26.83, 15.68 in Chitwan district while it was found to be 3.54, 4.50, 6.29, 25.89, 10.67 in Kavre district respectively. Enteric methane emission (kg CH<sub>4</sub>/season) in the calf, heifer, steer bull, mature female, and mature male at Chitwan district was found to be 0.0869, 0.1319, 0.0204, 0.2987, 0.0724 and Kavre it was found to be 0.0929, 0.0326, 0.0206, 0.3707, 0.0251 respectively. A higher amount of greenhouse

gas was produced in the Terai region due to a higher population and high grain feeding practice.

**Keywords:** Climate change, Buffalo, Greenhouse gas

**CLIM 006#**

## **An Assessment of Urban Flood Risk: A Case Study from Hanumante River Bhaktapur**

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In the past few decades, monsoon floods have wreaked havoc in the plains of Hanumante River in Bhaktapur, causing tremendous losses in terms of property and life. The river originates from Nagarkot hills and flows towards the west, connecting Suryabinayak, Madhyapur Thimi and Bhaktapur municipality. Its catchment area is 143 sq. km. The study tries to provide clarity in conceptualizing disaster risk by investigating the land use change of the district and hydrological aspects of the flowing river in the last few years and community based vulnerability assessment method, along with place based indicators. The findings of the study show that the major cause of flooding in the district is incessant rain and urbanization led inundation in the low plains. However encroachment of the river, dumping of solid wastes into the river, poor sewerage operation and lack of proper planning are the supplementary causes of flood. The flood affected people are aware of the flood of Hanumante but they still lack good knowledge about the floodplain and the encroachment of the waterway. The data shows that among the major affected municipalities in Bhaktapur district, Bhaktapur is a very high vulnerable zone whereas Suryabinayak and Madhyapur Thimi are high vulnerable areas. Urban

floods can be predicted and mitigated with appropriate information, tools and techniques by responsible authorities. A better knowledge and quantification of the risk and damages should make it possible to plan and manage flood plain areas to create flood resilient cities.

**Keywords:** Disaster, Urban, Flood, Vulnerable

CLIM 007#

## **Forest Carbon Stock Along Altitudinal Gradient At Shivapuri Nagarjun National Park (SNNP), Nepal**

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Forests are natural carbon (C) sink and storehouse of biomass as it plays a vital role in global and regional C cycle by sequestering more C from the atmosphere than any other terrestrial ecosystem. This global importance of forest emphasizes the necessity to accurately determine the amount of C stored in different forest ecosystems. In context of C sequestration, Shivapuri Nagarjun National Park which is situated 12 Km North from Kathmandu is one of the forests with higher potential. There are three major objectives of the study: to evaluate the C stock of different tree species of the forest, to assess the biomass C stock along an altitude gradient in the forest of SNNP, and to analyze the relationship between tree diversity and C stock in the forest. The study was carried out systematically using a quadrat method collecting 22 circular plots of area 250m<sup>2</sup> along the altitudinal gradient 1600-2700m at 50m intervals. The findings of the study revealed that the dominant species with large DBH and height sequestered the highest

C stock: *Quercus semecarpifolia*. There was a positive weak correlation between C stock and altitude as C stock increased along the altitudinal gradient but indicated an inverted bell shaped curved. Likewise, a negative weak correlation was observed between C stock and tree diversity as C stock was recorded low in highly diverse altitudinal belt i.e. mid-altitude. The result concludes that SNNP is a highly diverse forest with great C sequestration potential. Therefore, to enhance the C stock of the forest sustainably, it should be supported with the proper monitoring system.

**Keywords:** Tree carbon, Altitudinal variation, Tree diversity, Climate change, Biomass

**CLIM 008 #**

## **Soil Organic Carbon under Coffee Agroforestry System in Hilly Region of Western Nepal**

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Soil is given high priority by the government and various non-governmental organizations in Nepal for carbon balance through various climate adaptive agricultural practices. This study aim to measure the soil organic carbon (SOC) stocks in coffee-agroforestry (CA) (>20 years old) & traditional agricultural (TA) system (>50 years) in Kaski district, Nepal (with coordinates 28.38° N, 83.75° E @1240 m elevation). Soil samples were collected from CA & TA systems with four replicates each and under each replicate, four depths (0-15, 15-30, 30-60, 60-100 cm) were taken. Bulk density (BD) was sampled using a core method and SOC was measured by dry combustion method. Paired-T test was used in order to know the significance

in the BD. Results showed that BD was significantly lower in the CA system (0.98 g cm<sup>-3</sup>) compared to TA system (p<0.05). However, there was no significant difference found between depths in both land-use systems. The BD at 0-15 cm depth was 0.98 g cm<sup>-3</sup> (SD=0.12) and 1.05 g cm<sup>-3</sup> (SD=0.07) in CA and TA systems respectively. The percentage of SOC was comparatively higher in the CA system (4.8%) than in TA system (3.4%) at 0-15cm. The result showed that the SOC decreases with soil depth in both land use types. The physio-chemical parameters such as NPK, soil texture, & soil pH are under laboratory analysis. It is concluded from the results that percentage of SOC is higher in 0-15cm depth regardless of the land-use types, & that there is a negative correlation between BD& SOC.

**Keywords:** SOC, Bulk density, Agroforestry system

CLIM 009#

## **2015 Gorkha Earthquake and Its Impacts on Cultural Heritage Site: A Case Study of Bhaktapur Durbar Square, Bhaktapur**

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Flood, earthquake, winds, land and mudslides are among major causes of loss and damage in Nepal Which adversely impact on the natural and built environment. Disasters result in the loss of irreplaceable artistic and cultural assets and are costly. Cultural heritages are related to cultures which are passed on from one generation to next. They are at high risk of natural disaster since they encompass the archaeological and historical built environment. The main objective

of the study was to analyze the socio cultural and environmental effects of Gorkha earthquake 2015, in Bhaktapur durbar square area. Focus Group Discussion, Key Informant Interviews, questionnaire survey, and secondary data were used. Gorkha earthquake 2015 has highly affected the cultural (explicit and implicit cultural impacts) and traditional aspects of Bhaktapur Durbar Square. 16 cultural monuments were damaged by the quake as per the data provided by NRA. 124 handicraft industries, 242 small scale and cottage industries were damaged by earthquake; all these facts badly in tourism industry of durbar square area, number of tourists decreased rapidly from 244144 to 95056 after the quake in year 2072/73, though it was improved gradually in fiscal year 2073/74. Number of tourists visited the square area were 181350, and the number of tourist visits was improved in following fiscal years, 227614, 226370 respectively. It had damaged the source of water and also affected waste management. .On the positive side, the disaster also opened doors to new opportunities for new construction and innovation.

**Keywords:** Gorkha earthquake, Cultural heritage, Bhaktapur Durbar Square, Impacts

**CLIM 010<sup>#</sup>**

## **An Assessment of Future Urban River Flood Risk in Karmanasha River, Lalitpur**

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Flood is one of the most frequent and destructive types of natural disasters. In urban areas, perhaps the lower land prices have attracted people to build housing in the river banks. The population is growing

on the river banks, which is further escalated by encroachments mainly done by the squatters, who also become most vulnerable to the flooding. This study has assessed the possibility of flood risk in the Karmanasha River. Local people are used to facing flooding that generally lasts for 2-3 days and return to their normal lives once after the flood stops. A total of randomly selected 45 households within 25m distances from the river were surveyed using structured questionnaires in Harisiddhi, Hattiban and Gwarko. Community based vulnerability assessment methods along with place based indicators were used to determine vulnerability which identified Hattiban and Harisiddhi as very high vulnerable areas and Gwarkho as high vulnerable areas. However, people had little knowledge on flood adaptation strategies and there is no access to information for them. There is tremendous pressure exerted on the river by narrowing of river course for urban development in Hattiban and Harisiddhi area. Such narrowing in the upper part of the river also contributes to severe flooding in downstream areas. None of the flood victims have got compensation during the flood disaster. Importantly, establishing an early warning system that alerts people when the river exceeds its threshold level and proper channelization of the river in natural flow would minimize the damage in the area.

**Keywords:** Urban flood, Assessment, Risk, River encroachment

# TECHNICAL PRESENTATIONS

## Agriculture and Livestock

# represents the poster presentation



## Resource Use Efficiency of Orthodox Tea in Ilam District of Nepal

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Despite the high rate of the orthodox tea, the net margin is still below the satisfactory level. Thus the present research was conducted to estimate the cost and production efficiency of orthodox tea in Ilam district of Nepal. A total of 160 samples were collected, 80 each from organic and conventional tea growing areas of Deumai Rural Municipality, Ilam Municipality and two wards of Suryodaya Municipality. Similarly, 4 tea processing factories and 5 local traders were selected purposely. The polynomial average cost function was used to estimate economies of scale. The B:C ratio of conventional orthodox tea farming (2.76) was significantly higher than organic orthodox tea production (2.07). With 1 percent increase in fertilizer and manure cost would significantly decrease ( $p < 0.05$ ) the revenue from orthodox tea by 0.07 percent keeping other factor constant. Similarly, organic orthodox tea over conventional orthodox tea farming, the revenue will significantly decrease ( $p < 0.01$ ) by 47 percent, other factors remaining constant. It was estimated that the economies of scale for orthodox tea production was 29 metric ton. The total factor productivity was 0.468 and in organic orthodox tea cultivation area the partial factor productivity for labor and manure was 0.598 and 0.109 respectively. The result indicated that with respect to fertilizer

and labor it was found that increase in fertilizer and manure cost would decrease the revenue from orthodox tea.

**Keywords:** Orthodox tea, Production efficiency, Economies of scale, Nepalese tea

## AGRI 002

### **Effect of Different Seed Rates and Sowing Methods on Yield of Sunflower (*Helianthus annuus* L.) in Kailali, Nepal**

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Inappropriate seed rate and sowing methods contribute a significant role in low productivity of sunflowers. So, a study was conducted to assess the effect of different seed rates and sowing methods on the yield of sunflower in Ghodaghodi Municipality ward no. 2, Sandepani, far-west province, Kailali, Nepal, during spring season in 2018. The three different seed rates (8 kg/ha, 10 kg/ha and 12 kg/ha) combined with three different sowing methods (broadcasting, line sowing and ridge sowing). A randomized complete block design in a 3×3 factorial arrangement with three replicates per treatment was applied. The indigenous variety of sunflower was used as a test crop. The highest stem diameter was recorded with the lowest seed rate, which remained unaffected by different sowing methods. Head diameter, seeds per head and thousand-grain weight were maximum in plants receiving seed rate of 8 kg/ha. However, the highest (2.13 t/ha) and the lowest (1.76 t/ha) grain yield were achieved with the

seed rates of 10 kg/ha and 12 kg/ha, respectively. Regarding sowing methods, head diameter, seeds per head, thousand-grain weight and grain yield (2.68 t/ha) obtained in the ridge method were statistically superior over those obtained in line and broadcasting methods. The interaction effect of seed rate and sowing method on seeds per head suggested that maximum seeds per head were obtained with 8 kg/ha seed sown in the ridge. Our study recommended 8 kg/ha seed rate and ridge sowing of sunflower performed best in grain yield.

**Keywords:** Seed rate, Sowing method, Sunflower, Yield

### AGRI 003

## **Nutrient Management Practices for Rice Based Systems under Different Crop Establishment Methods in Central Inner Terai, Nepal**

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A field experiment was conducted to assess the effect of innovative nutrient management for conservation and conventional agriculture on the production and profitability of predominant rice-wheat and emerging rice-maize cropping systems in AFU, Rampur, Chitwan during 2018- 2019. The experiment was executed in the field in split-split design (rice), and split plot design (wheat and maize) with three replications which included two cropping system (rice-wheat and rice-maize) as main plot treatments, two crop establishment methods (CEM) (conservation agriculture and conventional agriculture) as sub plots and four nutrient management practices (NMP)(100%

recommended dose of fertilizer (RDF), Residue (5t/ha) + 75% RDF, Nutrient Expert (NE) dose, brown/green manuring (BM/GM) + 75% RDF) as sub-sub plot treatments. The RDF for rice, wheat and maize used was 150:45:45; 80:60:40; 180:90:60 kg N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O per ha respectively and varieties US-312, Bijay and Rampur hybrid-6 were used for respective crops. Rice-maize (RM) system had significantly higher rice equivalent yield (REY) (41.81%), net returns (139.54%) over rice-wheat (RW) system but system REY was not influenced by CEM and NMP. The rice grain yield was found higher for conventional tillage; maize yielded higher grains under CA but wheat yield was not affected by CEM. NE dose performed better for all crops; NE dose and Green manuring produced higher yields under conventional tillage for rice; residue +75% RDF performed better than 100% RDF for maize and wheat. The RM system was more productive and profitable than the RW system and under both CEM, better yield can be obtained using NE dose, green manuring and residues in the fields with the saving of 25% RDF applied for each crop.

**Keywords:** Cropping system, Nutrient expert, Residue, CA

## AGRI 004

### Effect of Land Use Systems on Soil Properties in Kanchanpur District of Nepal

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The land use systems in agriculture land of Kanchanpur District includes rice-wheat-fallow, rice-wheat-rice, rice/lentil-fallow, rice-vegetable-vegetable, native grasslands and agroforestry. The study area is facing

the problems of deforestation, overgrazing, poor soil management and severe erosion. The study was undertaken to evaluate the effect of land use systems on selected physical and chemical properties. Different land use systems of Bhimdatta Municipality, Krishnapur Municipality and Shuklaphanta Municipality of Kanchanpur District were the sample sites. From each sample site, composite soil samples were collected from six treatments in five replications at 0-15cm and 15-30cm depth and selected samples were analyzed for different physical and chemical properties in soil and fertilizer testing laboratory at Sundarpur, Kanchanpur. The data obtained were analyzed using R-studio. Soil properties were significantly affected by land use systems. Soil carbon content and total nitrogen were significantly higher in native grasslands system (27.54 t/ha and 2.38 t/ha) and lowest in the rice-wheat-fallow system (15.93 t/ha and 1.37 t/ha). However, available phosphorus content was significantly higher in rice-vegetable-vegetable system (123.81 kg/ha) and lowest in native grassland system (14.26 kg/ha). The potassium content (218.68 kg/ha) was found to be higher in native grassland system and lower (70.78 kg/ha) in the rice/lentil-fallow land use system. Bulk density was also statistically different as (1.29 g/cm<sub>3</sub> in rice-wheat-rice and 1.22 g/cm<sub>3</sub> in native grasslands). Since land use systems and management practices significantly affect soil physical and chemical properties, an appropriate and sustainable land use management option including conservation tillage is necessary for fertile and healthy soil.

