



International Nature Education and Experience

Summer School Programmes

January 2024

College of Natural Resources Royal University of Bhutan Lobesa

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Overview

The College of Natural Resources, Royal University of Bhutan, offers 12 International Summer School programmes both in the Spring and Fall Semesters. Each programme is offered for two weeks . These programmes are coordinated and facilitated by experienced faculty members and resource persons. All summer school programmes are field trip based in addition to classroom teaching.

The SS programmes are as follow: Biodiversity Survey Methods and Conservation Tool, Natural Resource Management, Nature and Wellness, Bhutanese Culture, Tradition and GNH. Food and Culture in the Land of Thunder Dragon, Traditional Ecological Knowledge in the Himalayas, Agriculture Systems in the Himalayas, Living a Farmer's Life in the Himalayas, Climate-smart Agriculture using Geospatial Technologies, Wild Edible Plants of Bhutan Himalaya, Ethnomedicine of Eastern Himalayas and Learning statistics using R

Biodiversity Survey Methods and Conservation Tools Credit: 8

College of Natural Resources Royal University of Bhutan Lobesa, Punakha, Bhutan

The syllabus of the programme may change from time to time based on emerging needs, learning conditions, experiences, and resources.

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Course Director	: D.B. Gurung (<u>dbgurung.cnr@rub.edu.bt</u>)
Code	: CON911
Course Duration	: Two Weeks

Course Overview

The two-week long course focuses on the development of knowledge and skills in using biodiversity surveys and conservation tools. The course includes topics on using equipment such as camera traps, fishing nets, and mist nets, among others. It also includes conservation tools such as habitat restoration and environmental education. The course is delivered through a combination of theory (37.5%), fieldwork/practical (37.5%), assignments (12.5%), and self-study (12.5%). Fieldworks, which aim to provide skills, include the study of mammals using camera traps, bird surveys, assessment of herpetofauna, and methods in aquatic biodiversity surveys. The learning and skills of the participants will be assessed using video clip assessment and multiple-choice questions.

Learning Outcomes

On completion of the course, the participants will be able to:

- 1. Explain the importance of biodiversity conservation.
- 2. Collect, retrieve, and analyse camera trap data.
- 3. Sample and analyse fish diversity data.
- 4. Assess water quality using macroinvertebrates.
- 5. Conduct bird survey.
- 6. Conduct an amphibian survey.
- 7. Identify and recommend management strategies for invasive species.
- 8. Select and use appropriate conservation tools.

Learning and Teaching Approach

The teaching and learning approach will consist of a mix of lectures, fieldwork, assignments, and self-study. Outside the contact hours, participants are expected to spend additional hours in completing their assignments, which require self-study.

Туре	Approach	Total Hours
	Lecture	16
Contact	Group work	10
Contact	Group presentation	4
	Field works	30
Independent study	Assignments	10
	Self-study	10
TOTAL		80

Assessment Approach

The participants will be assessed through poster or video clip presentation, quiz, and field report as detailed below.

A. Poster/video clip presentation (30%)

Participants will work in groups of two or three to prepare and exhibit a poster or develop a short video clip based on their interest and skill in biodiversity and conservation-related topics. The posters/video clips will be assessed using the following criteria:

- 10 Content: Informative, accurate, and comprehensive.
- 6 Design: Design of the posters/video clip, organization including the layout, colour scheme, and appropriate use of visuals.
- 6 Creativity: Creativity in their posters/video clips, including the use of innovative ideas, unique approaches, and engaging visuals.
- 8 Presentation: Presentation skills of poster/quality of video clip including ability to answer questions.

B. Quiz (20%)

At the end of the course, participants will appear on a written quiz consisting of 20 multiple-choice questions to evaluate their learning. Each question will carry one mark and will form a part of the assessment.

C. Field report (50%)

Participants will be taken to Phobjikha (Khebethang) or nearby forest for 5 days of fieldwork excluding two travel days. Each participant will submit a 2000-word-long report of the fieldwork on any thematic areas covered during the field trip. The report should be academic and will have to be supported with data and figures, including pictures. The report will be evaluated based on the following criteria:

- 10 Short summary or extract of about 100-150 words.
- 15 Content standards of the report, including plagiarism.
- 10 Visuals appropriate graphs and figures.
- 15 Completeness appropriate title, abstract/summary, introduction, main findings/results and discussion, conclusion and about 5 references.

Grading Scheme

Grade	Judgement of performance	Mark
A+	Outstanding	80% and above
А	Very Good	70 - 79.9%
В	Good	60 - 69.9%
С	Satisfactory	50 - 59.9%
D	Fail	49.9% and below

Important notes

Plagiarism

Plagiarism is the act of presenting someone else's work, ideas, or intellectual property as one's own without proper attribution. It is a serious violation of academic and professional integrity, and it undermines the values of originality, honesty, and scholarly rigour that we uphold.

Our university takes plagiarism seriously, and instances of plagiarism will result in severe consequences, including but not limited to academic penalties such as failure of the assignment, course or expulsion and legal consequences in cases of copyright infringement.

Deadlines

Timely completion and submission of tasks and assignments are crucial, and as such, each student should understand and meet deadlines associated with his/her assigned tasks and assignments. Those failing to meet the deadline will lead to a deduction of marks.

Content

Type: L: Lecture, FL: Field Lecture, D: Demonstration, GD: Group Discussion, A: Assignment, P/L: Practical/Lab, S: Seminar, OL: Observatory Learning, SR: Student Reflection, SE: Student Exercise

Content	Approach	Time (h)	Facilitator
 Introduction to biodiversity and its conservation Defining biodiversity Concept of conservation Importance of conserving biodiversity History of biodiversity conservation Principles and philosophy of biodiversity conservation 	L	5	DB Gurung
 2. Flagship species and RTE (Rare, Threatened and Endemic) 2.1 IUCN Red-list categories and criteria 2.2 Concept of flagship species 2.3 Concept of RTE species 2.4 RTE case studies (e.g., Tiger, WBH, Elephant, Red Panda, Golden Mahseer) 	L	10	DB Gurung
 Selected conservation tools Introduction to Geographical Information System (GIS) as a conservation tool – concept and application of GIS, software, cartography, and basic map production Remote sensing: analysis of satellite imagery or aerial photography to identify and map habitats and distribution Concept of conservation genetics and eDNA – sample collection, DNA extraction, purification, sequencing, and environmental DNA Protected areas management system (PAMS) – types of protected areas, monitoring tools, and protocols In-situ and ex-situ conservation – gene bank, herbaria, zoo, botanical gardens 	L/D/A/P/L	15	Ugyen Thinley, DB Gurung & Karma Sherub

	 3.6 Environmental education – developing educational materials such as posters and video clips, organising environment awareness campaign etc. 3.7 Habitat restoration and management of invasive species 			
4.	Crosscutting methods in biodiversity	L/D/A	10	DB
	 survey 4.1 Camera traps – setting up camera, data retrieving and analysis 4.2 Drones: setting up to survey large areas and identify habitats and movement patterns, data retrieving and analysis 			Gurung, Ugyen Dorji & Staff from Dept. of Forest and Park
	4.3 Citizen Science: Engaging public in data collection through online platforms or community-based programs4.4 Acoustic monitoring: Recording and analyzing sounds produced by animals			Services (DoFPS)
	and identification 4.5 Radio telemetry: radio tagging, GPS transmitter, tracking, and mapping movement of animals			
	predetermined path, using visual or auditory cues to detect the presence			
5.	Mammal survey methods	FL/GD/A/	8	DB
	 5.1 Setting up camera traps, data retrieving and analysis 5.2 Scat surveys: collection of specimens and analysis 5.3 Tracks and signs: using hooves marks, feathers, hairs etc. 	D/OL/P/SR		Gurung, Karma Sherub, & Staff from DoFPS
6.	Bird survey methods	FL/GD/A/	8	Dr. Om
	6.1 Point count6.2 Mist netting6.3 Bird banding	D/OL/P/SR		Katel & Sherub Dorji, UWICER
7.	 Herpetofauna survey 7.1 Visual survey 7.2 Using various traps in reptiles and amphibian survey 7.3 Mark and recapture 	FL/GD/A/ D/OL/P/SR	8	DB Gurung & staff from DoFPS
8.	Fish and macroinvertebrate sampling	FL/GD/A/	8	Ugyen
	 8.1 Fish sampling methods: cast nets, electro-shocker, seine net, line and spoon, rock flip 8.2 Macroinvertebrate sampling methods: D-net sampling 	D/OL/P/SR		Dorji, DB Gurung & staff from DoFPS
9.	Sampling terrestrial Invertebrates 9.1 Pitfall trap survey 9.2 Sweep net 9.3 Hand collecting 9.4 Baited trap	FL/GD/A/ D/OL/P/SR	8	DB Gurung, Cheten Dorji & staff from

9.5 Light traps to collect nocturnal	DoFPS
invertebrates such as moths and	
beetles	
9.6 Other methods if possible	

Materials and Resources

Camera traps, Sherman traps, Drones, Mist nets, binoculars, bird sound caller, bat detector, electro-shockers, fish tagging guns, numbered fish tags, digital weighing balance, fish measuring tape, fish measuring board, fish landing net, fish weighing scale, sample collection jar, cast net, laser range finder, seine net, white enamel tray, D-frame net, waders, scissors, sweep nets, stainless nets, stainless steel insect pins, butterfly spreading board, adjustable spreading board, snake hooks, snake tongs, leather hand gloves, forceps, formalin, alcohol, glass aquarium, DNA kits, medical kits, and tents. While some of the equipment is in the college, some will have to be rented or borrowed from another organisation (e.g., Drones), and a few more need to be purchased.

Reading Materials

- Ali, S. (1992). Field guide to the birds of the eastern Himalayas. Oxford University Press, Delhi.
- Bajracharya, R.M., Sitaula, B.K., Gurung, S., and Raut, N. (Eds.) (2022). Sustainable natural resource management in the Himalayan Region: livelihood and climate change. Nepal.
- Grierson, A.J.C. and Long, D.G. (1982-). *Flora of Bhutan*. Vol. 1-8, Royal Edinburgh Garden, UK and Royal Government of Bhutan.
- Gurung, D.B. and Thoni, R. (2015). *Fishes of Bhutan*: A Preliminary Check list. CRDS Publication, College of Natural Resources, Bhutan.
- Hunter, M.L. and Gibbs, J.P. (2007). *Fundamentals of conservation biology*. Blackwell publication.
- Inskipp, C. and Inskipp, T. (1999). *Birds of Bhutan*. WWF Bhutan, Bhutan.
- Van Der, P.P. and Wangdi, T. (2007). *Butterflies of Bhutan: Mountains, hills and valleys between 800 and 3000m*. RSPN, Bhutan.
- Wangchuk, T. (2004). *A Field Guide to the Mammals of Bhutan*. Department of Forestry, Thimphu Bhutan

Onetime equipment purchases cost

SI.	Equipment	Rate	Units	Price (Nu.)	Remarks
1	Camera traps	-	-	-	Available
2	Havahart traps (2 doors)	5000	5	25000	Purchase

3	Drones	-	-	-	Borrow
4	Mist nets	8000	2	16000	Purchase
5	Binoculars	-	-	-	Available
6	Bird sound caller	-	-	-	Borrow
7	Bat detector	8000	2	16000	Purchase
8	Electro-shocker	-	-	-	Borrow
9	Fish tagging kits	8000	2	16000	Purchase
10	Numbered fish tags	200	100	20000	Purchase
11	Digital weighing balance	5000	2	10000	Purchase
12	Fish measuring tape	500	2	1000	Purchase
13	Fish landing net	2500	2	5000	Purchase
14	Fish weighing scale	2500	2	5000	Purchase
15	Sample collection jar	100	100	10000	Purchase
16	Cast net	8000	2	16000	Purchase
17	Laser range finder	-	-	-	Available
18	Seine net	15000	2	30000	Purchase
19	White enamel tray	-	-	-	Available
20	D-frame net	-	-	-	Available
21	Waders	8000	5	40000	Purchase
22	Scissors	-	-	-	Available
23	Sweep nets	-	-	-	Available
24	Stainless nets	-	-	-	?
25	Stainless steel insect pins	-	-	-	Available
26	Butterfly spreading board	-	-	-	Available
27	Spreading board	-	-	-	Available
28	Snake hooks	5000	2	10000	Purchase
29	Snake tongs	10000	1	10000	Purchase
30	Leather hand gloves	1000	5	5000	Purchase
31	Forceps (sets)	5000	-	5000	Purchase
32	Formalin	-	-	-	Available
33	Alcohol	-	-	-	Available
34	Glass aquarium	2000	2	4000	Purchase
35	DNA kits	20000	2	40000	Purchase
36	Medical kits (develop)	5000	2	10000	Purchase
37	Tents	10000	10	100000	Purchase
	Total			394000	

Note: While some of the equipment is in the College, some will have to be rented or borrowed from another organisation (e.g. Drone from the Department of Parks and Services), and other needs to be purchased





Natural Resources Management Credit: 8

College of Natural Resources Royal University of Bhutan Lobesa, Punakha, Bhutan

The syllabus of this programme may change from time to time based on emerging needs, learning conditions, experiences and resources.

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Course Director	: Ugyen Dorji (<u>ugyen.cnr@rub.edu.bt</u>)
Code	: MGT921
Duration	: Two Weeks

Course Overview

The two-week long course focuses on the development of knowledge and skills in natural resources management. The course includes topics such as traditional practices in conservation, community-based natural resource management, and ethnobotany. The course will be delivered through theory (37.5%), fieldwork/practical (37.5%), assignments (12.5%), and self-study (12.5%). Fieldwork aims to provide skills and collect ethnobotanical information. The participants will be assessed through poster presentations and multiple-choice tests.

Learning Outcomes

On completion of the course, the participants will be able to:

- 1. Explain the importance of natural resources management.
- 2. Describe the roles of community-based forestry, ecotourism and watershed management in conservation and sustainable livelihood.
- 3. Explore traditional practices of natural resources management.
- 4. Discuss the ethnobotanical values of common plants.
- 5. Explain watershed resource management.

Learning and Teaching Approach

The teaching and learning approach will consist of a mix of lectures, fieldwork, assignments, and self-study. Outside the contact hours, participants are expected to spend additional hours completing their assignments, which require self-study.

Туре	Approach	Total hours
Contact	Lecture	60
Contact	Field work	00
Indonondont study	Assignments	20
independent study	Self-study	20
Total		80

Assessment Approach

The participants will be assessed through poster presentation and course examination as detailed below.

A. Poster presentation (50%)

Participants will work in groups of two or three to prepare and exhibit poster on natural resources management. The posters will be assessed using the following criteria:

- 10 Content: Informative, accurate, and comprehensive.
- 6 Design: Design of the posters, organization including the layout, colour scheme, and use of visuals.

- 6 Creativity: Creativity in their posters, including the use of innovative ideas, unique approaches, and engaging visuals.
- 8 Presentation: Presentation skills including ability to answer questions. The presentation will be evaluated based on confidence; ability communicate effectively.

B. Course exam (50%)

Participants will take a written exam of one hour duration covering subject matter of the three-week long course. The exam will consist of 50 multiple choice questions.

Grading Scheme

Grade	Judgement of performance	Mark
A+	An outstanding performance	80% and above
A	Very good performance	70 - 79.9%
В	Good performance	60 - 69.9%
С	Satisfactory performance	50 - 59.9%
D	Fail	49.9% and below

Important notes

Plagiarism

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Deadlines

Timely completion and submission of tasks and assignments are crucial, and as such, each student should understand and meet deadlines associated with his/her assigned tasks and assignments. Those failing to meet the deadline will lead to a deduction of marks.

Contents

Type: L: Lecture, FL: Field Lecture, D: Demonstration, GD: Group Discussion, A: Assignment P/L: Practical/Lab, S: Seminar, OL: Observatory Learning, SR: Student Reflection, SE: Student Exercise

Course Content

Contents	Approach	Time (h)	Facilitator
Module 1: Introduction to natural resources management 1.1. Defining natural resources 1.2. Natural resources as components of ecosystem 1.3. Plants and animals as biotic resources 1.4. Abiotic resources: water resources, land and air 1.5. Common pool resources – tragedy of commons 1.6. Sustainable management of natural resources Renewable energy sources	L/GD	5	Dr. Om Katel
 Module 2: Traditional practices in natural resources management in Bhutan 2.1. Overview of natural resources in Bhutan: geography and biodiversity of Bhutan, forests and water resources, minerals and energy resources, wildlife and conservation. 2.2. Payment for ecosystem services (PES) 2.3. Local values and beliefs of natural resources management in the international context 2.4. Practices in Bhutan such as Ridam, Lhadham, religious forest, separate groups, protection of watershed or part of water source (e.g., practices in Southern Bhutan, Nyala Duem forest, Cloud-forest, Black Mountain, sacred groove etc.) 	L/GD	5	Mr. Ugyen Dorji
Module 3: Community-based natural resource management3.1. Empowerment of local communities3.2. Promotion of sustainable resource use3.3. Development and implementation of policies and regulations governing natural resource management3.4. Conflict management3.5. Successful case studies from Bhutan including river fishery management and community	L/GD	20	Dr. Bhagat Suberi

forestry			
Module 4: Roles of research and policies4.1. Role of government policies in natural resources management4.2. Role of research in natural resources management4.3. Importance of research in monitoring natural resources status	L/GD	5	Dr. Dhan Bdr. Gurung
 Module 5: Integrated Watershed management 5.1. Springshed management: theory and practice 5.2. Sustainable land management including soil 5.3. Sustainable agriculture practices including fishery and livestock resources 5.4. Range and pasture management 5.5. Forest landscape management including social forestry 5.6. Water demand and supply management 5.7. Field visit to watershed and PES site 	L/GD/FL	20	Mr. Ugyen Dorji
 Module 6. Ethnobotany – local knowledge in managing useful plants 6.1 Relationship between plant, people and culture 6.2 Local healers and their plants 6.3 Wild plants and food baskets – the edible wild plants 6.4 Participatory mapping of plant distribution and use in the local area 6.5 Roles of plants in rituals and traditions 6.6 Field work on uses of plants 	L/GD/FL	20	Dr. Dhan Bdr. Gurung
Module 7: International cooperation to address transboundary natural resource management issues7.1Understanding transboundary issues7.2Need for collaboration in transboundary issue management	L/GD	5	Dr. Om Katel

Prerequisites

Basic understanding of environmental science and ecology is recommended but not mandatory.