**Keywords:** Land use system, Physical properties, Conservational tillage, Grassland

## Avifaunal Inventory and Diversity in Kachankawal Rural Municipality, Nepal

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Nepal lies between the indomalayan and palearctic realms with landscape heterogeneity reflecting rich biodiversity and harbour about 10 % of the world's bird species i.e. 886 species of birds. Among them, 42 species are globally threatened, 35 are globally near threatened and eight species are thought to be regionally extinct. The present study was conducted in the Kachankawal rural municipality, Jhapa, which includes the lowest place of Nepal named Kachankawal lying 58 m above the mean sea level. This area is poorly explored and the avifaunal diversity is not known yet. Thus, the present study was conducted to prepare the checklist of bird's species during the winter season. Avifaunal survey was conducted using point count method. Three potential sites, Baglamari (26.436944N, 88.006388E), Gherabari (26.421111N, 87.938888E), and Kechana (26.384166N, 87.999722E) were selected for the bird survey. Altogether, ten points were selected in the transect of 1 km and birds were recorded during 8 AM to 11 AM within the radius of 50 m from each point. Canon (PowerShot SX400 IS) camera was used for clicking the photos, Bushnell 10 x 42 binocular and Birds of Nepal (2016) was used for the identification of birds. The study was conducted for three days from 26th to 28th January, 2019. Total 186 individual birds belonging to 46 species and 31 families were recorded. Among them, one species was Globally Threatened Vulnerable species (*Leptoptilos javanicus*), two Nationally Threatened Vulnerable species (*Leptoptilos javanicus*, *Anastomus oscitans*) and

two species (*Elanus caeruleus*, *Athene brama*) listed in CITES Appendix II. Among 31 families, the species richness of Corvidae and Columbidae (4 species) was found to be higher followed by Alcedinidae (3 species). The diversity and relative abundance were found higher for *Mesophoyx intermedia* (Intermediate Egret) of Family Ardeidae with value 0.20 and 8.06 respectively followed by *Turdoides striatus* (Jungle Babbler) with diversity 0.17 and 5.91 relative abundance. The total diversity of birds in the study area was found to be 3.54. Hunting birds using catapult, fishing by poisoning the rivers, human disturbance, pesticides, cutting down old trees etc were found to be threats for the avifauna in the area. Conducting awareness programs and enforcing strict law against the bird hunters would help the conservation of avifauna.

**Keywords:** Diversity, Vulnerable, CITES, Abundance, Threats

**AGRI 006<sup>#</sup>**

## **Production Economics and Determinants of Potato Production in Nuwakot, Nepal**

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Study was conducted for comparative analysis of demographic, production economics and determinants of potato production between Kakani Rural Municipality and Bidur Municipality of Nuwakot District. Altogether 120 potato producers, 56 from Kakani and 64 from Bidur were randomly selected. Pre-tested semi-structured questionnaire was administered to randomly selected farmers. Potato growers were interviewed using face to face interview methods in the month of October, 2018. All the data was entered into SPSS

and Microsoft excel and analysis was done by using Microsoft excel, Stata and SPSS. Average productivity of potato in the research area was 14.69 ton per ha. Average cost of production and profit was Rs. 8614.61 per ropani and Rs 6083 per ropani, respectively. Benefit-cost ratio of potato production was 1.71 in the study area. It was found that an increase in organic manure (FYM and poultry manure), pesticide and tuber by 10% can result in an increase in income by 1.88%, 1.99% and 0.05%, respectively. Similarly, 10% increase in labor and chemical fertilizer resulted in 0.1% and 0.5% decrease in output. Labor and chemical fertilizer were over utilized resources on potato production. The probability of cultivation of potato in large scale was found to be 56.92% higher for those with access to extensive service and 47.89% higher for those who have received training. Most of the farmers did not use improved seed. Thus, distributing improved seed, providing training and extension services help to increase profit of potato production in Nuwakot district. Doubling the use of all factors of production would result in 32.39% increase in potato production.

**Keywords:** Benefit-cost ratio, Cobb-Douglas model, Determinants

**AGRI 007#**

## **Factors Affecting Adoption of Farm Machineries in Maize Zone Rolpa, Nepal**

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Mechanization has been one of the major interventions introduced



in agriculture to commercialize it and increase crop production. However, there are various constraints of mechanization. Numerous socio-economic factors contribute to the adoption decision of farm machineries. Therefore, survey research was carried out in March-April 2019 in the Western hills of Nepal to find out the determinants of adoption of farm machineries. Rolpa municipality, Sunilsmriti rural municipality, and Triveni rural municipality were purposely selected for study as these were major production areas of maize. Thereafter, a total of 120 samples, 60 from Rolpa municipality and 60 from other two rural municipalities were selected using cluster random sampling method. Primary data were collected by face to face interviews using semi-structured questionnaires, focus group discussion, and key informant interviews. Both descriptive and analytical statistics were used to analyze the data. In the survey, 46.6 percent of the respondents were female whereas 53.3 percent of the respondents were male. It was found that the status of mechanization was poor and limited to three cultural operations namely tillage, sowing, and threshing. Only in the case of tillage, farm machineries were adopted by more than 50% of the respondent farmers. A binary logit regression model was used to find out the determinants of adoption of farm machineries which showed that government subsidy and involvement in co-operatives were significant at 1% level of significance with an odds ratio of 16.5 and 32.12 respectively whereas household years of schooling was significant at 5% level of significance with an odds ratio of 1.23.

**Keywords:** Farm machineries, Adoption, Mechanization, Maize production, Rolpa

## Review on Major Viral Diseases of Crop Plants in Nepal

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Viral diseases are the important diseases next to the fungal and bacterial diseases in Nepal. The increase in incidence and severity of viral diseases and emergence of new viral diseases cause significant yield loss of different crops in Nepal. In order to know about the major viral diseases reported in Nepal, various literature and publications were reviewed for the period of one week. Most of the studies were focused on viral diseases of rice (Rice tungro virus and Rice dwarf virus), tomato (Tomato leaf curl virus) and potato (Potato virus X and Potato virus Y). Maize leaf fleck and mosaic caused by Maize mosaic virus were recorded as minor diseases of maize. Citrus tristeza virus is one of the important viral diseases of citrus fruit in Nepal. In beans, Bean common mosaic virus and Mungbean yellow mosaic virus has been found to be most prevalent while Tomato mosaic virus and Tomato leaf curl virus are common in tomato crop. Other major viral diseases are Yellow vein mosaic virus in okra, Papaya ringspot virus in Papaya, Cucumber mosaic virus in cucumber and Large Cardamom chirke virus and Cardamom bushy dwarf virus in large cardamom. Tissue culture techniques have been used to produce pre-basic seed (PBS) of potato at Nepal Agriculture Research Council, Khumaltar against six viral diseases of potato. More studies are needed regarding identification of plant viruses, diagnosis of the plant viral diseases, modes of transmission and viral diseases management.

**Keywords:** Plant, Viruses, Losses, Transmission, Nepal

## Technical Efficiency of Cauliflower Production in Suburb of Kathmandu Valley, Nepal: Stochastic Frontier Approach

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Cauliflower is one of the major sources of income among vegetable growing farmers of the suburb of Kathmandu Valley, Nepal. Income from cauliflower farming can be increased by increasing the level of technical efficiency. Therefore, a study was undertaken to determine the level of technical efficiency of cauliflower production in suburbs of Kathmandu Valley, Nepal. Multistage sampling was conducted in two suburb districts namely, Dhading and Kavre during the month of January 2019. Pretested semi-structured questionnaire was administered among 119 vegetable growing farmers, 59 from Dhading and 60 from Kavre. Face to face interviews were used to obtain data. Stochastic frontier production function was used to determine technical efficiency among cauliflower growers. Tobit regression was launched to determine the determinants of technical efficiency. The empirical evidence revealed that pesticide, labor and seedling were contributing towards higher production whereas tractor and fertilizers were negatively related with production. Tobit regression model showed that technical efficiency was positively related with the schooling of household head, membership of farmers' group, training received and membership of cooperatives. The average technical efficiency was 64.36% indicating there was great scope to increase production of cauliflower with available resources and technology.

Overall, our study points out that adopting high yielding varieties, following better crop protection measures, efficient utilization of labor and seedling, and providing training and promoting farmers groups are crucial for efficient cauliflower production.

**Keywords:** Multistage sampling, Technical efficiency, Production function

**AGRI 010<sup>#</sup>**

## **Socioeconomic Condition of Non-commercial Goat farmers of Rupandehi and Palpa Districts, Lumbini, Nepal**

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Nepal is a promising economic player of the Himalayan range countries. Mixed farming practices are prevalent and livestock contributes significant share in GDP. Caprine husbandry is a popular practice with huge socio-economic impact. Rupandehi and Palpa districts of Nepal are regarded as pocket areas for goat farming in Province no. 5 (Lumbini), Nepal. Previous studies on socio-economic conditions of con-commercial goat farmers in Rupandehi and Palpa districts are quite limited and are not successful to represent the actual scenario of farmers. This study aims at detailed study of socio-economic parameters of these districts and provides key insight to

plan better strategies to alleviate the miserable condition of non-commercial goat farmers. To study the socio-economic condition of non-commercial goat farmers, pocket areas of goat farming were selected; Tinahu Rural-Municipality (Palpa) & Devdaha Municipality (Rupandehi). Purposive sampling technique was followed and a total of 114 goat farmers were interviewed, 57 farmers from each district. The analysis of data indicated that household ownership was more in female farmers (53.04%) to male farmers (44.35%). The age range was 40-49 years (37.39%), 20-29 years (6.09%). indicating the gravity of youth's outmigration. Cooperatives are quite popular in Nepal and this finding supports the fact that 71.3% of total study population were involved in cooperatives Government support to enhance productivity through subsidized inputs and even in this study 75.65% respondents reported that they had received governmental support. The herd size associated with maximum population was found to be of 1-5 and 6-10 goats per household with 23.8% each and 21-25 is associated with lowest percentage (13.4%). Besides goat farming, 26.09% of respondents (with family members) were involved in labor works, 22.61% in business, 12.2% in government jobs, 26.6% in foreign employment. The 48.7% respondents believed that financial limitation was the major constraint for goat production. Study suggests that the condition of farmers in mid hills and Terai was marginal thus to mitigate this, measures like, provision of government funds through cooperatives, workshops on proper goat management and alternative income generating source should be taken.

**Keywords:** Goat farming, Socioeconomic condition

## Migration and Agriculture Production: Analysis of Farming Communities in Lamjung District, Nepal

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Migration can have a positive effect on young people by opening up new opportunities, a route to higher education, a better and stable career, and thereby addressing a crucial issue of unemployment but on the other hand, it can reduce farm labor, and consequently reduce agricultural production. A total of 123 households from Madhya Nepal Municipality of Lamjung District were selected to study socio-economic trend of the remittance-receiving households and the effect of international labor migration in agricultural activities management. Purposive snowball sampling technique and semi-structured questionnaires were used to collect the primary information. The study showed that majority of household heads were male (61%) and they were primarily involved in agriculture occupation. Remittance was the major source of income for 100% of the households followed by agriculture (84.17%). The main destination of migrant was gulf country, i.e., 81% followed by India (16%) and 3% were in developed countries such as the UK and the USA. Major affected areas by migration was found to be agriculture labor shortage (32%). Correlation showed that there is negative and significant relation between migration and labor used (-0.216\*) and change in cropping pattern (-0.275\*\*). It implies that migration leads to labor shortage which leads to change in cropping pattern.

**Keywords:** Agriculture, Remittance, Youth migration, Labor, Livelihood

## Assessment of Soil Quality of Agricultural Land in Ansinhola Watershed

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Soil quality assessment is a valuable tool for evaluating the sustainability of soil and crop management practices. This study is one of the first attempts in linking the physio-chemical analysis of soil with social understanding and visual analysis. The study was conducted to determine and compare the soil quality of intensive and less intensive agricultural land in Ansinhola watershed of central mid hills of Nepal. Data were obtained by means of semi-structured interviews, laboratory analysis and field observations. This paper attempts to describe the farmer's perception about soil quality, amount of chemical and organic fertilizer applied, the indicators they used to assess the soil quality in their fields and physio-chemical parameters of soil under intensive and less intensive agricultural land. Intensive agricultural land had higher bulk density ( $1\pm 0.11$  mg/cm<sup>3</sup>), SOM ( $4.42\pm 1.13$ ), SOC ( $1.94\pm 0.50$ ), MC ( $20.91\pm 10.20$ ), pH ( $5.36\pm 0.53$ ), nitrate ( $0.04\pm 0.02$ ), available phosphorus ( $10.77\pm 3.29$ ), ammonium ( $8.29\pm 6.63$ ) and exchangeable potassium ( $15.95\pm 13.63$ ) compared to less intensive agricultural land. The overall pH values of both the sites were highly acidic. Use of DAP was found higher than the urea and potash in both intensive and less intensive agricultural land.

**Keywords:** Soil quality, Intensive and less intensive agricultural land, Physio-chemical parameters, Urea, DAP

## **Human Right Situation Of Nepali Migrant Worker in Malaysia: A Case Study of Semenyih Immigration Detention Camp**

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Malaysia has been one of the major labour destinations of the Nepali migrant workers. It is obvious that Nepali migrants have returned with positive and negative experiences from the foreign employment. Among many, immigration detention is the one that has an extensive effect but has not been discussed adequately. The research attempts to assess the human rights situation of Nepalese migrant workers detained at Semenyih Immigration Detention Camp in Malaysia. The random sampling method was adopted to select the persons interviewed. Both open-ended and closed-ended questions were asked with the 18 returned detainees from Malaysia along with the key informant interviews. The data collected was then tabulated for the qualitative and quantitative analysis. The study found the situation of the detainee migrant workers at detention center was inadequate and the human rights was found to be often compromised including inadequate supplies of food, water, accommodation, sanitation, communication, along with physical and mental torture, access to justice. The main cause of the detention was identified as to be the absconding of the migrant workers for not getting the proper salary and work as promised in Nepal. The establishment of a mechanism to verify the contracts to avoid deception, creating a mutual fund to support the detainee migrant workers, effective implementation of the law and policy that exist, adhere to the human rights principles in operating the immigration detention.



## Field Response of Wheat Genotypes to Spot Blotch under Different Sowing Dates at Rampur, Chitwan, Nepal

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Wheat spot blotch caused by *Bipolaris sorokiniana* (Sacc.) is one of the major diseases in wheat. A field experiment was conducted at premises of Agriculture and Forestry University, Rampur to elucidate the field response of twenty wheat genotypes under different sowing conditions (early: 25th November, normal: 10th December and late: 25th December) to spot blotch in split plot design with three replicates during 2017-2018. The analysis of variance revealed highly significant interaction ( $p < 0.01$ ) between the sowing dates and genotypes for the disease progress. Higher yield penalties due to significantly higher disease severity under late-sown wheat cropping were observed due to warmer conditions later in the season. Genotypes viz., NL 1207 (168.5 and 416.77) and BL 4341 (185.97 and 428.8) outrivalled other test genotypes with substantially lower mean area under disease progress curve (AUDPC) values based on flag leaf and penultimate leaf infection and higher yield (3.23 and 3.02 t/ha), respectively. Thus, these could be effectively utilized as robust progenitors in spot blotch resistance breeding programs. Our findings revealed that the simultaneous adoption of early sowing and resistant wheat genotypes could be a promising and economic avenue to reduce the disease

pressure leading reduced yield penalties.

**Keywords:** Spot blotch, AUDPC, Resistance, Sowing conditions

**AGRI 015<sup>#</sup>**

## **Characterization of Nepalese Aromatic and Short Grain Rice Collection Using Agro-morphological Traits**

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Nepal is endowed with a diversity of aromatic and short grain rice landraces, however, detailed characterization of these landraces is lacking. A field experiment was conducted in Agronomy farm of Agriculture and Forestry University, Rampur, Chitwan from June to December (2018) to characterize Nepalese aromatic and short grain rice collection using agro-morphological traits. The experiment was carried out in alpha lattice design with three replications. Fifty genotypes including two released varieties Sugandhit-1 and Sunaulo Sugandha, as checked were studied. The twenty nine qualitative and twelve quantitative traits showed marked variation, except for presence of auricles, ligule and shape of ligule. The sensory test of grain aroma using 1.7% KOH revealed Jhinuwa as highly aromatic with aroma score 2.5. The Shannon-weaver index ( $H'$ ) ranged from 0 to 0.95 with a mean value of 0.51 for qualitative traits and 0.67 to 0.89 with mean value of 0.81 for quantitative traits inferring phenotypic diversity in the collection for both traits. The grain yield of three landraces, i.e, Budhidayen-3 (3637.107kg/ha), Kariya Kheraha (3599.540kg/ha) and Kariya Parewapwakh (3349kg/ha) were superior above to Sugandhit-1

(3305.273kg/ha) whereas fifteen landraces were superior to Sunaulo Sugandha (2421.743kg/ha). The findings reported in the present study can be useful for rice breeding programs in Nepal.

**Keywords:** Characterization, Aromatic, Short grain, Rice, Agro-morphological traits

**TECHNICAL  
PRESENTATIONS**  
**Water and Wetlands**

# represents the poster presentation

## Seasonal Variation of Major Ions in Ghodaghodi Lake, a Ramsar site in Western Nepal

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Wetlands are the most diverse ecosystems in the world that provide unique ecological functions and economic values. Ghodaghodi Lake complex is the biggest interconnected natural lake system in the western terai of Nepal which was designated as Ramsar Site in August 2003. A seasonal comparative study of physico- chemical parameters of lake Ghodaghodi was carried out in January 2019 (Winter season) and May 2019 (Pre-monsoon season), with special focus on major ions ( $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{NH}_4^+$ ,  $\text{HCO}_3^-$ ,  $\text{SO}_4^{2-}$ ,  $\text{NO}_3^-$ ,  $\text{NO}_2^-$ ,  $\text{Cl}^-$ ,  $\text{F}^-$ ). The analysis was carried out by ion chromatography, titration, and direct measurement using probes. The result showed that values of the most of the parameters evaluated onsite like temperature, pH, EC, TDS are higher in the pre-monsoon season than in winter whereas DO exhibited the opposite trend. Similarly, calcium and bicarbonate are the most dominating ions in both the seasons which can be explained by the influence of carbonate weathering. Calcium, sodium, magnesium,

Potassium, chloride, nitrate, nitrite, fluoride show relatively high concentration in the pre-monsoon season while ammonium is decreased in pre-monsoon season as compared to winter season. The increased concentrations of ions in pre-monsoon have been expected for a number of reasons such as evaporative enrichment and long range transport through dry deposition.

**Keywords:** Wetland, Ions, Long range transport, Ghodaghodi Lake, Ramsar site

## WATE 002

### Ecological Assessment of Bagmati River System

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Bagmati River, although being the holy river and the main source of water for domestic, irrigation and industrial uses for Kathmandu people, it is under pressure due to population growth, haphazard urbanization, human activities and various other stressing factors. The study was conducted in 14 sites in pre-monsoon season from Shivapuri dam to Pharping. The ecological river water quality class was determined calculating GRSbios ASPT and was verified using field screening protocol. Water quality map was prepared based on the river water quality class. A total of 28 families of macroinvertebrates were recorded in the study. High diversity of macroinvertebrates were recorded in upstream section having river water quality class I. As the river flow downstream in the semi-urban and urban areas, the diversity of macroinvertebrates decreases, with some sites with no macroinvertebrates resulting in river water quality class V. Two sites were categorized as river water quality class I, whereas nine sites

were categorized as class V. In addition, a total of 12 physico-chemical parameters were measured to support the ecologically determined water quality classes. Sites with water quality class V were found to have low dissolved oxygen with high intensity of stressors while some sites with zero dissolved oxygen. Canonical Correspondence analysis was carried out to determine the relation between macroinvertebrate assemblages and physico-chemical parameters that showed dissolved oxygen, chloride and temperature as significant environmental variables influencing macroinvertebrate assemblages in the river. Various sources of stressors responsible for the degradation of river water quality were also identified.

**Keywords:** Macroinvertebrates, Water quality map, Restoration, Screening protocol, Conceptual framework

## WATE 003

### **Determining the Relationship Between Benthic Macroinvertebrate Community Composition and Water Level Fluctuation in Wetlands, Nepal**

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Water level fluctuations influence the macroinvertebrate community; affect structure and function of aquatic ecosystems. However, there

is a lack of better understanding on how the water level fluctuations affect structure and composition of benthic macroinvertebrates in tropical shallow wetlands, Nepal. Here, we aimed to assess the changes in benthic macroinvertebrates community descriptors and identify indicator taxa in response to water level fluctuations. The study was conducted in 4 wetlands of KoshiTappu Wildlife Reserve covering one annual cycle of water level fluctuations. Altogether 64 littoral benthic macroinvertebrates samples, 27 environmental variables and weekly water level data were collected. The study revealed that macroinvertebrate composition was significantly different across water levels and families Atyidae, Dytiscidae, Baetidae, Planorbidae, Chironomidae, Bithyniidae, Sphaeriidae, and Thiaridae were attributed for this dissimilarity. Medium water level supports macroinvertebrates diversity and water level amplitude as intermediate disturbance shaping macroinvertebrate diversity. Two families of Coleoptera: Hydrophilidae, Dytiscidae, one of Heteroptera: Pleidae, one of Diptera: Muscida, three of Mollusca: Sphaeriidae, Viviparidae, Thiaridae, as indicators of low water level. Coleoptera: Scirtidae, Heteroptera: Micronectidae, Oligochaeta: Tubificidae of medium water level and Trichoptera: Polycentropodidae, Ephemeroptera: Caenidae of high water level. Water level is identified as an influencing factor in macroinvertebrates community variation. Hence, macroinvertebrates significantly responded to water level fluctuations therefore they can be used as ecological indicators in researches developing environmental flow frameworks.

**Keywords:** Regression analysis, Koshi Tappu Wildlife Reserve, Water level, Indicator taxa analysis



## Macrophytes and Water Level Fluctuation in Wetlands of Koshi Tappu Wildlife Reserve

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Macrophytes are the primary producer of the aquatic ecosystem and are sensitive towards the fluctuating water level. This research examined the changing macrophytes assemblage in relation to water level as well as environmental variables for an annual cycle of flood in four floodplain wetlands of KoshiTappu Wildlife Reserve. A total of 64 macrophytes samples, water and sediments (16 samples in each season) were collected from littoral zone by stratified random sampling method during summer and autumn of 2018 and winter and spring of 2019. Water level was recorded once a week for a year and categorized as high, medium, low and low for summer, autumn, winter and spring respectively using ANOVA test ( $F=36.63$ ,  $df=3$ ,  $p<0.01$ ). The 53 macrophytes belonging to 26 families were observed. Out of them, 15 were emergent, six were submerged, five were floating and 27 were amphibian plants. The regression analysis indicated the decreasing trend of macrophytes diversity ( $r^2=0.47$ ,  $p<0.05$ ), richness ( $r^2=0.3$ ,  $p<0.05$ ) and evenness ( $r^2=0.4$ ,  $p<0.05$ ) but, increasing trend of macrophytes biomass ( $r^2=0.40$ ,  $p<0.05$ ) in relation to increasing water level. The Importance Value Index represented the changing dynamics of macrophytes composition. The higher water level was found to support the floating macrophytes and medium level supported

the submerged macrophytes. Here, low water level facilitated the reestablishment of emergent and amphibian macrophytes. In a Canonical Correspondence Analysis, environmental variables accounted for only 43.50 % of variation in the first two axes where, DO, pH, water depth, nitrate and phosphate were the influencing factors in the distribution and composition of macrophytes. The outcomes of the study may help in sound management and conservation of wetlands.

**Keywords:** Canonical Correspondence Analysis, Eco-hydrology, Littoral zone, Regression analysis, Season

WATE 005<sup>#</sup>

## **Bioclimatic Variables Structuring the Macroinvertebrates Assemblages in the Himalayan River Systems**

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Bioclimatic variables play an important role in shaping the distribution of aquatic macroinvertebrates, their interactions and their adaptations. The influence of such bioclimatic variables on ecosystems is still poorly understood and is true for freshwater ecosystems, especially in Nepal Himalaya. This research investigates the influence of bioclimatic variables on the distribution of macroinvertebrates taxa in Manang and Ghunsa river valley, headwaters of Kaligandaki and Koshi River Basins,

respectively. Benthic macroinvertebrates were sampled following the multi-habitat sampling approach in which 10 sub-samples were collected within 100 meter river reach and a single composite sample was made for each site. The samples were collected using a kick net of size 25 cm × 25 cm with 500 µm mesh size. Macroinvertebrates were processed and identified at the lowest taxonomic resolution. Bioclimatic data of both the valleys were extracted from the worldclim database. The findings resulted in high abundance and taxa richness of Ephemeroptera, Plecoptera and Trichoptera (EPT) and Diptera in both the river valleys where Trichoptera had high number of BMI family of 12 in Manang and Diptera with 11 BMI family in Ghunsa. Hydrologic regime variables like annual precipitation (Bioclim 12), precipitation of the coldest and wettest quarter (Bioclim 11, Bioclim 13) influenced the taxa richness in Manang river valley and thermal regimes variables for example temperature seasonality (Bioclim 4) and temperature annual range (Bioclim 7) in Ghunsa river valley. Overall taxa richness was observed to be influenced both by energy availability and productivity. This study could open doors for more detail and in-depth study or provide as a baseline data in larger spatial scales.

**Keywords:** Community assemblage, Environmental variables, Geo-diversity, Longitudinal gradient

## Macroinvertebrates Assemblages in Glacial-fed (Bheri) and Rain-fed (Babai) Rivers of Western Nepal in the Wake of Inter Basin Water Transfer

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Inter basin water transfer is the transfer of water from basin which has copious amounts of water (donor basin) to water deficient basin (receptor basin) generally done for a variety of purposes such as hydropower generation, irrigation etc. Such kinds of infrastructure have both significant beneficial as well as adverse environmental and socio-economic impacts. This study attempts to assess macroinvertebrates diversity in glacial-fed (Bheri) and rain-fed (Babai) rivers of west Nepal, where interbasin water transfer process is on progress. Qualitative samples of macroinvertebrates were collected from different microhabitats from eight selected stretches of these rivers and their tributaries during post-monsoon (October 2018) and pre-monsoon (May 2019). The macroinvertebrates were sorted and identified up to family level by using standard protocols. Selected physico-chemical parameters such as pH, temp, DO, TDS and turbidity were recorded on-site and water samples were collected for major ions which were analyzed following standard methods. One way ANOVA revealed significant variation ( $p < 0.05$ ) in DO, conductivity and TDS between the glacial-fed and rain-fed systems; whereas only DO showed significant variation ( $p < 0.05$ ) with respect to season. A total of 5584 individuals belonging to 58 Families and 10 Orders of macro-invertebrates were recorded in both seasons. Chi-square test revealed a significant variation in the

macroinvertebrate assemblages between glacial-fed Bheri and rain-fed Babai river systems during post monsoon ( $\chi^2$  df=32,  $p<0.001$ ) as well as pre-monsoon period ( $\chi^2$  df=50,  $p<0.001$ ). The outputs of this study would be a baseline on macroinvertebrates assemblages of the Bheri and the Babai rivers and its selected tributaries.

**Keywords:** Receptor basin, Microhabitats, Monsoon

WATE 007<sup>#</sup>

## Ecological Assessment of Seti River Basin within Pokhara Metropolitan City, Nepal

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Seti River has been an indispensable part of lives in Pokhara Metropolitan City (PMC) as it provides unlimited ecosystem services from drinking water, irrigation, hydropower, cultural and religious values, to flourishing biodiversity. However, rapid population growth at an annual rate of 3.84 percent from 2001-2011, and haphazard urbanization has degraded the Seti River basin. For its restoration, an assessment of the river water quality and identification of the stressors is imperative. Thus, the aim of this research is to assess the present ecological status, determine the decadal changes (2008-2019) and document the stressing factors that deteriorate the river basin. The study uses both physico-chemical parameters and benthic macroinvertebrates (BMIs) as bio-indicator for its

assessment. Physico-chemical parameters were measured using standard methods while benthic macroinvertebrates were sampled following a multi-habitat sampling protocol. River water quality classes (RWQC) were determined using GRSBIOS. In total, benthic macroinvertebrate belonging to 37 families and 12 orders were recorded in the river basin. The species richness and Shannon diversity index were found to be highest in Class II river sections, followed by Class I, whereas it was found least in Class V river sections. The Seti River was found to have maintained a good water quality in the entire river section within Pokhara Metropolitan City. However, various tributaries including Gharmi, Fusre, Kahun, and Bijaypur streams were degraded within the decade time period.

**Keywords:** Pokhara valley, River health, Benthic macroinvertebrates, Bio-indicator

WATE 008<sup>#</sup>

## Preliminary Trophic Status Assessment of Two Ramsar Sites (Lake Rara and Lake Ghodaghodi) of Western Nepal

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Wetlands are one of the most productive and dynamic ecosystems on Earth providing crucial ecosystem services. However, these ecosystems are being continuously undergoing degradation due to increasing anthropogenic activities thereby making wetland assessment crucial for their sustainable conservation. Trophic state assessment is an important aspect to consider for wetland health as it provides information on nutrient status of the water bodies. This study is the result of preliminary assessment of trophic states of two Ramsar sites of western Nepal viz. Lake Rara and Lake Ghodaghodi, a high mountainous lake and a low land lake respectively, were conducted in June 2019. Carlson Trophic State Index (TSI) was estimated based on chlorophyll-a, total phosphate and Secchi transparency (Carlson, 1977). The average total phosphorus concentration of Lake Rara and Lake Ghodaghodi were 0.019mg l<sup>-1</sup> and 0.035mg l<sup>-1</sup> respectively whereas chlorophyll-a values were 5.63µg l<sup>-1</sup> and 6.29µg l<sup>-1</sup> respectively. The average Secchi disk value of the Lake Rara was 13.48 m and for Ghodaghodi was 0.34 m. Lake Rara was found to be oligotrophic (TSI 37.21) and Lake Ghodaghodi to be eutrophic (TSI 57.41).