Note

The course may include guest lecturers by natural resources managers, practitioners and experts in natural resources management, providing students with direct insights and real-world perspectives.

Materials and Resources

PowerPoint projector, whiteboard, marker pen and field notebook.

Reading List

- Bajracharya, R.M., Sitaula, B.K., Gurung, S., and Raut, N. (Eds.) (2022). Sustainable natural resource management in the Himalayan Region: livelihood and climate change, Nepal.
- Berkes, F. (1989). Common property resources: Ecology and community-based sustainable development. Belhaven Press with the International Union for Conservationof Nature and Natural Resources.
- Department of Research and Development Services, MOAF. (2002). *Community-based natural resource management in Bhutan: A framework.* Kuensel Corporation.
- Means, K. and Josayma, C. (2002). Community –based forest resource conflict management: A training package. Food and Agriculture Organisation of the United Nations.
- Menon, A., Singh, P., Shah, E., Lele, S., Paranjape, S. and Joy, K.J. (2007). *Community-based natural resource management: Issues and cases from South Asia.* Sage Publications India Pvt Ltd.
- Sundaram, K.V., Moni, M. and Jha, M.M. (2004). *Natural resources management and livelihood security: Survival strategies and sustainable policies*. Concept Publishing Company.
- Grierson, A.J.C. and Long, D.G. (1982-). *Flora of Bhutan*. Vol. 1-8, Royal Edinburgh Garden, UK and Royal Government of Bhutan.





Nature and Wellness Credit: 8

College of Natural Resources Royal University of Bhutan Lobesa, Punakha, Bhutan

The syllabus of this programme may change from time to time based on emerging needs, learning conditions, experiences, and resources.

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Course Director	: Chogyel Wangmo (<u>chogyel.cnr@cnr.edu.bt</u>)
Code	: HLT912
Duration	: Two Weeks

Course Overview

This course focuses on exploring the concept of nature and its connection to wellness. It emphasizes the benefits of spending time in nature and its positive impact on physical, mental, and emotional health. The course introduces various nature experiences, such as hiking, bird watching and cultural tourism. Participants will learn about the importance of incorporating nature into daily life and traditional uses of plants and trees. The participants will also learn about local legends and folk stories and how they relate to nature. The course also highlights sustainable behaviour and living for personal and environmental wellbeing. The course will be delivered through theory, field activity, journal assignment and independent study. Field activity will develop skills on mindfulness, meditation and self-awareness through mindfulness walk, hiking, bird watching and visiting cultural sites. The participants will be assessed through their daily journal writing during the course period.

The course offers holistic approach of self-improvement, combining the benefit of nature, cultural understanding, and sustainable living to enhance various aspects of one's well-being.

Learning Outcome

On completion of the course, participants will be able to:

- 1. Explain the concept of nature and wellness and the benefits of spending time in nature.
- 2. Explain the importance of connecting with nature and engaging with naturebased mindfulness and meditation.
- 3. Examine the different types of nature experience, including mindfulness walk, hiking, meditation and bird watching.
- 4. Explain some traditional uses of plants and trees for health and well-being.
- 5. Explain local legends and folk stories related to nature and its role in Bhutanese culture.

Learning and Teaching Approach

Summer school will take place for a duration of two weeks. During the course period, tutors will employ an interactive, student-centred approach, integrating critical thinking skills using the following strategies: practical exercises and activities, group work that includes discussions, collaborative and individual tasks, and independent study. The hours and credit for the learning and teaching approach are given as follows:

Туре	Approach	Total Hours
	Lecture	30
Contact	Group Discussion	6
	Field Activity	30
Independent study	Student Exercise	4
independent study	Journal Writing	10
Total	·	80

Assessment Approach

The assessment, which reflect and test the learning achieved by the participants consist of a daily journal writing. Details of the assessment will be provided by the course tutor along with the assessment rubrics. The assessment approaches is given below along with assessment marks.

A. Daily Journal (100%)

During the course period, participants will maintain daily journal that logs their experiences and insight gained. Participants will have the liberty to use any standard format to record journal. The participants will be assessed based on the following criteria:

- 20 Content
- 15 Topic coverage (the extent to which the article covers the topic and its relevance to course content)
- 15 Quality of analysis
- 20 Consistency
- 10 Originality and creativity
- 10 Organization and clarity
- 10 Grammar, spelling, and punctuation

Grading Scheme

Grade	Judgement of performance	Mark
A+	Outstanding	80% and above
A	Very Good	70 - 79.9%
В	Good	60 - 69.9%
С	Satisfactory	50 - 59.9%
D	Fail	49.9% and below

Important notes

Plagiarism

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Deadlines

Timely completion and submission of tasks and assignments are crucial, and as such, each student should understand and meet deadlines associated with his/her

assigned tasks and assignments. Those failing to meet the deadline will lead to a deduction of marks.

Contents

Type: L: Lecture, FL: Field Lecture, D: Demonstration, GD: Group Discussion, A: Assignment P/L: Practical/Lab, S: Seminar, OL: Observatory Learning, SR: Student Reflection, SE: Student Exercise

Content	Approach	Time(h)	Facilitator
Module 1. Concept of nature and wellness 1.1 Evolution in the concept of nature and wellness 1.2 Role of nature in promoting physical wellbeing 1.3 Relation between nature and mental wellbeing 1.4 Importance of connecting with nature 1.5 Potential risk associated to nature exposure (allergen, toxin, and environmental hazard) 1.6 A hike in the Nature (Dorothang)	L/GD/SE	10	Ms. Chogyel Wangmo/ Dr. Rekha Chhetri
 Module 2. Benefit of spending time in nature 2.1. Psychological and physical benefits of nature connection 2.2 Type of Nature experience (Hiking and trekking, camping, wildlife watching, Nature photography, outdoor recreation) 2.3 Nature conservation and restoration 	L&GD	8	Ms. Chogyel Wangmo/Dr. Rekha Chettri/Mr. Ugyen Dorji/ Ms. Yogeeta Dahal/Dr. Yonten Dorji
Module 3. Nature Experience and Nature based mindfulness 3.1 Meditation 3.2. Concept of Ecopsychology, Ecotherapy, Wilderness therapy, forest bathing 3.3 Bird Watching (preparation of Bird watching, Habitat and ecology of bird, observation and identification, birding ethics) 3.3 Practice Ecotherapy through sensory contact and mindfulness (Lampheryi park) 3.4 Practice Forest bathing (immerse self in the forest in the mindful way): Khotokha-Wangdue 3.5 Bird watching in Punakha-Wangdue region	L/SE/OL	36	Dr. Rekha Chettri/ Dr. Yonten Dorji/Ms. Chogyel Wangmo/ Dr. Om Katel/ Bird Sherub

Module 4. Cultural Heritages: Local legends and folk stories 4.1 Traditional use of local plants and trees 4.2 Visit cultural heritage sites (Punakha Dzong/ Wangduephodrang Dzong/ Chimmi Lhakang/ Paro Taksang) Module 5. Sustainable Behaviour and living 5.1 Sustainable and social equity 5.2 Energy and water conservation 5.3 Sustainable Consumption and food choice 5.4 Waste reduction and management	L/OL	20	Dr. Thubten Sonam/Mr. Tandin Gyeltshen/Dr. DB Gurung/ Dr. Om Katel/Ms. Chogyel Wangmo/ Ms. Yogeeta Dahal
	L/GD	6	Dr. Thubten Sonam/Dr. Om Katel/Ms. Chogyel Wangmo/ Ms. Yogeeta Dahal/Ms. Anooja Nair

Prerequisites

Basic understanding of environmental science and health is recommended but not mandatory.

Note

The course may include guest lecturers by local healers, local experts on wellness and nature conservationists.

Materials and Resources

PowerPoint projector, whiteboard, marker pen and field notebook.

Reading List

Choden, K. (2013). Bhutanese tales of the Yeti. Proglen Trading Co., Ltd..

Choukas-Bradley, M. (2018). *The joy of forest bathing: Reconnect with wild places & rejuvenate your life*. Rock Point.