**Keywords:** Trophic state, Wetlands, Chlorophyll-a

## Assessment of Water Quality of Shallow Wells in Kathmandu Valley

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This study presents a simple water quality analysis for shallow wells in the Kathmandu Valley. Traditional brick walled and concrete ring wells generally used for household purpose were taken as sampling sites. The main purpose of this study is to (1) compare the water quality parameters of shallow wells with National Drinking Water Quality Standard Value, NDWQS and (2) assessment to temporal variation of water quality in shallow wells. Physico-Chemical parameters such as temperature, TDS, EC, pH, Total Hardness, Total Alkalinity, Chloride, Ammonia, Phosphate, Nitrate and microbiological parameters such as coliform were determined in the laboratory. Thus, individual results obtained were compared with NDWQS for analysis. Only few parameters i.e. TDS, EC, Nitrate and chloride values were found within the NDWQS standards. All the samples exceed the limit of NDWQS for Total coliform. Contamination of coliform and high concentration of ammonia may be due to the poor sewage system in the valley. High concentration of hardness indicates minerals getting dissolved in water while coming in contact during percolation and sub-surface flow. The temporal analysis of shallow wells in the valley shows that groundwater quality of Bhaktapur is relatively deteriorated than that of Kathmandu and Lalitpur which may be caused by overuse of fertilizers, pesticides and an unmanaged sewage system.

**Keywords:** NDWQS, Temporal variation, Shallow wells



# TECHNICAL PRESENTATIONS

**SOCIOLOGY AND HUMANITIES/  
BIODIVERSITY CONSERVATION**

# represents the poster presentation

## Role of Women in Household-Level Socio-Economic Decision Making Processes

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The aim of this study is to find out whether the feminist movement, and other gender program has really worked out in empowering the women's participations in the socio-economic activities. The study analyzed the women's role in the household decision-making process and for the voice and choice of economic activities particularly in Saibnu Ward no 18 of Lalitpur Metropolitan City. The study is focused on the semi-urban area of Lalitpur District, which has both urban and rural settings. The survey was conducted in 322 households using Kobo-toolbox mobile application. The study was carried out in four sub-categories to find out the status of women which are: Asset ownership, Decision making, Accessibility, and Awareness. Analysis was primarily focused on three variables: Employment, status Caste/Ethnicity, and Education. Based on the research women have been progressing rapidly in most of the sectors. However, in terms of financial matters, they were little behind in taking and giving decisions despite being financially independent. Additionally, it was found that females and males both counterparts used to receive the consensus for the decision. The results were satisfactory in terms of women empowerment however it was not satisfactory in case of rapid urbanization and competitive world. The women have been made aware of their basic rights, capacitated from the government and private sectors but only limited to participation. Women were excluded in the representation in politics, leadership, social representation. Enhancing leadership

skills and securing representation of women could impact better in their socio-economic status and decision-making.

**Keywords:** Decision making, Empowerment, Socio-economic, Women participation

## SHBC 002

### **Factors Influencing User's Preference in Menstrual Hygiene Management Products**

**RABINA LUITEL**

Menstruation, a biological function experienced by cis women and transgendered men comes with high cost because of the influence of pink tax and tampons tax. The study aimed to explore factors influencing user's preference in MHM products. Although various studies have been conducted on tampon tax, the environmental impact of MHM products, Tampons Vs. Pads, there is only limited research which analyzed factors influencing user's preference in MHM products. This study used the snowball sampling method to find out respondents. The google-forms were used for the data collection process. This study surveyed a total of 271 females belonging to the age group of 20-29 from Kathmandu Valley . It is observed that pads were highly popular among users followed by a combination of silicon cup and cloth pad. Tampons were least preferred by the respondents. Women with knowledge, and awareness on available products chose a MHM product among various choices available. Other factors including engagement in income generating activity, economic independence helped to create an enabling environment to increase access to those products. Therefore, it is important to increase ease and effectiveness of the products, and educate people about menstruation.

**Keywords:** Menstruation, Knowledge, MHM product, Silicon cup

## Effect of Maternal Migration on Education of Children in Nepal

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The growing trend of female migration for employment over the years has been an issue for discussion in Nepal. Maternal migration may have a negative impact on the emotional and educational performance of the children left behind. The aim of the study is to find the link and impact of mothers' migration for foreign employment on their children's emotional behavior and educational performances. The study area was Changunarayan Municipality in Bhaktapur District of Bagmati Province, Nepal. The survey was conducted among 110 children (100 children of migrated mothers and 10 from non-migrants) from 97 households. The children's educational performance such as percentage marks, marks obtained on key subjects, school attendance along with other study variables was observed for before and after the mother's departure and compared with children from non-migrant mothers (reference group). The study found some kind of emotional and behavioral changes in the children after mothers' departure. Results showed that educational performance such as marks obtained, school attendance, study time was found to be negatively affected by mother's migration. Similarly, compared with reference group students, reduced educational performance was observed among the children left behind. Other study variables like tuition facility, household work and tiffin were found to be affected by mothers' migration. The social protection policies must focus on the prevention of such negative consequences.

**Keywords:** Educational performance, Reference group, Emotional, Foreign employment

**SHBC 004**

## **A Comparative Analysis of Factors Affecting Street Vendors' Existence in Informal Activity in Kathmandu**

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Street vending can be understood as the business generated for oneself to sell the products in busy streets which leads to traffic congestion, a difficulty for pedestrians. However, street vendors are not accepted by municipality or government for not paying taxes. The main aim of this research was to understand the factors affecting existence of street vendors in the informal activity in Kathmandu and has particularly focused on the cooperation, understanding and variance between vendors and local shopkeepers. It also triangulated the response of street vendors, local shopkeepers and local clubs in operating street shops. The data were collected using questionnaire surveys with 44 vendors using convenient random sampling, where both open-ended and close-ended questionnaires were asked. The result demonstrated that the transaction in the informal economy was higher, but lacked the economic returns for the government. The relationship between vendors and local shopkeepers were non-conflicting and have been living in harmony. Similarly, no local youth clubs were associated with vendors for their protection but Samakhusi local club was involved for management of the place, water, electricity and waste management. Cooperation and providing special space for street vendors would be helpful to manage it.

**Keywords:** Street vendors, Vending, Shopkeepers

**SHBC 005**

## **Perceptions of the Role of Internet Use on Sexual Health Among Young People in Kathmandu**

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The reorganization of sexuality and sexual interests among young people have largely been shaped by changing communication media, particularly, the Internet. This article aimed to describe sexual behaviors and the perceived role of internet use on such sexual behaviors among young people in Kathmandu. Study was undertaken using a mixed method with cross-sectional descriptive design among randomly selected 423 young people (age: 15-24 years) from 42 different colleges in Kathmandu. Self-administered questionnaire was employed for data collection. Chi-square test was carried in SPSS v.22. Internet accessibility was found among 92.3% of respondents with the mean $\pm$ SD of 19.44 $\pm$ 2.29 years. Sexual behaviors, undertaken in this study, were revealed mostly by male respondents, increasing proportionally with higher education level. The porn videos, followed by social media were found the main sources of such sexual behaviors. The interaction between internet access and sexual intercourse was found insignificant ( $p=0.534$ ); however, various statements related to attitudes towards the negative role of the internet were responded to in higher proportion. Role of Internet use was found significantly changing the perceptions towards sexual behaviors of young people. Around 42% youths agreed with the negative effects of internet use in their sexual matters; thereby, feel vulnerable to its use. Thus, to

encourage the young people's internet safety and sexual well-being, there is a need to have proper guidance through complex analytical and experimental modules.

**Keywords:** Young people, Pornography, Sexual behavior, Social media

SHBC 006

## **Ecological Status of Himalayan Newt (*Tylotriton verrucosus*, Anderson, 1871) in Mai Pokhari and Adjacent Areas of Eastern Nepal**

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*Tylotriton verrucosus*, only newt known from Nepal, is predominantly found in Mai Pokhari, Ilam. Studies on these organisms are scarce if any they lack detailed study on population estimates. The study's purpose was to estimate the population abundance of *Tylotriton verrucosus*, investigate the water chemistry and its association with abundance in Mai Pokhari and adjacent ponds; and assess the threats to organisms in Eastern Nepal. Two Mark-recapture population estimates: Petersen and Schnabel methods were used to calculate the abundance using Visual Implant Elastomer as a marking agent. Five physical and nine chemical parameters of water were also measured in these three ponds and Principal Component Analysis (PCA) was conducted to estimate abundance and water chemistry's association. all total of 13 Key Informant Interviews (KII), was carried out to know the distribution and threats of *Tylotriton verrucosus* in Eastern Nepal. Total 229 and 203 individuals were estimated in Mai Pokhari following

both methods whereas 265 and 66 individuals were estimated in pond 2 and 3 respectively using only the Petersen method. Mai Pokhari holds the population density of one individual per 100 m<sup>2</sup> which is low compared to 9 and 6 individuals per 100 m<sup>2</sup> in respective Pond 2 and 3. PCA showed that water parameters like temperature, turbidity, conductivity, chloride, nitrate positively influence the abundance of these organisms in all four sites. Altogether 11 places of eastern Nepal were reported with the presence of *Tylototriton verrucosus* in our study. According to KII, habitat destruction as road construction and pollution in ponds were the major threats to these organisms.

**Keywords:** Visual implant elastomer, Mark-recapture method, Threats, Principal Component Analysis

**SHBC 007#**

## **Behavioral Study of Northern Palm Squirrels (*Funnambulus pennantii* Wroughton, 1905) in Shankha Park, Kathmandu, Nepal**

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A behavioral study of northern palm squirrels was performed to observe six different behaviors of the northern palm squirrels during post-monsoon (Oct.-Nov. 2018) and winter season (Dec. 2018-Jan. 2019). The study was done in a park in the urban area of Kathmandu, Sankha Park, from 8:00 a.m. to 11:10 a.m. for 10 days in each season for better understanding of ecology of squirrels. Scan sampling method was used for the collection of the data at an interval of 10 minutes. Foraging behavior was observed highest during both post- monsoon



season and winter season. The foraging behavior peaked twice during the study period in the post-monsoon season but during the winter season, it peaked only once but it occurred for a longer period of time. Resting behavior was observed higher in the winter season than in the post-monsoon season. But travelling and social interaction were higher in post-monsoon than in winter. And vocalization and grooming behavior were observed similar in both seasons. But the overall behaviors observed were significantly associated with variation of season.

**Keywords:** Foraging, Behavior, Seasons

SHBC 008#

## **Foraging Behavior of Asian Openbill (*Asiaticus oscitans*) in Rupandehi and Kapilvastu Districts of Nepal**

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Foraging studies are important to widen conservation blueprint for storks as their food distribution plays a significant role in breeding. How storks are adapting to more frequent disturbances in human dominated landscape has become a question to researchers and conservation practitioners. Foraging behavioral study of Least Concern (IUCN Red List) and Vulnerable (National Red List) Asian Openbill (*Asiaticus oscitans*) was done in November, 2019 in Rupandehi and Kapilvastu Districts of Nepal. Study was carried out to assess behavior pattern in different environmental and anthropogenic variables and to study the effect of flock size in vigilance and foraging. Total 5 road transects

of variable lengths were surveyed that were replicated in Morning, Day and Evening. Replacing the traditional manual monitoring, a high zoom (86x) camera was used to record species behavior following Focal Animal Sampling method. The Time Activity Index revealed that Asian Openbill spent more time on Foraging (61.57%) followed by Locomotion (16.8%), Vigilance (14.31%) and Maintenance (7.32%). In addition, they foraged more in wetland compared to the farmland. Asian Openbill were observed to have adapted much as it spent most of its time in Foraging in both high (72.97%) and low (35.40%) disturbed conditions. Flock size was observed likely to affect the vigilance and foraging behavior of the species. With the increasing flock size, vigilance decreased while foraging increased. Foraging technique might have played a key role in deterministic changes in foraging and vigilance with increasing flock size.

**Keywords:** Focal animal sampling, Flock size, Time activity, Vigilance

**TECHNICAL  
PRESENTATIONS  
BIODIVERSITY CONSERVATION/  
FORESTRY**

# represents the poster presentation

## Human-Elephant Interaction and Factors Associated with Elephant Presence in Khata Corridor, Bardia

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This study confers the extent of human-elephant interaction, factors determining wild elephant presence and effectiveness of local initiatives to combat conflict in Khata Corridor, Bardia. Preliminary field visit, direct observation, households questionnaire survey (n = 180), line transect (n = 5) and quadrat method (n = 87) were carried within nine community forests and four buffer zone community forests in Khata Corridor. Crop damage was a major problem than property damage by wild elephants. Crop damage was observed positively associated ( $\chi^2 < 0.05$ ) with type of crops grown while property damage had no association ( $\chi^2 > 0.05$ ) with types of home garden plants grown by local people. People observed an increasing trend of human-elephant conflicts in the last five years. About 44% of respondents were interested in alternative crops which were less preferred by wild elephants while some people received economic benefits by managing home stay. Elephant presence was higher in community forest than in buffer zone community forest and its presence was positively significant with presence of its preferred species. Human disturbance was higher in community forest than in buffer zone community forest. No significant difference between phyto-sociological characteristics of vegetation in buffer zone community forest and community forest was observed. Positive association was observed with elephant

presence and distance between forest boundary where it had negative association with human disturbance, distance of river and farmland in Khata Corridor. The study indicated that vegetation composition does not have any significant role in elephant presence but observed negative association with river distance, when at finer scale study on buffer zone community forest and community forest.

**Keywords:** Asian elephant, Human disturbance, Khata Corridor, Vegetation

**BICF 002**

## **Human-Asian Elephant (*Elephas maximus*) Interaction around Parsa National Park, Nepal**

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The demand for resources has been increased by the human population but the accessibility and availability of the resource has been decreasing and need to compete with wildlife. This study aimed to assess the status of human-elephant conflict (HEC), existing mitigation practices, and its effectiveness around PNP. We also evaluated the spatio-temporal association of HEC, and the compensation mechanism for HEC mitigation. The study was carried out in five different rural municipalities of Parsa District around PNP in 2019. Primary data was collected by a questionnaire survey with victim family and local people, Key Informant Interviews, Focus Group Discussion. A total of six people were killed and one person has survived with severe injury in the study area by the elephant attacks between 2013 and 2019. Crop raiding was indicated as the most serious conflict from the elephants by local people. HEC intensity was highest during the

rice harvest season, at night. Local farmers did not use any specific mitigation measure. Local people believed planting unpalatable crops and constructing a solar fence around the national park would minimize HEC. The aroma of ripening paddy had an interesting relation with HEC, it was associated with elephants' crop-raiding behaviour. Our study concluded that HEC had a significant relation with the distance of human habitat with forest ( $p=0.00941$ ), and there was also a significant relationship between education and perception towards elephant conservation ( $p=0.30688$ ). Modern mitigation measures need to be introduced to reduce the HEC as traditional mitigation measures have not been effective.