Jordans, B. (2010). Bhutan: A Trekker's Guide. Cicerone Press Limited.

- Selhub, E. M., & Logan, A. C. (2012). Your brain on nature: The science of nature's influence on your health, happiness and vitality. John Wiley & Sons.
- Williams, F. (2017). *The nature fix: Why nature makes us happier, healthier, and more creative*. WW Norton & Company.
- Wohlleben, P. (2016). The hidden life of trees: What they feel, how they communicate—Discoveries from a secret world (Vol. 1). Greystone Books.





Bhutanese Culture, Tradition and GNH Credit: 8

College of Natural Resources Royal University of Bhutan Lobesa, Punakha, Bhutan

The syllabus of this programme may change from time to time based on emerging needs, learning conditions, experiences and resources.

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Course Director	: Chogyel Wangmo (chogyel.cnr@rub.edu.bt
Course Code	: SOC913
Duration	: Two weeks

Course Overview

This course focuses on exploring the concept of nature and its connection to This course aims to provide a comprehensive understanding of the Bhutanese culture, history, and tradition with an emphasis on its unique identity and philosophy of Gross National Happiness (GNH). Through a combination of theoretical and practical lessons, participants will gain an in depth understanding of country's diverse ethnic backgrounds, social customs, spiritual beliefs, architecture, and traditional arts. The course will be delivered through theory, field work, group activity, group discussion, journal assignment and independent study. Field activity will develop basic skills on Bhutanese customs and etiquette through performance in cultural dance, practice of etiquette, playing traditional sports and visiting cultural sites. The participants will be assessed through their daily journal writing and a quiz based on the course content.

The course offers holistic approach of self-improvement, combining the benefit of nature, cultural understanding, and sustainable living to enhance various aspects of one's well-being.

Learning Outcome

On completion of the course, the participants will be able to:

- 1. Examine the diversity and strength of cultural tradition, including local legends and folk stories.
- 2. Perform basic steps and movement of cultural dances and techniques of selected traditional games.
- 3. Analyse the concept of GNH.
- 4. Demonstrate wearing and handling national dress.
- 5. Demonstrate basic social customs and Bhutanese etiquette according to Driglam Namzha.
- 6. Explain the significance of Bhutanese architecture and traditional arts in Bhutanese culture.

Learning and Teaching Approach

The summer school will take place for the duration of two weeks. During the course period, tutors will employ an interactive, student-centred approach, integrating cultural and critical thinking skills using the following strategies: demonstration, practical exercise and activities, group work that includes discussions, problemsolving activities, collaborative and individual task, and independent study. The hours and credit for learning and teaching approach are given as follow:

Туре	Approach	Total hours
	Lecture	30
Contact	Practical	10
	Field Activity	20
Independent study	Written assignment	10
independent study	Self -study	10
Total		80

Assessment Approach

The assessment, which reflect and test the learning achieved by the participants consist of a daily journal writing and a quiz. Details of the assessment will be provided by the course tutor along with the assessment rubrics. Course tutors are encouraged to provide feedback to participants on their daily journal in the first few days of the course duration, so that participant can improve based on the feedback. The quiz will be based on the course contents and will be conducted at the end of the course to assess the learning outcomes. Participants are reminded of the consequences of plagiarism. Plagiarism will not be tolerated in any form and if any student is found or judged to have plagiarized or indulged in any academic dishonesty, the participants will be considered as fail.

A. Assignment (Daily Journal): 50%

During the course period, participants will maintain daily journal that logs their experiences and insight gained. Participants will have the liberty to use any standard format to record journal. The student will be assessed accordance the following criteria.

- 10 Content
- 10 Topic coverage (the extent to which the article covers and topic and its relevance to course content)
- 10 Quality of analysis
- 5 Consistency
- 5 Originality and creativity
- 5 Organization and clarity
- 5 Grammar, spelling, and punctuation

B. Quiz: 50%

The quiz will be conducted for one hour during the end of the course for 50 marks, which will be converted to 50%. Questions will cover all the contents of the course.

Grade	Judgement of performance	Mark
A+	Outstanding	80% and above
A	Very Good	70 - 79.9%
В	Good	60 - 69.9%
С	Satisfactory	50 - 59.9%
D	Fail	49.9% and below

Grading Scheme

Important notes

Plagiarism

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Deadlines

Timely completion and submission of tasks and assignments are crucial, and as such, each student should understand and meet deadlines associated with his/her assigned tasks and assignments. Those failing to meet the deadline will lead to a deduction of marks.

Contents

Type- L: Lecture, FL: Field Lecture, D: Demonstration, GD: Group Discussion, A: Assignment P/L: Practical/Lab, S: Seminar, OL: Observatory Learning, SR: Student Reflection, SE: Student Exercise

Content	Approach	Time(h)	Facilitator
Module 1: Introduction to Bhutan:Culture, Traditions and Happiness1.1 History of Bhutan1.2 Geography and climate1.3 Economy and society1.4 Diversity and strength of cultural traditions	L/GD	8	Ms. Chogyel Wangmo/ Dr. Thubten Sonam/Dr. Om Katel
Module 2: Ethnic backgrounds and identity markers 2.1 Language, costumes and food habits 2.2 Bhutanese national dress 2.3 Cooking traditional Bhutanese cuisine 2.4 Games and sports-Outdoor Play (practical archery, kuru, dego) 2.5 Songs and music 2.6 Cultural dance and music 2.7 Spiritual and secular dances and rituals 2.8 Cultural dance (practical) 2.9 Health practices 2.10 Agricultural practices	L/GD/D/P/ OL/SR	24	Ms. Chogyel Wangmo/Dr. Rekha Chettri/Mr. Ugyen Dorji/ Ms. Yogeeta Dahal/Dr. Thubten Sonam/ Dr. Sonam Tashi/ Dr. Tulsi Gurung/ Mr. Tandin Gyeltshen
 Module 3: Understanding Bhutan's Customs, cultural heritage, legends, architecture, and healing 3.1 Social customs and etiquette (Driglam namzha) 3.2 Local legends and folk stories 3.3 Beliefs and spirituality (Buddhism and its influence, Importance of monasteries and temples, Festivals religious ceremonies, 3.4 Deities offering culture, Nature protection 3.5 Bhutanese architecture (Dzong, temples, palaces, houses, bridges, 	L/GD/D/P/ OL/SR/FR	40	Dr. Thubten Sona/ Mr. Tandin Gyeltshen/ Kenpo Tshering Dendup

mills, chortens, mani dangrem) 3.6 Thirteen Bhutanese traditional Arts (dzo rig chu sum) 3.7 Traditional medicine and healing practice 3.8 Impact of modernization to Bhutanese culture			
3.9 Cultural heritage field visit (Punakha/ Wangduephodrang Dzong/ Chimmi Lhakang, Textile Museum /National Traditional medicine Institute, Paro Museum/ Paro Taksang)			
Module 4: GNH concept 4.1 The four pillars of GNH 4.2 Measuring GNH 4.3 Implementing GNH 4.4 Case studies	L/GD/SE/ SR	8	Dr. Thubten Sonam/ Dr. Rekha Chettri/ Dr. Dr. Om Katel/ Dr. Sonam Tashi

Prerequisites

Basic understanding of social science is recommended but not mandatory.

Note

The course may include guest lecturers by local healers, local experts

Materials and Resources

PowerPoint projector, whiteboard, marker pen and field notebook.

Reading List

Choden, K. (2013). Bhutanese tales of the Yeti. Proglen Trading Co., Ltd..

Jordans, B. (2010). Bhutan: A Trekker's Guide. Cicerone Press Limited.

Lepeley, M. T. (2017). Bhutan's gross national happiness: An approach to human centred sustainable development. *South Asian Journal of Human Resources Management*, *4*(2), 174-184.

Phuntsho, K. (2013). The history of Bhutan. Random House India.

- Pommaret, F. (2018). *Bhutan: Himalayan mountain kingdom*. Odyssey Books & Maps.
- Ura, K., Alkire, S., & Zangmo, T. (2012). Bhutan: Gross national happiness and the GNH index.

Choden, K. (1994). Folktales of Bhutan. Bangkok: White Lotus Co. Ltd.





Food and Culture in Land of Thunder Dragon Credit: 8

College of Natural Resources Royal University of Bhutan Lobesa, Punakha, Bhutan

The syllabus of the programme may change from time to time based on emerging needs, learning conditions, experiences, and resources.

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Course Director	: Karma Wangchuk (<u>karmaw.cnr@rub.edu.bt</u>)
Code	: FCS914
Duration	: Two Weeks

Course Overview

This two-week course will explore the traditional food and culture of Bhutan. Participants will learn about the importance of food in Bhutanese culture and how it has shaped the country's history, identity, and social customs. They will also gain an understanding of the local ingredients, cooking techniques, and dining etiquette, as well as the role of festivals and ceremonies in Bhutanese cuisines. The course includes lectures, hands-on experience, and field visits to understand Bhutanese food and culture. The participants will be assessed using assignments, practicals, and field visits.