**Keywords:** Crop-raiding, Conflict, Spatio-temporal, Unpalatable crop

## BICF 003

### **Human-Wildlife Conflict in Annapurna Conservation Area: A Case of Lomanthang Rural Municipality**

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Human-wildlife conflict (HWC) is a major challenge for biodiversity conservation with potential risk of diminishing local support for conservation. Due to the dynamic nature of HWC, periodic assessments are essential to ensure evidence based conservation intervention. In ACA there was presences of excessive use of natural resources such as traditional livestock herding practices, overgrazing, massive extraction of resources for fuel and for medicinal and aromatic plants by people

has resulted in the loss of wildlife habitat and has been identified as a major reason for HWC in these regions. This study was aimed to quantify the nature and extent of conflict, associated monetary loss and local people's attitude towards conservation in Annapurna Conservation Area (ACA) within Lomangthang Rural Municipality. Stratified Random sampling was employed to collect data using semi-structured questionnaire surveys among 130 households (the then VDCs Chhunup 50, Chhoser 35 and Lomanthang 45). Focal Group Discussion (FGD) on Lomangthang and Key Informant Interview (KII) with ten people who were working for managing conservation areas at different levels was also carried out. Local resource dependency viz. use of dung cake, fodder and firewood were the major drivers of encounter with the wildlife in the areas. More than 67.69% respondents faced problems from wild animals and perceived livestock depredation as a major problem compared to crop depredation. Annual average economic loss due to livestock depredation was US\$ 224 per household in 2018. Chhoser and Chhunup were highly affected compared to Lomangthang. The annual livestock depredation rate was found 9.55% occurring mostly in winter (80.17%) and mainly in grazing land areas (69.5%) with increased size of herd. Presence of light in the shed was found to reduce livestock depredation by 98%. A focus on conservation education, monitoring, relief and alternate income generation is necessary to boost the existing positive attitude towards wildlife conservation in order to reduce HWC.

**Keywords:** Local, Grazing, Predator, Depredation

## **Distribution and Conservation Status of Chinese Pangolin in Palungtar Municipality of Gorkha District, Western Nepal**

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Chinese pangolins are peculiar mammals having stiff scales depicting nocturnal and burrowing nature. According to literature, they are receiving less attention as compared to their vital ecological role. Their ecology, behavior, status and distribution in Nepal are relatively unknown and no significant research has been conducted upon this species. In the case of Nepal, illegal trade, habitat destruction and lack of awareness and information are causes of decline in population. Thus, this research was conducted to find out the distribution, habitat type, social belief and conservation status of Chinese Pangolin. The methodologies used were group discussion for participatory mapping and habitat analysis, key informant interview to analyze the poaching and population trends, questionnaire survey of 52 respondents to know the people's perception, field observation along the transects and random search for the live animals and indirect signs. 26 new and 82 old burrows were recorded. Distribution patterns of burrows were found clumped by chi-square test and were not uniformly distributed throughout all the wards and aspects. Preferred habitat was found to be forest at an elevation of 600-700m altitude. A total of 25- 50 % crown cover in forest had the maximum numbers of burrows. Respondents believed in superstition that keeping the pangolin hide will drive evil spirits away and pangolin transmitted communicable diseases to domestic animals. The conservation status was not good in the study area as findings from the social survey concluded that population trend was declining and habitat destruction, hunting at high scale and predation were major threats.



**Keywords:** Chinese pangolin, Population, Social belief, Poaching, Habitat destruction

**BICF 005**

## **Comparative Study of Active Constituents of some Medicinal Plants along Altitudinal Gradient**

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Plant-based medicine for curing diseases is as old as human civilization. Medicinal plants consist of an active constituent, which are used for treating various diseases and healing wounds in humans. This paper aims to identify bioactive phytochemical constituents of selected four medicinal plants viz. *Acorus calamus* L. (Bojho), *Eucalyptus camaldulensis* Dehnh. (Masala), *Artemisia indica* Willd. (Titepati) and *Cymbopogon winterianus* Jowitt ex Bor (Citronella) and compare their concentration along altitudinal gradient in Makawanpur District, Central Nepal. The plant species were selected from different altitudinal regions and the phytochemical screening was done using Gas Chromatography-Mass Spectrometry (GC-MS) to identify major active constituents. The four major active constituents were found in Bojho of three altitudes among which the major active constituent i.e.  $\beta$ -Asarone was found to be highest in temperate region. In Masala, six major active constituents were found among which, Eucalyptol was found to be highest in the temperate region. The major active constituents in Titepati of tropical and temperate regions were six and in sub-tropical were five. The concentration of major active constituent, 7-Oxabicyclo [2.2.1] heptane, 1-methyl-4-(1-methylethyl),

was found to be highest in the sub-tropical region. Five major active constituents were found in Citronella and the concentration of the major active constituent (R)- Lavandulyl was found to be highest in sub-tropical region. The findings of this study provide the empirical support for the cultivation of Bojho and Masala mainly in temperate region, Titepati in subtropical region and Citronella in tropical region so as to obtain optimum yield of major active chemical constituents.

**Keywords:** Medicinal plant, Active constituent, Phytochemical, Gas Chromatography-Mass Spectrometry (GC-MS).

**BICF 006<sup>#</sup>**

## **Gender Issues on Forest Resource Management**

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Sustainable management of forest resources requires equal opportunities to its users ensuring broader participation and equitable share of benefits. Mainstreaming gender in resource management often requires adequate knowledge of how different factors relating to gender are addressed in forest institutions. This study aimed to assess the status and factors affecting gender participation in resource management and decision-making process in the Rammapur Buffer Zone Community Forest (BZCF) of the Bardiya National Park (BNP). We conducted household surveys based on simple random sampling (n=110), focus group discussions (n=2) and key informant interviews (n=20) to collect the required information. Regression

analysis was used to determine the significant factors contributing to gender participation in decision making process. Clear distinction was observed between males and females regarding the labor share. Women were observed being more engaged in labor-intensive forest management works while higher-level decision-making bodies of the BZCF user groups were completely dominated by the males. The four factors (sex, education, occupation and income source) significantly influenced gender participation in the decision-making process of the BZCFUG ( $p < 0.05$ ). Despite women's prominent roles in forest conservation and management, the CFUG yet has to ensure their active roles in decision making. BNP and its conservation stakeholders should mobilize adequate resources to address gender issues in forest resources management.

**Keywords:** Community forest, Gender, Participation, Resource management

**BICF 007<sup>#</sup>**

## **Fish Diversity and Their Relation to Different Environmental Variables in Kamala River, Nepal**

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Fish diversity was assessed in five sections of Kamala River including its upper, middle and lower stretch and correlated with different environmental variables. Kamala River originates from lower part of Mahabharat range and flows through inner to outer terai, providing broad range of ecosystem services; provisioning, regulating, supporting

and cultural. Since the information regarding the environmental factors and species diversity in the river not available enough, this study intended to bridge the gap by exploring baseline information on diversity and abundance of fish and their relation to environmental variables. The study was carried out during October, marking the post-monsoon season of Nepal. Fish samples were collected using cast nets while physio-chemical parameters were analysed onsite as well as through lab analysis. Altogether 19 freshwater fish species belonging to 5 orders, 8 families and 15 genera were recorded with highest diversity at downstream. Cyprinids (*Garra annandalei*, *Paracanthocobitis botia* and *Barilius barila*) were most dominant in the river while Channids, Mastacembelids, Botiids, Sisorids, Gobiids were among the rare taxa. The RDA ordination method revealed significant association between fish species and environmental variables. The first axis explained 57% of species variation and correlated with temperature whereas second axis explained 27% of variance that correlated with EC, TDS and nitrate. Nonetheless, different sections of river were disturbed due to mining, deforestation and construction activities which could possibly pose a real threat for fish population as well as other aquatic organisms.

**Keywords:** Kamala River, Fish species, Water parameters, Correlation, Elevation gradient

## BICFOO8<sup>#</sup>

### **Present Status and Traditional Uses of *Pterocarpus marsupium*, Roxb. in Hariyali Community Forest, Kapilvastu**

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*Pterocarpus marsupium*, Roxb., locally known as Bijaysal, is a medium to large-sized deciduous tree that grows up to 33 m height. Confined to an altitude of 100-500 m is naturally distributed at the foothills of siwalik. The study was carried out in the Hariyali Community Forest, Kapilvastu. The field data were collected from the study area through direct field observation, household survey, key informant interview and focus group discussion whereas secondary data were collected from relevant published and unpublished materials. Out of 116 individuals found in the study area, 4 were trees, 79 were poles and 33 were saplings. The species were mostly distributed in North, North East, and North West aspects, within elevation from 97-139m elevation, flat and undulating slope mainly in Calcaric phaeozems soil order. Generally, local people were using the species for fodder (46%), medicines (41%), dyes (7%), timbers, utensils, agricultural tools (5%), etc. Cutting for fodder (29%) was the main human-induced threat followed by grazing (24%), fire (22%), medicinal use (17%) and illegal felling (10%). Major natural threat for the species was low germination (58%) and slow growth rate (42%) thus awareness for plantation, protection, conservation, proper utilization and management of Bijaysal were mandatory for the long term to benefit from this valuable species.

**Keywords:** Distribution, Bijaysal, Ethnobotanical uses, Conservation

**BICF 009<sup>#</sup>**

## **Vegetation Composition and Regeneration Status of Jure Landslide Area**

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This study focuses on the vegetation composition and regeneration status of Jure landslide, Sindhupalchowk. The total area of the landslide is around 71 hectares and in order to capture the past, during and post landslide scenario a structured questionnaire survey was conducted. Similarly, the quadrat (7 plots of 20m x 20m) method was used for assessing the detail regeneration status. In addition to that quadrates of 1m x 1m were laid down diagonally to collect the no. of herbs and shrubs. Further, diameters at breast height (DBH), basal area, frequency and importance value index were calculated to quantify the post vegetation structure. *Alnus nepalensis*, *Schima wallichii* and *Shorea robusta* were found to be the major tree species before the landslide. Whereas species of vascular plants belonging to 28 genera and 18 families were found very significant in the landslide area with higher occupancy of *Alnus nepalensis*. The mean value of Shannon-Weiner diversity index was found to be 2.87 suggesting high species diversity. The overall findings show that the area is under good regeneration status and community people are willing to collaborate with various sectors to conserve it. Participatory forest management strategy is recommended in order to sustain the forest.

**Keywords:** Importance value index, Shannon-Weiner diversity, Regeneration

**BICF 010<sup>#</sup>**

## **Nature and Characteristics of Snakebites in Eastern Nepal**

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Snakebite is one of the most neglected human casualty problems in tropical regions, especially in developing countries that results in

millions of people losing their lives. Its distribution along with gender, age, monthly, and seasonally basis was studied to understand the status of snakebite because it varies with place and season. The recorded data from the three snakebite treatment centers of Jhapa in Eastern Nepal were collected and analyzed. Data obtained from those centers consist of the patient's record of total five districts namely Jhapa, Morang, Illam, Panchthar, and Taplejung. Total 11526 patients were recorded from these five districts over the last half decade. Records had expressed that 42.20% of total patients were found to be female. Similarly, males between 10-20 while females of 20-30 were found to be more vulnerable. However, 93.21% of patients were encountered with non-venomous snakes while venomous 46.60% were found to be encountered with Viper. In addition to this, the majority of bites were recorded in the summer months. The bite rate to females is high possibly due to their more involvement in outdoor activities in the farms, bush, and forests along with the trend to male to migrate in forging countries for the source of income. Main reason behind the high non-venomous bites might be due to the fact that the majority of encountered snakes were non-venomous to humans.

**Keywords:** Venomous, Non-venomous, Snakebite

# TECHNICAL PRESENTATIONS

## Pollution and Control Measures/STEM

# represents the poster presentation



## Assessment of Wetland Health of Nepal Using Wetland Condition Index

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Wetlands are a productive ecosystem throughout the world. It provides various resources to the national and local economy by producing resources, and enabling recreational activities. In recent decades these ecosystems are degraded due to anthropogenic activities and natural processes. Lake Cluster of Pokhara Valley is rich in biodiversity, provides a number of ecosystem services, and it is listed in Ramsar sites. However, due to the rapid increase in population, haphazard urbanization, wetland resource exploitation and pollution, the wetlands are degrading at an alarming rate. This study could raise the public awareness of the wetland condition and guide policy makers to make sustainable policies to protect and restore wetland ecosystems of Nepal. This study assessed the health of the wetland ecosystem of five lakes namely (Begnag, Rupa, Dipang, Khaste and Gunde) using wetland condition index (WCI) through wetland remote sensing and biological indicator data. Altogether forty samples were collected for each component (phytoplankton, macrophytes and water). The samples were collected based on land use features during January, 2020. Wetland environment and landscape development intensity index were calculated based on field and Remote sensing data. The results of WCI demonstrated that the Begnag Lake was best wetland condition due frequent applied of restoration and conservation effort and surrounding upper most watershed area are less polluted, whereas Deepang was found to be lower due to overgrowth of aquatic

plants and non-point sources of pollution. Thus, these results provide scientific guides for wetland protection, restoration and development planning of the pokhara.

**Keywords:** *Wetland condition index, Landscape intensity index, Ecosystem*

**PCMS 002**

## **Water Stress and Availability in Jhimruk Watershed, Pyuthan District, Nepal**

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Water poverty is an emerging challenge and affects all the living beings of the world. Water Poverty Index (WPI) is an easy, innovative, and clear tool that helps to calculate the water poverty on the basis of five components i.e. resource availability, resource use, capacity to manage and utilize resources, accessibility to the resource, and surrounding environmental factors. This research attempts to calculate the WPI of Jhimruk Watershed with 5 major components and 24 sub-components based on location to determine the water poverty situation in Jhimruk Watershed. The WPI is calculated on ward levels that is the WPI of total 26 wards (8 wards of Jhimruk, 10 wards of Pyuthan, and 8 wards of Naubahini) will be calculated. The results till now show that use of components (ranges from 4.152 to 5.968) is the worst which add more water poverty and stress in Jhimruk Rural Municipality. Similarly, capacity component ranges from 8.202 to 10.123 and access component ranges from 11.106 to 12.684 showing medium poverty level of studied areas.

**Keywords:** Water poverty index, Environmental factors, Accessibility

PCMS 003

## Water Quality Analysis of Ground Water and Surface Water Along Lal Bakaiya River in Rautahat and Bara Districts

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Groundwater is the major source for domestic and agricultural activity in the Rautahat and Bara district, which is extracted through dug wells and pumps. This study assesses the hydro-geochemistry along Lal Bakaiya River. The analysis of groundwater quality was done to recognize the appropriateness for drinking and agricultural uses, and for establishing relation between surface water-groundwater. Altogether, 28 samples were collected from surface and groundwater along the river. Onsite measurement of various parameters such as pH, electrical conductivity and temperature were taken in field whereas major cations ( $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{K}^+$ , and  $\text{Na}^+$ ), anions ( $\text{Cl}^-$ ,  $\text{NO}_3^-$ ,  $\text{HCO}_3^-$  and  $\text{SO}_4^{2-}$ ) were analyzed in laboratory. On the basis of different water quality indices viz. World Health Organization and Nepal Drinking Water Quality Standards, Sodium Adsorption Ratio, Sodium percentage, Residual Sodium Carbonate, Kelly Ratio, Magnesium Hazard and Potential Salinity; groundwater and surface water of the study area suits for drinking and agricultural usages. Water quality was classified as medium salty and low sodium (C2-S1) category according to US salinity diagram indicating excellent to good quality. The pattern of cationic and anionic dominances are  $\text{Ca}^{2+} > \text{Mg}^{2+} > \text{Na}^+ > \text{K}^+$  and  $\text{HCO}_3^- > \text{SO}_4^{2-} > \text{Cl}^- > \text{NO}_3^-$  for groundwater and surface water. Piper's

classification shows that majority of the samples belong to  $\text{Ca}^{2+}$ - $\text{Mg}^{2+}$ - $\text{Cl}^-$ - $\text{SO}_4^{2-}$  hydro-chemical facies. Clustering of samples showed groundwater and surface water interactions can be categorized into three classes and significance test shows surface water-groundwater interaction within a buffer of 1 km.