Learning Outcome

On completion of the course, the participants will be able to:

- 1. Explain the unique cultural and culinary traditions of Bhutan.
- 2. Analyze and critique the historical and social context for Bhutanese cuisine.
- 3. Elucidate the relationship between food, culture, and Bhutanese identity.
- 4. Develop practical skills in Bhutanese cooking and dining etiquette.

Learning and Teaching Approach

The following teaching and learning approach will be used for the course: lectures, field visits, assignments, and self-study.

Туре	Approach	Total Hours
Contact	Lecture	12
	Group discussion/presentation	8
	Field visits /practicals	40
Independent Assignment		20
Total		80

Assessment Approach

The following assessments are mandatory to be completed by the participants, which include assignments, field visits, and food cultural analysis. The plagiarism policy is available at <u>www.rub.edu.bt</u> (Wheel of Academic Law - WAL).

A. Group assignment (20%)

A group of 3–4 individuals will document/videograph a processing technique of food from different regions in Bhutan. This is to provide the students with real-time experience in Bhutanese food processing. The following criteria will be used as a guide:

- 8 Edition/clarity
- 8 Narration and subtitle
- 4 Presentation

B. Field visits (60%)

The individual participants will write a report from different field visits to understand festivals, customs and tradition and their connection to Bhutanese cuisine. The report may include personal reflections and critiques. The following places will be visited, and the assignment will be graded as below:

- 1. Punakha Tshechu/Mushroom Festival (Genekha) (20)
- 2. Babesa village restaurant/farmer's House (20)
- 3. Visit to a nearby farm (20)

Further breakdown of marks is provided below:

- 4 Context and introduction
- 8 Content
- 4 Language and critique
- 4 Conclusion

C. Food cultural analysis (20%)

Individual participants will document and analyze the cultural aspects of Bhutanese cuisines in festivals and ceremonies to explore the linkage between festivals, ceremonies, and food. The assignment will be assessed using the following criteria:

- 4 Introduction
- 4 Content
- 4 Analysis and critique
- 4 Conclusion
- 4 References

Grading Scheme

Grade	Judgement of performance	Mark
A+	Outstanding	80% and above
A	Very good	70 - 79.9%
В	Good	60 - 69.9%
С	Satisfactory	50 - 59.9%
D	Fail	49.9% and below

Important notes

Plagiarism

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and professional integrity, and it undermines the values of originality, honesty, and scholarly rigour that we uphold.

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Deadlines

Timely completion and submission of tasks and assignments are crucial, and as such, each student should understand and meet deadlines associated with his/her assigned tasks and assignments. Those failing to meet the deadline will lead to a deduction of marks.

Contents

Type: L: Lecture, FL: Field Lecture, D: Demonstration, GD: Group Discussion, A: Assignment P/L: Practical/Lab, S: Seminar, OL: Observatory Learning, SR: Student Reflection, SE: Student Exercise

Content		Teaching approach	Time (h)	Facilitator
1.	 Module 1: Introduction to Bhutanese food and culture 1.1 Role of food in Bhutanese culture and identity 1.2 Major influences on Bhutanese cuisine (Indian, Chinese, Tibetan) 1.3 Current trends in Bhutanese cuisine and culinary tourism 1.4 Challenges to traditional food culture in Bhutan 1.5 Sustainable food practices and initiatives in Bhutan, Dining etiquette and hospitality, Significance of hospitality in Bhutanese culture 1.6 Group assignment videography 	L & GD &A	12	Kezang Choden
2.	Module 2: Food production system and processing 2.1 Importance of food preservation 2.2 Processing (grinding, distillation, brewing, fermentation, drying —air/smoking, burying — soil/water, pasteurization)	L & GD & FL	8	Ugyen and Sumba
3.	Module 3: Bhutanese cuisines 3.1 Introduction to key Bhutanese ingredients (rice, <i>kharang</i> , chillies, cheese, mushrooms, egg, spices/flavours, vegetables etc.) 3.2 Sourcing of raw materials 3.3 Techniques for cooking Bhutanese food (<i>ema datshi, phaksha paa, momos</i> , rice	L & GD & P/L	11.5	Ugyen, KW, sumba

<i>Thukpa, Bathup, Puta</i> —traditional extruder) 3.4 Regional variations in Bhutanese cuisine 3.5 Hands-on cooking session - Art of making tea (Suja)			
 2. Module 4: Festivals, ceremonies, and food 4.1 Importance of festivals and ceremonies in Bhutanese culture 4.2 Foods and drinks associated with major festivals (<i>Lomba, Losar, Kharam, Tshechus, Diwali</i>) 4.3 Rituals and custom surrounding food during ceremonies (birth, marriage, death) 4.4 Food cultural analysis 	L & GD & A	9.5	Tandin Gyeltshen
 Module 5: Experiencing the Food and Culture 5.1 Field visit to Babesa village restaurant/farmers house/Smoking of fish 5.2 Field visit to Visit to Punakha Tshechu/Genekha mushroom festival. 5.3 Report writing 	F/L, O/L, A, S/R	40	KW, Tandin Gyeltshen, Ugyen and Sumba
Total hours		80	

Materials and Resources

Utensils, raw materials, and bus for field visit.

Reading List

Choden, K. (2008). Chilli and cheese: Food and society in Bhutan. White Lotus.

Nagamatsu, E. T., & Nagamatsu, E. (2010). *Foods of the Kingdom of Bhutan*. Kuensel Corporation.





Traditional Ecological Knowledge in the Himalayas Credit: 8

College of Natural Resources Royal University of Bhutan Lobesa, Punakha, Bhutan

The syllabus of this programme may change from time to time based on emerging needs, learning conditions, experiences and resources.

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Course Director	: Dr. Om Katel (<u>om.cnr@rub.edu.bt</u>)
Course Code	: NRM907
Duration	: Two weeks

Course Overview

The quality of environment around us is immensely important for our well-being. Addressing environmental challenges require not only scientific understanding of drivers affecting environmental change but also engagement of various stakeholders such as government, civil society, and individuals. One of the ways to address environmental challenges is to realise the knowledge and experience attained by local indigenous communities. Communities have lived and learned the ways to manage the environmental resources around them since millennia that would be useful also for current and the future. Specifically, the adaptation of communities with the environmental change and the knowledge they have drawn based on their practice to manage their environmental resources sustainably for now and the future can be generally referred to as Traditional Ecological Knowledges (TEK). TEK entails knowledge comprised of beliefs, action, and cultural practices. Such knowledge is often passed orally and by demonstration. Therefore, to make environmental management more effective and holistic, it is vital to learn from TEK and consider it as inclusive by valuing the perspectives of local people.

This course aims to provide a comprehensive understanding of the role of traditional ecological knowledge (TEK) in the Himalayas, where local communities/indigenous communities have generated the knowledge on how to adapt and manage their environmental resource and passed on from generation to generation benefiting them. The participants will learn about the concept of TEK and its importance in sustainable resource management and its role in preservation of cultural heritages, as well as its current status and challenges faced in its preservation. The participants will explore various ways in which TEK is integrated in Hindu Kush-Himalaya (HKH) regions through cases studies. As a field experience, participants will gain knowledge on integration of TEK in Bhutanese culture through different practices, folklore, and customary approaches. The participants will have the opportunity to learn methods and techniques on documentation and conservation of TEK.

Learning Outcomes

On completion of the module, participants will be able to:

- 1. Explain the concept of TEK and its relevance to sustainable development in Bhutan and HKH region.
- 2. Analyse theories and concepts of TEK in relation to different practices and beliefs of local people among mountain communities in Bhutan.
- 3. Examine the role of TEK in conservation of environmental resources in Bhutan and in HKH regions.
- 4. Analyse and interpret how TEK has shaped human-environmental interactions in Bhutan and beyond.
- 5. Evaluate the documentation and conservation methods and techniques of TEK.

Learning and Teaching Approach

The course comprises an understanding of theories, principles, and cases associated with TEK. Also, class discussions will be held concerning the methods and techniques employed to collect data associated with TEK during the first week. During the second week, the student will spend time in the field to collect and analyze data. Students are then required to present the result of their field study in the class relating to the principles of TEK. The course will be delivered through a combination of lectures, practicals and field visits using an interactive, student-centred approach to integrate scientific and TEK through field exercises and activities. The course delivery comprises theory, fieldwork, group activity, group discussion, assignment and independent study. The course will be assessed from a total of 100 marks. The assessment of the learning will be done in the form of assignments and class presentations, as detailed below.

Туре	Approach	Hours per week	Total hours
	Lecture	5	10
	Tutorials	5	10
Contact	Group presentation	10	20
	Field study	10	20
	Written assignment	5	10
	Independent study	5	10
TOTAL			80

Assessment Approach

The assessment, which reflects and tests the learning outcomes achieved by the participants, consists of a reflective essay and group presentation. The course tutor will provide details of the assessment along with the assessment rubrics. Course tutors are encouraged to provide feedback to participants on their assignments so that participants can improve based on the feedback.