**Keywords:** Hydrochemistry, Terai, Water quality, Central Nepal

PCMS 004

## Assessment of Air Pollution Impact on Biochemical Properties of Roadside Plants of Lalitpur District

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Air pollution has become an extremely serious problem globally, which causes human health problems and interferes with biochemical and physiological processes of plants. Therefore, present study was carried out to assess the impact of air pollution by vehicular exhaust on some selected tree species along the roadside of Lalitpur District. The leaves samples of commonly available tree species viz. *Ficus religiosa* L., *Buddleja asiatica* Lour., *Tecomastans* (L.) Juss. Ex Kunth., *Leucosceptrum canum* Sm., and *Nyctanthes arbortristis* L. were collected from areas with potentially higher and lower levels of air pollution on the basis of suspended particles. Fully mature fresh leaves were collected for calculating biochemical parameters-of leaf extract pH, relative water content (RWC), total chlorophyll, and ascorbic acid by using standard methods. Chlorophyll a, b and total chlorophyll content and pH of leaf extract in both the plants were found to be significantly higher ( $p < 0.001$ ) in less polluted sites. Ascorbic acid, relative water content

and Air Pollution Tolerance Index (APTI) were found to be significantly higher ( $p < 0.001$ ) at more polluted samples. The tree species with high APTI suggesting that they are possibly adapted themselves in polluted condition by physiological changes. Based on the present results, *Ficus religiosa* emerged as the most tolerant species with the highest APTI value (11.13); however, *Buddleja asiatica* as the most sensitive one with the lowest APTI value (4.68). Hence, *Ficus religiosa* can be suggested for plantations along the roadside of urban areas for green belt development.

**Keywords:** Air pollution tolerant index, Bio-indication, Roadside plants

PCMS 005

## Chemical Composition and Bio-activities of Essential Oils from *Origanum majorana* and *Mentha arvensis*

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Nepal, Himalaya possesses a wide range of unique and valuable medicinal and aromatic plants due to having a globally significant and biologically diverse ecosystems. Two Nepalese originated *Origanum majorana* and *Mentha arvensis* of the labiatae family were collected on the basis of traditional uses and ethnobotanical information for this study. The essential oils from the aerial parts of these plants were obtained by hydro-distillation and analyzed by Gas-Chromatography and Mass-Spectrometry (GC-MS). The essential oils were screened

for antibacterial activity and antifungal activity using micro broth dilution technique. A total of 50 volatile chemical constituents were identified by GC-MS in *O. majorana*, representing 99.8 % of total oil extract. The major components in *O. majorana* were Terpinen-4-ol (32.1%), Linalool (13.8%),  $\gamma$ -Terpinene (9.5%) and Linalyl acetate (5.9%). Similarly, a total of 63 chemical components were identified in *M. arvensis*, representing 98.7% of total oil extract. The *M. arvensis* oil had Menthone (54.8%), Pulegone (22.2%) and Isomenthone (4.9%) as volatile compounds. The class of oxygenated monoterpenoids was predominant in both oils. The essential oils of *M. arvensis* had higher sesquiterpene hydrocarbons than that of *O. majorana*. Both oils exhibited prominent activity against *Bacillus cereus*, *Staphylococcus aureus* and *Staphylococcus epidermidis* with minimum inhibitory concentrations (MIC= 312.5  $\mu\text{g/ml}$ ). The antifungal activity for two oils was very good against *Candida albicans* and *Trichophyton mentagrophytes* (MIC= 156.3  $\mu\text{g/ml}$ ). The oil of *Origanum majorana* showed prominent antifungal activity against *Aspergillus niger* (MIC= 156.3  $\mu\text{g/ml}$ ) and *Aspergillus fumigatus* (MIC = 312.5  $\mu\text{g/ml}$ ). The oil of *Mentha arvensis* showed strong antifungal activity against *Aspergillus niger* (MIC= 78.1  $\mu\text{g/ml}$ ) and *Aspergillus fumigatus* (MIC= 156.3  $\mu\text{g/ml}$ ). The results suggest that the essential oil of *O. majorana* and *M. arvensis* possess diverse compounds with certain antimicrobial activities and can be used as a natural preservative ingredient in food, cosmetics and other pharmaceutical uses.

**Keywords:** Nepalese medicinal plants, Essential oil, Bioactive component, GC-MS analysis, Antimicrobial activity

## Multiple-Use Water Systems as an Adaptive Approach for Sustainable Water Resource Management

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Multiple-Use Water System (MUWS) is an integrated approach towards water resource management where water is stored in a reservoir and distributed to nearby households for domestic as well as agricultural purposes. A comparative analysis was carried out between functional MUWS, non-functional MUWS and Non-MUWS (traditional) water supply system in six villages (Saanjhpani, Odaal taal, Jaypur, Kholigaun, Chanabari and Banskot) of Surkhet district, Nepal in May 2019. Data regarding issues and challenges regarding the functionality of MUWS were collected using Focused Group Discussion (FGD). Moreover, water quality analysis was conducted on water samples from source, reservoir and tap stands using standard APHA (1998) method. The result obtained from FGD's revealed that MUWS has marked positive impact on water availability, water access, increased agricultural production and people's livelihood in areas having functional MUWS. Non-functional MUWS communities were found to face hardships to fulfill household water needs and their livelihood option reduced after MUWS stopped functioning. The most common problem identified for failure of MUWS system was technical failure of structural components and financial incapability of the community to overcome it. Water quality analysis of MUWS and Non-MUWS water samples were within national standard except for ammonia and calcium. The

Presence/Absence test for fecal coliforms revealed the presence of fecal pollution in 95% of the samples. The study shows that MUWS has positive results in terms of water use, livelihood and water quality

**Keywords:** MUWS, Water quality, Livelihood

PCMS 007#

## **Groundwater Recharge Estimation Using Empirical Formulae in Tinau River Basin, Rupandehi**

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Groundwater is an esteemed fresh water asset and accounts for approximately two-third of the world's fresh water reserves. In Nepal, 50% of the country's population solely depends upon groundwater for domestic water supply. Recharge is an important parameter that controls the fluctuation of groundwater. In context to groundwater, Rupandehi is one of the districts with greatest potential. Downward leakage in the basin to deep aquifers from shallow aquifers is high i.e. 120 (MCM/year). The aim of the research is to access the correlation between recharge and rainfall and to evaluate the impacts of temperature, humidity, solar radiation, runoff and evapotranspiration on groundwater recharge using empirical formulae. From Department of Hydrology and Meteorology (DHM), ten (10) years of weather parameters were collected to calculate recharge, evapotranspiration, recharge coefficient, and run off. Using CROPWAT version 8.0, potential evapotranspiration was determined based on FAO Penman-Monteith Formula. Unit root test and Johansen procedure model was



used to test for integration analysis. The study showed groundwater recharge to be 18.05 mm per annum, recharge coefficient 9.15% and runoff 137 mm. Data is mainly based on secondary sources obtained from the Department of Hydrological and Meteorological station. The highest correlation was between recharge and precipitation. So, there is positive correlation between precipitation and recharge where low recharge and high runoff was observed.

**Keywords:** Tinau River basin, Co-integration, Recharge, Runoff, Precipitation

**PCMS 008#**

## **Efficiency Assessment of Drinking Water Treatment Plant of Amarapuri Drinking Water and Sanitation Organization, Gaindakot 15, Nawalpur**

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Drinking water quality is a very important factor for determining human health. Water quality treatment plants with different types of technologies are used in different communities for drinking water purification. However, the efficiency of such treatment plants may vary. Therefore the monitoring of the parameters is essential. The study was carried out in winter 2020 to assess overall water quality before and after drinking water treatment plant managed by Amarapuri Drinking Water and Sanitation Organization, ward 14-17 of Gaindakot Municipality, Nawalpur District. The treatment plant treats the water through sedimentation, roughing filter and slow sand filter. Chlorination was stopped during the study period with the

understanding that water treatment processes do not need disinfection due to lack of pathogens in the winter season. Different physico-chemical and microbial parameters were analyzed by collecting water samples from source, treatment plant and home tap. Except total coliform, all water quality parameters analyzed were found within the acceptable range of the World Health Organization Drinking-water Quality Guideline value and National Drinking Water Quality Guideline (NDWQS), Government of Nepal. The heavy reduction of coliform and TSS shows the high efficiency of treatment plants but not sufficient due to presence of total coliform even after treatment, so the drinking water is unsafe for drinking without disinfection. The study recommends continuing the chlorination process every season.

**Keywords:** Slow sand filter, Chlorination, Total coliform

PCMS 009<sup>#</sup>

## **Environmental Implication, Technological Performance and Socio-Economic Impacts of Renewable Energy (Hydraulic Ram Pumps) in Context of Rural Nepal**

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Hydraulic Ram Pumps (Hydrams), is a simple water pumping technology that uses swift streams to pump water from river to higher elevations for distribution. It is resource efficient, cost-effective and eco-friendly technology that is easy to install, operate, and maintain for the rural topography of Nepal. Over 30 Hydrams are already installed throughout Nepal however the aftermath of installation

lacks evidence. Therefore, this research focuses on those research gaps with objectives to 1) Compare Hydrum efficiency between two sites based on geography and access to infrastructure; 2) Compares Hydrum and diesel pumps in-terms of avoided emissions; and 3) Socio-economic impacts of Hydrums. The data was collected through total survey of daily Hydrum usage in two sites: Jharuwarashi, Lalitpur (Site-1) and Yaladi, Syangja (Site-2). Data was tabulated and analyzed with 30% of data excluded as inconsistent outliers. Excel was used to calculate efficiency and avoided emissions of Hydrum in both areas. Excel and SPSS were used to formulate graphs and find co-relations between socio-economic parameters and water availability (with Pearson's and Spearman's correlation coefficient). Results show that using zero carbon technology Jharuwarashi and Yaladi avoid 1811 and 1201 kilograms of CO<sub>2</sub> emissions per year, respectively. The efficiency of Hydrum in Site-1 and Site-2 were calculated to be 21.57 and 50.23. Although, pump used in Site-2 is more efficient, water supply and usage observed in the area is less than that of Site-1. Comparing supply capacity and analysis of socio-parameters, it was found that Jharuwarashi efficiently used the water supply due to better access to physical infrastructures, pro-active community and elevational advantage than Yaladi. Meanwhile, Yaladi lacked proper distribution of water pumped. Overall, this research helps identify the importance of sustainable technology and proper water management.

**Keywords:** Hydrums, Diesel pumps, Efficiency, Avoided emissions, Water supply

## Black Soldier Fly Technology for Sustainable Feed and Food Production In Nepal

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Organic waste management is a major environmental problem and serious public health issue in Nepal, owing to the lack of reliable and affordable technology. On the other hand, billions of rupees are spent every year to import feed ingredients for the rapidly booming poultry sector. To address both these problems, a tropical fly species (Black Soldier Fly) larva could be used. The study aimed to assess the performance of the colony to bio-convert organic waste to protein rich feed ingredients and fertilizer in relation to the ambient environmental conditions of the study site. Qualitative and Quantitative interpretations of various aspects related to Black Soldier Fly (BSF) production were determined. Performance index was prepared where the best performance was recorded in the warmer and humid months of the year. The ratio among waste, larva production and fertilizer production rate was found to be 100:19:7, which concluded the implementation of BSF technology is a beneficial and sustainable way of organic waste recycling. However, the technology should be developed for locally available resources. The technology carries a huge potential to be commercialized at an industrial scale and can be a great opportunity to generate employment and boost national productivity.

**Keywords:** Performance index, Alternative protein ingredient, Bio-waste management

# TECHNICAL PRESENTATIONS

**Climate Change/Sociology and  
Humanities/Medical and Health Science**

# represents the poster presentation

## Dry Spell Impact on Small-Farm Productivity at Kuleni in Nawalpur, Southern Nepal

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Dry spell, a prolonged period of dry weather with reduced soil moisture causes a period of little or no productivity and results in low income. Thus, the increased severity of dry spell is worrying the small-holder farmers around the world. Nepal is an agro-based country with 60 percent of its Gross Domestic Product accounting for agriculture. Over half of this agriculture comprises small-scale farming that largely depends on rainfall. As a signal of climate change, the country is already witnessing increased temperature and erratic precipitation, both having negative impacts on agriculture especially in the southern dry lowlands of Tarai. A study was conducted in Kuleni rural area of Nawalpur in southern Nepal to assess the impacts of dry spell. The status of soil moisture was assessed applying the Landsat images proceeded by the calculation of Temperature Vegetation Dryness Index (TVDI) for three decades. Questionnaire survey and Focus Group Discussions were carried out among the farmer groups to know their perception on climate change, estimate impact of dry spell on agriculture productivity and document the adaptation/mitigation measures they have adopted. Results showed that the soil moisture has decreased while the pest infestation has increased in recent years. This has negatively affected agricultural productivity and thereby the socio-economic condition of the small-holders. The farmers are taking community action of technology use in water lifting by solar panels.

**Keywords:** Agriculture productivity, Climate change adaptation, Temperature Vegetation Dryness Index

## **Response of Climate Change on Annual Ring of *Larix himaliaca*: A Case Study from Lantang National Park, Nepal**

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Climate change is the statistical change observed in climatic variables and that sustains for longer period. As the imprints of climate change are noticeably observed in the tree-rings, dendroclimatology has been a reliable tool to understand the past climate. In this study, a tree core was collected and analyzed to know the response of the climate change by analyzing the ring-growth of *Larix himalaica* in Chandanbari-Gosaikunda area in Langtang National Park, Nepal. Out of 68 tree cores collected, 34 healthy ones were used for the study. The samples were dried, mounted and sanded. Dating and measurement was carried out using stereo-zoom microscope and LINTAB. COFECHA was used to detect error in dating. Mean index chronology were developed using ARSTAN. Tree ring-width chronology 93 years was developed extending from 1926 to 2018 AD. Climatic data of nearby station (Dhunche) was obtained. Its analysis showed an increasing trend of rainfall and temperature. July received the highest rainfall while November and December were the driest. June was the warmest month whereas January was the coldest one. The growth of *L. himalaica* was favored by the rainfall and temperature of pre-monsoon and monsoon season. But the autumn climatic condition seemed to create stress on the growth. June had a strong positive correlation with temperature while precipitation had strong positive correlation growth of *L. himalaica* particularly in the months of April,

June, August and May. This shows that fluctuation in any climatic condition in these months will change the growth pattern of the *L. himalaica*.

**Keywords:** Climate change, Dendroclimatology, Tree-ring width chronology, Monsoon

CCSM 003

## Crop Yield and Food Security under Climate Change Scenario in Kailali, Western Nepal

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Climate change is a threat multiplier of food security. In Nepal, the majority of its farm households are climate vulnerable due to the prevalent rain-fed and subsistence agriculture. This study investigates the climate change impacts on crop yields and food security in Kailali District, western Nepal. A multivariate regression model was used to assess the crop yield relationship with climate variables. The detrended observed annual crop yield was regressed with respective seasonal temperature and rainfall and their deviations within the growing season. A rise in the seasonal maximum temperature showed a significant positive effect (0.89767Mt/ha) on potato yield, while a rise in the minimum temperature showed a significant negative effect (-0.64889 Mt/ha). Paddy, maize, and wheat yields were also affected by climate variables. Five hypothetical climate change scenarios were considered to assess the effects of climate change on food availability and food balance. The scenarios were average seasonal maximum temperature rise by 2°C, average seasonal minimum temperature rise



by 2°C, average seasonal maximum and minimum temperature rise by 2°C, average seasonal maximum and minimum temperature rise by 2°C along with 10% rainfall increase, and average seasonal maximum and minimum temperature rise by 2°C along with 10% rainfall reduction. Under the different climate change scenarios, paddy and maize production was likely to decrease, which would threaten the district food supply and food balance. However, the changing scenario would benefit wheat production that would contribute to district food availability and food balance.

**Key words:** Climate change, Crop yield, Food availability, Food balance, Multivariate regression

## CCSM 004

### **Importance of Tree Outside of Forest (TOF) for Immediate Flood Response/Recover**

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Flood of August 2017 severely affected to the most population of Nepal causing about 135 people killed, nearly 30 people disappeared, another 41 people wounded, and huge property loss of 79812 private houses completely destroyed and another 104425 houses partially destroyed. For construction of immediate shelter after flood, people used various forms of timber including bamboo and poles of easily available trees. Trees outside of forest (TOF) were a major source of timber for construction of houses/shelter for both humans and cattle. Therefore, this study was carried out in Loharpati Municipality ward number 5 of Mahottari District on the basis of purposive sampling to analyse the importance of TOF for immediate flood response. Households were

selected randomly from Dalit and Musahar communities. Participatory rural appraisal including focus group discussions, semi-structured interviews and formal and informal meetings were carried out to explore the importance of TOF. This study found that more than 60% of the household have trees in their own land where species such as Sissoo (*Dalbergia sissoo*), Masala (*Eucalyptus SP.*), Mango (*Mangifera indica*) and Bamboo (*Bombax ceiba*) are common. Among surveyed households, 15% respondents reported that they used Sissoo and 7% respondents Masala for pillars (khaba) to develop temporary houses, whereas bamboo was used for all kinds of poles in more than 75% of temporary houses. Bamboo was extracted from their neighbor's land. Out of 75% sampled households, 15 % respondents bought whereas 60% respondents were supported by the helping hands. Bamboo, Sissoo and Masala were either extracted from their own land or from neighbour's land. It could not be drawn any statistical conclusion in the choice of species to construct temporarily among households in different wealth categories. Trees outside forests, together with forests and other woodlands, play an essential role in solving important problems of rural and urban populations. People, however, are not fully benefiting from these important roles, because trees outside forests are neither well-perceived nor well-documented, and receive little attention in the formulation of national forestry policy and planning.

**Key words:** Trees outside forest, Flood, Recovery, Temporary shelter

CCSM 005

## **Women in Micro Entrepreneurship: Opportunities and Challenges of Women Entrepreneurs in Hetauda**

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Increasing number of women are found to be enrolling in the business sector every day. However, what contributes to their sustainability or lack of it is not well understood. Taking Hetauda Sub-metropolitan City as a case, this study tried to explore the major business sectors that women were involved in; their motivation factors and opportunities; key challenges for sustainability; and the role of different stakeholders including family, financial institutions, government and non-government organizations. This study conducted the questionnaire surveys with women entrepreneurs, key stakeholders and reviewed secondary data. It was found that women micro entrepreneurs were playing a significantly important role in family income. Furthermore, family support, self-confidence, relevant skill and knowledge, access to financial services, and support from government and non-governmental organizations were found to have strong bearing on the start-up, success and sustainability of businesses run by women. However, capacity development of women to make informed decisions, simplify procedures and implement relevant policies keeping women entrepreneurs at the centre are essential for their betterment.

**Keywords:** Women entrepreneur, Sustainable business, Market

CCSM 006<sup>#</sup>

## **Prevention of Zoonotic Swine Influenza Viral Infection by Development of Various Nanoparticle Based Influenza Vaccines**

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Swine influenza is a rapidly spreading, highly contagious, zoonotic viral disease of pig caused by type A Influenza virus of Orthomyxoviridae. Recently, H1N1, H1N2, H3N2 and H3N1 subtypes of Influenza A Virus are endemic in the swine population worldwide. Enormous genetic variability in Influenza Virus due to antigenic drift and antigenic shift results in novel reassortment of viruses in the respiratory tract of swine that can infect humans. Rapid evolution and mutation in the influenza virus causes reduction in efficacy of the vaccine and further increases challenges for prevention and control of disease. One novel approach to improve vaccine efficacy is use of various nanoparticles in vaccine delivery. This poster outlines the progressive development of various nanoparticle based Swine Influenza Vaccine, including what they are, why they are used and what is known about their mechanism of action to induce immune response against viral infection in the swine population by systematic review of various published research papers from different source like PubMed, NCBI, Google Scholar, ResearchGate and reanalyzing and summarizing obtained information in this Poster. However, nanoparticles alone are not sufficient for improving vaccine efficacy but the vaccine delivered in nanoparticles approach adding adjuvants may contribute to improve efficacy of Swine influenza vaccine, suggesting future study and research to be focused on development of ideal nanoparticle based influenza vaccine that provides both homologous and heterologous protection and induce mucosal, humoral and cellular immune response against different subtypes and strains of Swine Influenza Virus which are source of next global pandemic.

**Keywords:** Influenza, Mutation, Nanoparticles, Vaccine, Zoonotic

## Psychological Impact of Social Media Among Adolescents of Morang District

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Psychological impact refers to the effect caused by environmental and/or biological factors on an individual's social and/or psychological aspects. Psychological impact includes body dissatisfaction, fear of missing out and anxiety. Research done by KIST medical college and Teaching Hospital among medical students found the prevalence of anxiety was 5.8%, however it is unknown the psychological impact. The objective of this study was to determine the psychological impact of social media on adolescents of Morang district. Descriptive cross-sectional study was done. Study population was students of grade 11 and 12 among one of the selected colleges which was Kantipur International College in Biratnagar Morang, Nepal. The data was collected through census technique. Total sample was 347. Dr. OZ anxiety scale was used to measure anxiety among students and 5-point Likert scale was used for measuring level of FOMO and body dissatisfaction. Univariate and bivariate analysis were done. Majority of the students (91.7%) were found to have body dissatisfaction, followed by FOMO (82.8%) and anxiety (15.2%). Gender of the students was highly associated with body dissatisfaction where male students had more prevalence of body dissatisfaction than female students.

**Keywords:** Psychology, Social media, Adolescent, Impact

## Assessment of Impact of Climate Change on Wetland: A case study of Rupa Wetland, Pokhara

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The study evaluated the impact of the climate change on the Rupa wetland's health and on the alteration of wetland's services as well as on the livelihood of the people. By using the questionnaire on the HH Survey, the perception of the people was mapped and the data were discussed and cross checked by Focus Group Discussion (FGD) and Key Informant's Interview (KII) as well. PRA tools were used during this study. The report shows the major impact on the wetland's health due to increase in natural hazards, changes in climatic parameters, invasive colonization etc. The ecosystem's health is degraded and deteriorated by many reasons; climate change being one of them. It also depicts the ecosystem services changes making the connection with climate change and shows the impact of climate change on livelihood perspective. The study reveals that the declination of the ecosystem services are the impact of climate change and the increase of the few services are due to the adaptation intervention. A need of the adaptation intervention is seen in the area.

**Keywords:** Climate change, Wetland, Ecosystem health, Ecosystem services, Livelihood

## **Study of Avifaunal Diversity in Different Land Covers around Chitwan National Park**

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As most of the research on birds is done focusing on protected species, this study is conducted to assess the bird species diversity along with their conservation status and their status (resident/migratory) in various land covers around Chitwan National Park. Trail transect, sound recognition and direct observation methods were used to survey birds. The sites were selected and a 2 km long trail was followed on each site for 2 days consequently from 05:00 to 08:00 in morning and 16:00 to 18:30 in the evening in the month September and December for 10 days each. A total of 149 species of birds were observed where 63 species of birds of 27 families was observed in forest, 22 species of birds of 11 families was observed in grassland, 29 species of birds of 23 families was observed in farmland, 24 species of birds of 19 families was observed in residential areas and 48 species of birds of 18 families was observed near water resources. Family Accipitridae had the highest number (nine) of species in forest, family Muscicapidae had the highest number (five) of species on grassland, family Psittaculidae had the highest number (three) of species on farmland and family Ardeidae had the highest number (five) of species near water sources. The study showed the number of bird species along with their conservation status in various land covers. Thus, timely monitoring, proper conservation and proper land-use

planning is required to maintain bird species that are present in our environment as different bird species require different habitats to live and reproduce.

**Keywords:** Birds, Species diversity, Land cover



# TECHNICAL PRESENTATIONS

## Energy/Indigenous Knowledge and Technologies

# represents the poster presentation

## Performance of Rainwater Harvesting System as a Source of Drinking Water

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Water scarcity is one of the major challenges that Kathmandu faces today. Rainwater can serve as the supplement but paradoxically, it is mostly treated as a risk rather than as an opportunity in the valley. Despite the fact that the use of rainwater harvesting systems for drinking is still viewed with skepticism, some schools in Kathmandu valley have started to install Rainwater Harvesting Systems (RWHS) and use the harvested rainwater for drinking purposes. This study explores the case of one such school and aims to assess the supply and quality of harvested rainwater. The school has installed three filters for the treatment of raw rainwater. Our analysis showed that the measured physico-chemical parameters were well within the WHO guidelines for drinking water, both before and after filtration. Though fecal coliform was detected in the raw rainwater, it was absent after Bio-Sand Filtration. The Rainwater Harvesting Potential for the study area was determined by using the catchment area, the average annual rainfall and the runoff coefficient. It was calculated to be 495,658 litres per year which exceeded the annual drinking water demand of the school by approximately 50%. If regularly maintained and supplemented with treatment systems, Rainwater Harvesting System seems to be a promising solution to mitigate potable water shortages in Kathmandu.

**Keywords:** Water demand, Rainwater harvesting potential, Drinking water, Water quality

## Effect of Biochar on Crop Productivity in Nawalpur, Nepal

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Biochar is a black carbon made by burning organic waste in absence of oxygen. If incorporated in soil, biochar builds overall soil health, increases crop yield, reduces run-off chemicals and improves water holding capacity of soil. It can be especially useful to Nepal's smallholder farmers, for whom restoring soil organic matter, improving soil fertility, and conserving water in the root zone are key opportunities for improving crop production. An experimental research was conducted on winter maize during 2019-2020 to assess the effect of biochar on crop productivity and soil properties in Kuleni Village of Nawalpur. Biochar, made from an invasive plant species, *Lantana camara*, was applied in four replicates of factorial randomized field experiment. There were 20 different plots altogether. Biochar, thus prepared from all four batches, were mixed and applied in the experimental field. Biochar was either applied alone with 5 tones or mixed with six month old farm yard manure (compost) of buffalo in 1:1 ratio. Basic physical and chemical parameters of soil before the biochar addition were tested using standard methods. Similarly, "Shrestha" maize grains were shown in 20 different plots. From the statistical tests it was found that the height of the maize plant in the plot with 10t/ha biochar+compost was found highest. Also the treatment 4 (10t/ha biochar+compost) were observed to have the highest grain yield and biomass above ground. Interestingly, the treatment 2 (15t/ha compost) following treatment 4 obtained the highest value in above ground biomass, grain yield and height of plant. The crown cover of the plant

was widely varied among different treatments. The highest crown cover was obtained of treatment 2 whereas control has the lowest. This study only reflects the results for initial biochar applications and suggests for further research on biochar either higher application rates or longer duration trials to confirm the long-term effect of biochar on soil quality and crop productivity.

**Keywords:** Biochar, Crop productivity, Invasive species, Pyrolysis, Soil amendment

### EIKT 003

## Energy Contribution from Rice Crop in Small Landholder Farmers: A Case of Kuleni

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Small landholding farmers are those who cultivate less than two hectares of land and irrigation is an important component in the production of crops. The study covers the committee of 35 farmers (small landholders) of Kuleni who have collectively installed the renewable source of energy for water irrigation. These committees of farmers have been divided into two groups: Irrigated and Rain-fed based on the availability of the installed water source for irrigation. The energy use is calculated based on the farming practices and procedures of the individual farmers. Primary and secondary sources of data were collected through questionnaire surveys, direct interviews with farmers and literature reviews. The major inputs and outputs were converted into equivalent energy (kWh) after their economic valuation. Cobb-Douglas production function and cropping schedules

were estimated based on the major inputs and outputs of the rice crop. Water (m<sup>3</sup>) and direct energy (kWh) were the only differing inputs in between irrigated and rain-fed farmers and contributed to less than 2% of the total energy share. Results showed that spending a unit kWh energy per ha in irrigated farms for direct energy and water has lifted the output by additional 5 kWh per ha of energy in comparison to rain-fed farms in the year 2076.

**Keywords:** Energy share, Economic valuation, Cobb-Douglas, Cropping schedule

**EIKT 004<sup>#</sup>**

## **An Assessment to Evaluate the Efficiency of Cook Stoves in Chyasingkharka-05, Kavre, Nepal**

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The usage of traditional stoves is considered as the most inefficient form of cooking because the efficiency of these stoves is about 10%. According to WHO, smokes produced from use of inefficient cook stoves causes about 4.3 million premature deaths every year. Furthermore, inefficient stoves also have an impact on women's drudgery. Asian women spend 3-7 hours per day for cooking purposes and about 374 hours to collect fuel in the household using traditional stoves whereas women living in houses having improved cook stoves (stoves designed to reduce fuel use and emission) would save 70 hours annually. This study aimed to assess the efficiency of five traditional cook stoves and five improved cook stoves using Water Boiling Test protocol 4.2.3 in Chyasingkharka, Ward Number 05. The

data collected were analyzed using Water Boiling Test spreadsheet 4.2.4 and the impact of traditional cook stoves on women drudgery was evaluated through questioning 100 households. From the Water Boiling Test, it was found that the efficiency of traditional stoves ranged between 8-10 % whereas improved stoves ranged from 17-24%. From the questionnaires it was found that women using traditional cook stoves would go to forest four times a week to collect firewood which is double of the women using improved stoves. Similarly, on an average, the cooking time for the women using traditional stoves exceeded by two hours than improved cook stoves users. Therefore, improved cook stoves were found to have better efficiency and other socio-economic benefits.