A. Reflective Essay (40%)

Participants will be required to submit a written reflective essay individually reflecting on the concept of Traditional Ecological Knowledge (TEK) and its potential contribution to sustainable development in Bhutan and the Hindu Kush-Himalayan (HKH) region. The assignment should be based on the field experience of 1500-2000 words and should include references and case studies. The following marking criteria will be used.

- 05 Reflection and analysis (demonstrate a clear understanding of the topic and reflect on personal experiences, thoughts, and feelings related to the topic and provide critical assessment on the topic).
- 05 Use of relevant theories and concepts (use relevant theories and concepts related to the topic to support the analysis and evaluations).
- 05 Organization and coherence (well organized and coherent with a clear introduction, body, and conclusion).
- 05 Clarity and concision (clear and concise, proper grammar, punctuation, and spelling).
- 10 Use of evidence (use of relevant and credible evidence to support argument and analysis, proper citation, and reference).

- 05 Creativity and originality (demonstrate creativity and originality in the analysis and evaluation of the topic, provide insights and perspective on the topic).
- 05 Reflection on learning (reflect the learning gained from the course, highlight the areas of growth and need for further improvement.

B. Class presentation

Participants will choose to design a topic for the field study. The topic should be under the broad theme of TEK and should be contextualised to Bhutanese cases. A group comprises three to five individuals and works as a team to collect data related to local traditional knowledge from Dagana or Zhemgang. Students will have three days' time to collect data and analyse the collected data in the field. The data collected should be analysed and presented in the class for grading. The presentation should include theories, principles, and concepts associated with cases around the world. The local cases relating to the evidence on TEK and the ways they are contributing to sustainable resource management in Bhutan and in the HKH region should be presented. Marking criteria for the presentation is as follows:

- 10 Presentation of the framework based on the cases around the world.
- 10 Use of theories and principles.
- 10 Methodology or approaches used for data collection.
- 10 Discussion of data types on local traditional knowledge.
- 10 Critical analyses on reflection of local traditional knowledge with reference to SDGs
- 10 Recommendations and significance of the study

Grading Scheme

Grade	Judgement of performance	Mark
A+	An outstanding performance	80% and above
A	Very good performance	70 - 79.9%
В	Good performance	60 - 69.9%
С	Satisfactory performance	50 - 59.9%
D	Fail	49.9% and below

Important notes

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Deadlines

Timely completion and submission of tasks and assignments are crucial, and as such, each student should understand and meet deadlines associated with his/her assigned tasks and assignments. Those failing to meet the deadline will lead to a deduction of marks.

Course content

Type: L: Lecture, FL: Field Lecture, D: Demonstration, GD: Group Discussion, A: Assignment P/L: Practical/Lab, S: Seminar, OL: Observatory Learning, SR: Student Reflection, SE: Student Exercise

Contents	Approach	Time (h)	Facilitator
Module 1: Traditional Ecological Knowledge (TEK) in perspective 1.1. Theories and principles of TEK. 1.2. Integrating TEK in Science. 1.3. Indigenous knowledge and community resource management. 1.4. Philosophical understading of TEK. 1.5. Learning from indigenous knowledge and relate to TEK for environmental sustainability	L/GD	15	Om Katel
Module 2: Case studies on TEK through historic times 2.1.Historical evolution of TEK in Georgia, Canada and in Eastern Himalayas. 2.2.Diversification of TEK in response to Climate Change.	L/GD	10	Om Katel
 Module 3: Role of TEK on conservation and development 3.1. Communities and natural resources management. 3.2. Case of first european vision for amazonic Indian. 3.3. TEK in south-east Asia. 3.4. Success indicator of development and knowledge of ecosystem. 	L/GD/SR	15	Om Katel/exper ts on TEK from Ministries and NGOs
 Module 4: Institutional and economic issues on TEK 4.1. Characteristics of traditional resource use and ethno-economics. 4.2. Enhancement of social capital. 4.3. Ecological knowledge, subsistence and livelihoods. 	FL/D	20	Dr. Thubten Sonam/Dr Mani Ram Moktan
 Module 5: TEK Research and Documentation 5.1. Techniques for TEK research and documentation. 5.2. Recording indigenous knowledge and practices. 5.3. Participatory mapping, Oral histories 	L/OL/SR/S E	25	Local experts from field/Om Katel
and community-based conservation 5.4. Ethical considerations in engaging with local communities.			
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 Module 6: Challenges and Opportunities 6.1. TEK to address Climate and Environmental challenges. 6.2. Agriculture, forestry, water management & natural resource management. 6.3. Bio-cultural diversity. 6.4. Role of local knowledge in environmental conservation. 6.5. Implications of TEK for sustainable development 6.5.1. Potential contribution of TEK: Poverty alleviation, Biodiversity conservation, Climate change adaptation 	L/A/GD	15	Om Katel

Prerequisites

Basic understanding of ethnobotany, ecology or natural resources management medicine is recommended but not mandatory.

Note

The course may include guest lecturers by botanists, anthropology and ethnobotanists providing students with direct insights and real-world perspectives.

Materials and Resources

Powerpoint projector, whiteboard, marker pen and field notebook.

Reading List

- Das, A., Gujre, N., Devi, R. J., & Mitra, S. (2021). A review on traditional ecological knowledge and Its role in natural resources management: north east India, a cultural paradise. *Environmental management*, 1-22.
- Das, A., Gujre, N., Devi, R. J., Rangan, L., & Mitra, S. (2023). Traditional ecological knowledge towards natural resource management: perspective and challenges in North East India. In *Sustainable Agriculture and the Environment* (pp. 275-294). Academic Press.
- Dkhar, M., & Tiwari, B. K. (2020). Traditional ecological knowledge of tribal communities of North East India. *Biodiversitas Journal of Biological Diversity*, *21*(7).
- Gondo, R. (2022). Integration of traditional ecological knowledge and western science in natural resources management in the Okavango Delta, Botswana. *Journal of African Studies and Development*, *14*(4), 141-153.

- Hoagland, S. J. (2017). Integrating traditional ecological knowledge with western science for optimal natural resource management. *IK: Other Ways of Knowing*, 1-15.
- Houde, N. (2007). The six faces of traditional ecological knowledge: challenges and opportunities for Canadian co-management arrangements. *Ecology and Society*, *12*(2).
- Huntington, H. P. (2000). Using traditional ecological knowledge in science: methods and applications. *Ecological applications*, *10*(5), 1270-1274.
- Kim, S., Li, G., & Son, Y. (2017). The contribution of traditional ecological knowledge and practices to forest management: The case of Northeast Asia. *Forests*, *8*(12), 496.
- Laudari, D. (2010). Implication of traditional ecological knowledge on forest resources management. *Himalayan Journal of Sociology & Anthropology, 4*.
- Lertzman, D. A. (2010). Best of two worlds: Traditional ecological knowledge and Western science in ecosystem-based management. *Journal of Ecosystems and Management*, *10*(3).
- Mekonen, S. (2017). Roles of traditional ecological knowledge for biodiversity conservation. *Journal of Natural Sciences Research*, 7(15), 21-27.
- Menzies, C. R. (Ed.). (2006). *Traditional ecological knowledge and natural resource management*. U of Nebraska Press.
- Rai, S. C., & Mishra, P. K. (2023). Traditional ecological knowledge and resource management: a conceptual framework. In *Traditional ecological knowledge of resource management in Asia* (pp. 1-11). Cham: Springer International Publishing.
- Ray, L. A., Kolden, C. A., & Chapin III, F. S. (2012). A case for developing placebased fire management strategies from traditional ecological knowledge. *Ecology and Society*, *17*(3).
- Ruiz-Mallén, I., & Corbera, E. (2013). Community-based conservation and traditional ecological knowledge: implications for social-ecological resilience. *Ecology and Society*, *18*(4).
- Whyte, K. P. (2013). On the role of traditional ecological knowledge as a collaborative concept: A philosophical study. *Ecological processes*, *2*(1), 1-12.





Agricultural Systems in the Himalayas Credit: 8

College of Natural Resources Royal University of Bhutan Lobesa, Punakha, Bhutan

The syllabus of this programme may change from time to time based on emerging needs, learning conditions, experiences, and resources.

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Course Director	: Tenzin Wangchuk (<u>tenzin.cnr@rub.edu.bt</u>)
Code	: AGR906
Duration	: Two Weeks

Course Overview

This course provides a captivating exploration of the agricultural marvels nestled in the Himalayas. This immersive experience, based in Bhutan, unravels the distinctive features, challenges, and opportunities inherent in Himalayan agriculture. Delving into diverse agroecological zones, traditional farming practices, and innovative approaches, participants gain a comprehensive understanding of the region's food production systems. The course blends dynamic learning methods, including expertled lectures, collaborative classroom discussions, hands-on fieldwork, and selfdirected study. A transformative field trip provides participants with first-hand experiences alongside local farmers. Assessment involves quizzes, reports, and oral presentations, ensuring a well-rounded grasp of Himalayan agricultural intricacies.