**Keywords:** Inefficient cooking stoves, Traditional cook stoves, Improved cook stoves, Water boiling test, Women drudgery

**EIKT 005#**

## **Spatial Distribution, Historical Existence of Gharial and Its Conservation Impact on Local Livelihood in Rapti River of Chitwan National Park**

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Gharial (*Gavialis gangeticus*) were reported from all the major river systems of low land Terai of Nepal but currently they are present only in two river systems (Karnali in Bardia and Narayani in Chitwan) as isolated populations. Gharial population is declining in their natural habitat due to habitat destruction and anthropogenic pressure. Therefore through research on its presence and associated habitat

factors is warranted for its future conservation. This study aimed to assess spatial distribution, historical existence of Gharial, and explore impact of gharial conservation in livelihood of local people in and around Chitwan National park. Focus Group Discussion, Key informant interview and Questionnaire survey was carried from November to February. Total 4 FGDs were carried between age groups of 50 to 60 years. The study of 2 days in Rapti river through boat survey estimated a total of 45 individual Gharials in Rapti River-a tributary of Narayani River system. Gharial was observed to have a high number in mud banks (58%) followed by water (31%) and then sand banks (12%) during the study period. The FGD identified the historical presence of Gharial in the Golaghat, Dudhara and Sitamaithan in fishing activities. Through the questionnaire surveyed with people like bote, darai, musahar, living in the nearby village of Rapti river, 68% of people are not having any problem with conservation activities. According to FGDs, promoting alternatives in income generation to these communities would help in Gharial conservation in CNP.

**Keywords:** Gharial, Historical existence, Local livelihood, In-situ conservation

# TECHNICAL PRESENTATIONS

## Environment

# represents the poster presentation



## **Distribution, Threat Analysis and Community Based Conservation of Pangolin: A Case Study in Rani Community Forest, Makwanpur District**

**UCHITA LAMICHHANE**

*Agriculture and Forestry University, Faculty of Forestry, Hetauda,  
Nepal*

Pangolin is one of the most elusive and poorly studied small mammals across its range. Pangolins are experiencing population decline throughout its range mostly due to poaching, illegal trade and loss and degradation of their habitats. In this context, the study was carried out in Rani Community Forest of Makwanpur District of Nepal to assess the distribution and key threats to pangolin along with its conservation efforts at the community level. The direct and indirect signs of pangolin (burrows, footprints, fecal material) were searched as the indication of pangolin presence. Simple random sampling method was applied for the collection of social information related to pangolin. A total of 130 burrows (44 new and 86 old) were recorded during the survey. Distribution of burrows was clumped type and not uniform throughout all elevations. Majority of the burrows were found in the elevation range of 500- 600m. People were aware about pangolin however, only few respondents had seen it directly inside their community forest. Key threats to pangolin were construction activities, drying water resources, rapid urbanization, habitat loss, lack of food inside forests, overgrazing, mining, deforestation, poaching, predation of associated animal species, and forest fire. Among them the construction activities were considered as the biggest threat to pangolin. Various community-based conservation programs were initiated by authorities of Rani Community Forest; however, these programs were still not effective for the conservation of pangolin. A

collaborative conservation approach is needed to protect this species outside of protected areas.

**Keywords:** Pangolin, Distribution, Threat, Conservation

## ENVI 002

### **Optimization for Overproduction of Type III Polyketides in *E. Coli* and Metabolomics for Mass Spectrometry-Based Identification**

**YOGESH JOSHI<sup>1</sup>, PRITI SAXENA<sup>1</sup>**

*<sup>1</sup>South Asian University*

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Polyketides are an important class of compounds present in unicellular organisms - bacteria, amoeba, and multicellular organisms - algae and plants. These polyketides can be expressed artificially in situ using suitable expression vector. Expression vector pET-21c, with our gene of interest *Mmar\_1* and *Nf\_1*, transformed into BL-21 strains of *E. coli* are grown at different culture conditions followed by metabolite extraction using acid hydrolysis method. The extracts were then, concentrated using multi vapor and by purging liquid nitrogen. Metabolomics for mass spectrometry in multiple reaction monitoring (MRM) mode and thin Chromatography using the different solvent system for the detection Type III polyketides in the crude sample and silica gel fractions of the different optimized condition identified the range of these compounds. The different profile of these metabolites in response to various physiological changes in the growing system shows the possibility to enhance the growth of the compounds by up-scaling the production using bio-reactors in various physiological conditions.

## **Conscious Innovation: Program Design, Evaluation and Measures of Success for Climate Action in Kathmandu, Nepal**

**KAVYAA RIZAL**

This research study aims to understand the perceptions and practice of innovation among third sector organizations aimed at climate action in Nepal. Additionally, this study seeks to understand current practices and understanding of innovation pertaining to three organizational practice parameters: program design, monitoring and evaluation, and measurement of programmatic success, conducted among 5 third sector organizations currently implementing programs in Nepal, with head offices in Kathmandu. This study found that all actors agree that Nepal is currently in the state of climate emergency, and there is an urgency for innovative approaches in the climate domain. In terms of understanding of innovation itself, it was found that innovation was described within three core aspects: innovation in technology development and adaptation, indigenous (ground level) innovation, and innovation in organizational processes, approaches and capacity. For program design, while traditional models of development were still used, new methods such as the integrated approach, community ownership approach and a pre-structured approach enhance innovation. In terms of program evaluation and measurement of success, organizations still use traditional models and tools. Measurement of success is tied to the activities conducted by the organization, and perhaps even the budget disbursed. This research recommends the use of two tools: human-centered design and systems analysis for more effective program design. A heavy focus on research and capacity building is necessary to ensure that the country is, in the long term, self-reliant in the climate domain, and in the short-term, effectively responds to the urgent issues witnessed.

## Environmental Impact Assessment of Municipal Solid Waste Management in Banepa, Nepal

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Municipal solid waste (MSW) management is one of the major environmental topics among urban areas in developing countries. Haphazard handling of MSW can contribute to emissions of carbon dioxide, methane, and nitrous oxide, which could accelerate global warming and impact human health and environment. Banepa is one of the upcoming municipalities in Nepal located 25 km east of Kathmandu city and has an area of 54.59 km<sup>2</sup>. This study evaluated the environmental impact of greenhouse gas (GHG) emissions under different scenarios of MSW management in Banepa city using the Life Cycle Assessment (LCA) tool. The scope of the study includes development of LCA spreadsheet following guidelines recommended by Intergovernmental Panel on Climate Change (IPCC) for National Greenhouse Gas Inventories, LCA standard guidelines prescribed by ISO 14044 and ISO 14040. The six different scenarios of MSW management system, i.e. baseline or business as usual (S1), composting combined with landfilling (S2), material recovery facility (MRF) comprised of systematic recycling and composting combined with landfilling (S3), MRF and anaerobic digestion (AD) together with landfilling (S4), MRF, composting and AD with landfilling (S5), and incineration along with landfilling (S6) were evaluated for GHG emissions by reviewing extensive literature review and IPCC methodologies. Recycling in MRF can significantly minimize the volume of MSW going to the landfill. Likewise, energy recovery using AD and composting has significant implications on minimizing GHG emissions.

**Keywords:** Life cycle assessment, Greenhouse gas, Waste

# PANEL DISCUSSION

## Theme: COVID-19: Lessons for Future

S.N.	Name	Affiliation
<b>Moderator</b>		
1	Dr Prativa Pandey	Founder and CEO, Catalyst Technology
<b>Panelists</b>		
2	Dr Madhurima Bhadra	Faculty, Master's in International Co-operation and Development (MICD), Mid-western University, Nepal
3	Dr Ambika Prasad Gautam	Professor and Principal, Kathmandu Forestry College (KAFCOL)
4	Dr Prajal Pradhan	Potsdam Institute for Climate Impact Research (PIK), Germany

**Dr Prajal Pradhan** explained how the system and supply in the food sector are affected due to the pandemic. Food production, availability, and stability are affected worldwide. In Nepal, many people are involved in organic farming and kitchen gardens. Various people have adapted to agriculture and are encouraging local products. Various questions are arising regarding the post COVID era, Dr Pradhan believes that pandemic has provided opportunities in various sectors. He explained how we need to contribute systematically as this is the 'Wait and See Phase'. He believes that in this situation of global pandemic, the main role of scientists is to provide evidence based research to influence the policy makers.

**Dr Ambika Prasad Gautam** believes we are in an active COVID phase. The clear picture of the impact of COVID is yet to be discovered. The pandemic has affected the community, society, individuals negatively. However some positive impacts are also evident, global air pollution has decreased subsequently. Dr Gautam stated that the future economic sector is also affected due to the pandemic, the majority of the budget is diverted to various economic and health sectors.

However, the general awareness created by the pandemic among the people is alarming. He suggests that policymakers around the world are to make sustainable, environment friendly policies for proper balance.

**Dr Madhurima Bhadra** believes that COVID has affected the children, immunization, vaccination, expecting mothers both economically and mentally. Since Nepal has not reached its peak in terms of numbers of infected, the social and mental impacts are yet to unfold. According to Dr Bhadra, the pandemic had set its biggest impact on the National GDP as the Visit Nepal 2020 campaign was hindered. In addition to this the service economy, education sectors, hospitals are facing set back on various levels. On the other hand, she believes that various opportunities are available on a personal level due to this pandemic, a healthy lifestyle, and an immediate/positive environment perspectives are to be considered. Dr Bhadra stated that “We cannot act locally while thinking globally”. Now is the time when local people can globalize household level inventions as necessity is the mother of inventions. To achieve smarter and greater Nepal, government agencies should organize skill-based training.

## **Conclusion**

The moderator Dr Prativa Pandey, expressed her regards towards the panelist and the participants for making the following discussion fruitful. She emphasized that as a researcher, we need to Agree to Disagree and we need to bring into the mindset of the government and general public that disagreeing does not mean that individuals cannot work together. She mentioned incorporating a holistic approach in development because of which Nepal can get into transformative government. One take home message for participants can be the call of action, people realizing what their part of responsibility is to make a difference.

## Annex 1.

### Name of the volunteers involved in the Sixth Graduate Conference

Aarati G.C., AFU	Prekshya Subedi, CDES-TU
Aayasha Shrestha, Saptagandaki Multiple Campus	Prizma Chapagain, KU
Abish Man Shakya, MICD-MWU	Purna Man Shrestha, RHF
Alina Shahi, CDES-TU	Rachana Sharma, CAS
Amisha Acharya, PMC-TU	Sadikshya Ghimire, Tri-chandra
Anil Neupane, Tri-chandra	Samita Khadka, CDES-TU
Anita Neupane, Saptagandaki Multiple Campus	Sandhya Dahal, Khopwa College
Anjana Bhattarai, CDB-TU	Sarita Chaulagain, CDB-TU
Ashish Dhakal, KU	Satyam Chaudhary, CDES-TU
Bina Thapa, CDES-TU	Shaurav Sharma, AFU
Diana Ghale, GGIC-TU	Shraddha Kunwar, KU
Dikshya Ghimire, ISET-Nepal	Shristi Shrestha, GGIC-TU
Dipa Rai, CDZ-TU	Sneha Pradhananga, KU
Enna Mool, CDES-TU	Subekshya Bastakoti, Khopwa College
Ganga Poudel, CDES-TU	Suchana Baniya, CDES-TU
Hirendra Bista, KU	Susan KC, Pokhara University
Jeebina Adhikary, GGIC-TU	Sushma Timsina, CDES-TU
Kiran Gosai, CDES-TU	Sudeeksha Basyal, KU
Mahesh Sapkota, Saptagandaki Multiple Campus	Pragya Neupane, KU
Maiya Pahari, CDES-TU	Kanchan Kattel, EGH-RHF
Mandip Kafle, KU	Prakriti Koirala, CDES-TU
Manjita Kharel, CDES-TU	Shreesha Pandey, AFU
Miraj Poudel, AFU	Gauri Jayaswal, CDES-TU
Monika Dhakal, Khopwa College	Manisha Basnet, CDES-TU
Monika Gurung, KU	Smritee Subedi, KU
Nabin Basnet, Central Campus of Technology	Shrabada Gurung, KU



Nikita Maharjan, CDES-TU	Shankar Prasad Poudel, AFU
Onisha Mahato, Saptagandaki Multiple Campus	Shreeya Aryal, AFU
Pooja Mahato, Saptagandaki Multiple Campus	Anjana Pradhan, KU
Pooja Manandhar, CDES-TU	Shraddha Bhattarai, CDES-Tu
Prabhat Adhikari, CDB-TU	Gaurav Adhikari, AFU
Prabhat Rai, KU	Reecha Acharya, NARC
Pragati Dahal, CDES-TU	Usha Acharya, ISET-Nepal
Pragya Kafle, PMC-TU	

## Annex2:

### Nomenclature of the conference host rooms



#### 1. *Kande Vyakur* (काँडे ब्याकुर) Room

This conference room is named after Spiny Babbler. The Spiny babbler (*Turdoides nipalensis*) is Nepal's only endemic bird species that belongs to the family Leiothrichidae. It is found only in the middle hills of Nepal. It is predominantly a shy bird, lives in dense scrubs and mounts branches of bushes and small trees.



#### 2. *Rato Habre* (रातो हारो) Room

This conference room is named after Red Panda. Red Panda, also known as the lesser panda, is one of the most interesting animals in the world. This mammal has reddish-brown fur and a long striped tail. An interesting fact about this animal is that it is the only species in their genus, *Ailurus* (except for their ancestors).



#### 3. *Jumli Marshi* (जुम्ली मार्शी) Room

This conference room is named after Jumli Marshi. Jumli Marshi, an indigenous rice variety of Nepal, is grown at the highest elevation of the world at an altitude of 3050 masl. The International Rice Research Institution has confirmed the presence of cold tolerant gene in this variety that supports it to thrive well in cold temperate condition.



## HKC 2020 Volunteers Team



Himalayan Knowledge Conclave (HKC) also known as Graduate Conference is the annual conference that occurs usually in the first week of April. The Central Department of Environmental Science (TU-CDES), Institute for Social and Environmental Transition-Nepal (ISET-Nepal) and Resource Himalaya Foundation (RHF) initiated this conference in 2015. Government of Nepal has generously patronized and supported the initiatives since 2018. Nepali universities and colleges are the partners in the conference. Kathmandu University has been involved in the conference since 2019 and Agriculture and Forestry University has been involved from this conference. The conference provides an opportunity for young researchers to present their research to researchers and experts in their respective fields.

[www.resourceshimalaya.org](http://www.resourceshimalaya.org)