Learning outcomes

On completion of the course, the participants will be able to:

- 1. Evaluate agriculture and food production systems in the Himalayas.
- 2. Assess the impact of climate change on agricultural systems in the Himalayas.
- 3. Analyze case studies of successful agricultural practices and identify innovative and adaptive approaches to building climate resilience.
- 4. Gain hands-on experience through field trips and interactive sessions with local farmers using PRA tools.

Learning and Teaching Approach

The theoretical aspect of the course will be taught through lectures and classroom discussions with the aim of integrating critical thinking skills. Experiential learning will help the participants to gain hands-on experience in the course. The hours for learning and teaching approach are given as follows:

Туре	Approach	Total Hours
	Lecture	16.5
Contact	Group discussion and Demonstration	15.5
	Practical/Field Visit	32
Independent study	Assignment	16
	Total	80

Assessment Approach

Participants will be assessed individually as well as in groups to test their knowledge and skills gained from the course. The details of the assessment are as follows:

A. Class Quiz (30%)

Participants will attend a written quiz of 30 marks at the end of Week 1. The quiz will last 20 minutes and will be used to assess the theoretical knowledge.

B. Experiential learning report and presentation (70%)

At the end of the field visit, the participants will work in groups of 2-3 members and will submit a report on activities, field observations, and their experiences from the field visit, making a connection between theoretical concepts and practical experiences. They will also make a group presentation.

The report will be assessed for 50% using the criteria below:

- 20 Content (depth and relevancy)
- 10 Critical reflections
- 7 Coherence/organisation
- 6 Conclusion
- 4 Clarity
- 3 Language

The presentation will be assessed for 20% based on the following criteria:

- 7 Content
- 4 Delivery
- 3 Visuals
- 3 Overall presentation
- 3 Responses to questions

Grading Scheme

Grade	Judgement of performance	Mark
A+	Outstanding	80% and above
A	Very Good	70 - 79.9%
В	Good	60 - 69.9%
С	Satisfactory	50 - 59.9%
D	Fail	49.9% and below

Important notes

Plagiarism

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Deadlines

Timely completion and submission of tasks and assignments are crucial, and as such, each student should understand and meet deadlines associated with his/her assigned tasks and assignments. Those failing to meet the deadline will lead to a deduction of marks.

Contents

Type: L: Lecture, FL: Field Lecture, D: Demonstration, GD: Group Discussion, A: Assignment P/L: Practical/Lab, S: Seminar, OL: Observatory Learning, SR: Student Reflection, SE: Student Exercise

Contents	Approach	Time (h)	Facilitator
 Module 1. Introduction to the Himalayan farming 1.1 Background 1.2 Farming diversity and characteristics (subsistence and semi-commercial) 1.3 Characterization of agro-ecological zones 	L/GD	3.5	Mahesh Ghimiray/ Tenzin Wangchuk
 Module 2. Food production systems in the Himalayas 2.1 Integrated food production systems: crops, animals, and trees 2.2 Types of production systems: crops and cropping system 2.2.1 Irrigated/wetland. 2.2.2 Rainfed/dryland systems 	L/GD	3	Mahesh Ghimiray
Module 3. Recent approaches to farming in Bhutan 3.1 Organic farming 3.2 High-value cash crop farming	L/GD	3	Dr. Sonam Tashi
 Module 4. Climate change and its impact on agriculture in the Himalayas 4.1 Shifts in weather pattern 4.2 Vulnerability to climate change 4.3 GLOF and its effect 4.4 Pest and diseases outbreak 4.5 Adaptation and mitigation measures 	L/GD/SR	7.5	Mahesh Ghimiray/ Tenzin Wangchuk
 Module 5. Challenges faced by farmers in the Himalayas 5.1 Production related: Geographical terrain, Scale of farming, Input availability 5.2 Market related: access to market, Transportation cost, Marketing chain, Policy barrier 5.3 Processing related: value addition, inadequate equipment and facilities and lack of expertise 	L/GD	6	Mahesh Ghimiray/ Tenzin Wangchuk
Module 6. Case studies of successful agricultural practices in the Himalayas	GD/A	8	Mahesh Ghimiray

Module 7. Participatory Rural Appraisal7.1 Definition and principles7.2 Basic PRA tools7.3 Interviewing7.4 Evaluation of findings7.5 Feedback session with the farmers7.6 PRA report writing	L/D	9	Dr. Thubten Sonam
Module 8. Field trip to observe agricultural systems using Participatory Rural Appraisal (PRA) tools: A case of Bhutan 8.1 Field survey and data collection 8.2 Data compilation and processing for presentation 8.3 Evaluation and feedback, report generation	A/OL/SR	40	Dr. Thubten Sonam/ Tenzin Wangchuk

Materials and Resources

Books, LCD, Projectors, Stationery (chart paper, marker, staple, cellotape), White board, Bus, Tents, Utensils for cooking

Reading list

- Cavestro, L. (2003). PRA-participatory rural appraisal concepts methodologies and techniques. *Padova University. Padova PD. Italia*.
- Chaudhary, P., & Bawa, K. S. (2011). Local perceptions of climate change validated by scientific evidence in the Himalayas. *Biology Letters*, 7(5), 767-770. <u>https://doi.org/10.1098/rsbl.2011.0269</u>
- Chhogyel, N., & Kumar, L. (2018). Climate change and potential impacts on agriculture in Bhutan: A discussion of pertinent issues. *Agriculture & food security*, 7(1), 1-13.
- Dorji, T., & Rai, P. B. (2018). Traditional agricultural practices in Bhutan: A review. *Journal of Mountain Science*, 15(7), 1553-1563. https://doi.org/10.1007/s11629-018-4872-8
- Gyamtsho, T., & Gaihre, S. (2016). Agricultural productivity and food security in Bhutan: Status and future prospects. *Mountain Research and Development*, 36(2), 250-260. <u>https://doi.org/10.1659/MRD-JOURNAL-D-15-00067.1</u>
- Joshi, P. K., & Jha, S. K. (2015). Livelihood security and agro-biodiversity through sustainable agricultural practices: A case study from the Kumaon Himalaya, India. *Ecological Indicators*, 57, 558-569. <u>https://doi.org/10.1016/j.ecolind.2015.05.024</u>
- Khadka, K., & Maharjan, K. L. (2020). Climate change, food security, and agrobiodiversity in the Himalayan region. *Journal of Mountain Science*, 17(6), 1356-1366. <u>https://doi.org/10.1007/s11629-020-6103-8</u>
- Tamang, B., & Thapa, G. B. (2020). Agrobiodiversity management for enhancing resilience of farming systems in Bhutan. Agroecology and Sustainable Food Systems, 44(5), 533-551. <u>https://doi.org/10.1080/21683565.2019.1698363</u>





Living a Farmer's Life in the Himalayas Credit: 8

College of Natural Resources Royal University of Bhutan Lobesa, Punakha, Bhutan

The syllabus of the programme may change from time to time based on emerging needs, learning conditions, experiences, and resources.

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Course Director	: Mahesh Ghimiray (<u>mghimiray@gmail.com</u>)
Code	: AGR 907
Duration	: Two Weeks

Course Overview

This course provides a unique opportunity for participants to immerse themselves in the way of life and culture of rural Bhutan. It also provides an in-depth understanding of agricultural and rural life in Bhutan with a focus on sustainability and livelihoods. Bhutan, known for its unique Gross National Happiness development philosophy, provides a unique case study of sustainable agricultural practices and rural livelihoods. The course will combine theoretical and practical approaches, including lectures and hands-on experience on working and living on a farm. The participants will be assessed using various methods such as quizzes, journals, and reflections.

Learning Outcome

At the end of the course, the participants will be able to:

- 1. Understand agriculture and rural life in Bhutan.
- 2. Gain knowledge of sustainable agriculture practices.
- 3. Experience living on a farm and engaging in the daily chores of a farmer.

Learning and Teaching Approach

The teaching and learning approach comprises a combination of theory in the form of class lectures, interactive discussion sessions, group work, oral presentations, and independent study. The second week of the course will be fully devoted to experiential learning by allowing the participants to live in rural areas with host families and engage themselves in the daily activities of the farmers.

Туре	Approach	Total Hours
	Lecture	20
Contact	Class discussion	10
	Presentation	5
	Farm experience	30
Independent study	Self-study	15
Total		80

Assessment approach

Participants will be assessed individually as well as in group work to test their knowledge and skills gained from the course. The details of the assessment are as follows:

A. Class Quiz (30%)

Participants will attend a written quiz of 30 marks at the end of Week 1. The duration of quiz will be 25 minutes and will be used to assess the theoretical knowledge.

B. Daily Journal (30%)

During their stay in the household, participants will maintain a daily journal that logs their experiences and insights gained. The journal will be assessed as per the rubric provided in Appendix A.

C. Reflection Essay (40%)

In groups of 2-3 members, the participants will write a reflection essay on their experience of living on a farm. They will also make a 15-minute oral presentation of their experience.

The reflection essay will be for 30% and will be assessed as follows:

- 4 Clarity
- 5 Reflection
- 4 Connection with course content
- 5 Depth of analysis
- 4 Writing quality
- 5 Evidence of personal growth
- 3 Originality

The presentation will be assessed for 10% based on the following criteria:

- 4 Content
- 2 Delivery
- 2 Visuals
- 2 Responses to questions

Grading Scheme

Grade	Judgement of performance	Mark
A+	Outstanding	80% and above
A	Very Good	70 - 79.9%
В	Good	60 - 69.9%
С	Satisfactory	50 - 59.9%
D	Fail	49.9% and below

Important notes

Plagiarism

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Our university takes plagiarism seriously, and instances of plagiarism will result in severe consequences, including but not limited to academic penalties such as failure of the assignment, course or expulsion and legal consequences in cases of copyright infringement.

Deadlines

Timely completion and submission of tasks and assignments are crucial, and as such, each student should understand and meet deadlines associated with his/her assigned tasks and assignments. Those failing to meet the deadline will lead to a deduction of marks.

Contents

Type: L: Lecture, FL: Field Lecture, D: Demonstration, GD: Group Discussion, A: Assignment P/L: Practical/Lab, S: Seminar, OL: Observatory Learning, SR: Student Reflection, SE: Student Exercise

Contents	Teaching approach	Time (h)	Facilitator
Module 1. Introduction to Agricultural and RuralLife1.1 Mountain agriculture and rural living1.2 Himalayan ecosystems and biodiversity1.3 Features of mountain farming1.4 Agriculture and Bhutan's GNH developmentphilosophy1.5 Historical context and evolution of agriculture inBhutan1.6 Challenges and opportunities of farming in theHimalayan mountains	L/GD	7	Mahesh Ghimiray Tenzin Wangchuk
 Module 2. Farming practices in Himalayas 2.1 Traditional Mountain farming and sustainability 2.2 Crops and cropping systems 2.3 Livestock management 2.4 Integrating crops, animals and trees 2.5 Examples of sustainable agriculture practices in Bhutan Himalaya 2.6 Organic farming: opportunities and challenges 	L/GD	9	Dr Jigme Tenzin, Dr Sonam Tashi Tenzin Wangchuk MGhimiray
Module 3. Case studies of sustainable farming practices in the Himalayas	A	9	MG/JT/ST & TW
Module 4. Farm experience in rural Bhutan 4.1 Introduction to Bhutanese culture and tradition 4.2 Local culture, traditions, beliefs, and significance 4.3 Cultural diversity and its importance 4.4 Tradition of singing and dancing 4.5 Excursion to Punakha valley Module 5. Experiencing rural life	L/D/GD/FL	7	TG/TS/MG
		0-	

5.1 Living with a host family		and WG
5.2 Farm tour/transect		
5.3 Milking cows		
5.4 Harvesting vegetables		
5.5 Cooking Ema datshi		
5.6 Cultural evenings		
5.7 Farm observation: interconnectedness of		
nature, farming, and livelihoods		

Materials and Resources

Books, LCD, Projectors, Stationery (chart paper and marker), whiteboard, Bus

Reading list

Choden, K., & Roder, W. (2008). *Chilli and Cheese: Food and Society in Bhutan*: White Lotus.

Documentary: "The Happiest Country on Earth Revealed! | My Bhutan Road Story" by ETHEREAL. (43) The Happiest Country on Earth Revealed! | My Bhutan Road Story - YouTube

Phuntsho, S. (2019). Bhutan: A Complete Guide. Bradt Travel Guides.

Katwal, T. (2013). Multiple cropping in Bhutanese agriculture: Present status and opportunities. In *Regional Consultative Meeting on Popularizing Multiple Cropping Innovations as a Means to Raise Productivity and Farm Income in SAARC Countries*. Peradeniya, Kandy Sri Lanka.

FAO. Undated. Livestock composition in the Himalayan Mountains.

International Institute for Environment and Development. Smallholder farming systems in the Indian Himalayas Key trends and innovations for resilience.





Climate-smart Agriculture Using Geospatial Technologies Credit: 8

College of Natural Resources Royal University of Bhutan Lobesa, Punakha, Bhutan

The syllabus of this programme may change from time to time based on emerging need, learning conditions, experiences, and resources.

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Course Director	: Dr. Ugyen Thinley (<u>uthinley.cnr@rub.edu.bt</u>)
Code	: GIS908
Duration	: Two Weeks

Course Overview

This course contains concepts, principles and practices of Climate-smart Agriculture and how geospatial technologies can be integrated to operate CSA successfully. The course will be delivered through a combination of lectures, case studies, and practical exercises. The practical exercises will give students hands-on experience in using GIS software for CSA decision-making, data analysis, and mapping. The course will be assessed using a combination of different approaches. The course will be suitable for students with a background in agriculture or environmental sciences, as well as professionals in the agriculture sector who want to enhance their skills in using GIS for climate-smart decision-making.

Climate-smart agriculture (CSA) is an approach that aims to increase agricultural productivity, enhance resilience to climate change, and reduce greenhouse gas emissions from the sector. Geospatial tools are technologies that enable the collection, analysis, and visualization of spatial data, such as satellite imagery, geographic information systems (GIS), and remote sensing.

This programme provides students with opportunities to apply skills and knowledge to solve real-world problems, such as improving crop yields, adapting agricultural practices to climate variability, and reducing emissions. Students will be empowered to create new products, services, and policies that can benefit farmers, consumers, and society. In the nexus of agriculture, climate change and geospatial technologies, in the long run, students can become a precision agriculturist, GIS analysts, environmental consultants, and climate policy analysts.

Learning Outcomes

On completion of the course, the participants will be able to:

- 1. Describe the concepts and principles of CSA.
- 2. Explain different CSA technologies and practices.
- 3. Design CSA practices using a Geographic Information System.
- 4. Acquire remotely sensed datasets from open sources such as Google Earth Engine, Earth Explorer, etc.
- 5. Carry out a case study on a typical Bhutanese agriculture landscape.

Learning and Teaching Approach

This course will be delivered using a mixed mode comprising lectures, class exercises and tutorials. Field trips to nearby farms will also be arranged to get a firsthand idea of climate-smart agriculture practices. Different modes of teaching-learning are given in the following table, along with duration.

Туре	Approach	Total Hours
Contact	Lecture	9
Contact	Group discussion/presentation	3
Contact	Field visits /practicals	50

Independent	Assignment	18
Total		80

Assessment Approach

The participants' learning will be assessed using different approaches. The assessment will be from a total of 100%. The different assessment approaches are given below, along with assessment marks.

A. Group presentation (40%)

The participants will be divided into groups of four or five, depending on the number of participants. Through desktop review and using secondary data on climatic and edaphic factors, the participants will draw up a CSA suitability analysis integrating GIS. They will present their work in the form of poster exposition, and it be evaluated using the following criteria:

- 6 Problem definition
- 6 Workflow and procedure
- 10 Poster design
- 14 Presentation skills
- 4 Group participation/Response to questions

B. Case study (40%)

Each participant will write a case study comparing the resilience of farms that have adopted CSA technologies to those which have not. The farm resilience should be in terms of building mitigation measures and adaptation practices against climatic events such as erratic rainfall, flash floods, pest and disease outbreaks, soil erosion, etc. The study should be of 2,500–2,700 words, and it will be graded based on the following criteria:

2 Attractive title

- 12 Comprehension of the key issues, concepts, and facts
- 4 Use of appropriate terminologies of CSA and GIS
- 9 Depth and breadth of analysis of the case
- 6 Creativity and originality
- 5 Clarity, structure, and organization of the report
- 2 Currency of the references

C. Field trip report (20%)

Participants will be taken to nearby farms that have adopted CSA technologies and practices. Here, besides observing the farms, the participants will interact with farmers on challenges and prospects of adopting CSA, and future scope of enhancing/upscaling CSA by using geospatial technology. The participants will submit a field trip report three days after the trip. The following criteria will be used to assess the report:

- 2 Observational skills
- 9 Identification of opportunities and challenges
- 2 Clarity and logical sequencing of ideas
- 7 Relevant and practical recommendations

Grading Scheme

Grade	Judgement of performance	Mark
A+	Outstanding	80% and above
A	Very Good	70 - 79.9%
В	Good	60 - 69.9%
С	Satisfactory	50 - 59.9%
D	Fail	49.9% and below

Important notes

Plagiarism

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Deadlines

Timely completion and submission of tasks and assignments are crucial, and as such, each student should understand and meet deadlines associated with his/her assigned tasks and assignments. Those failing to meet the deadline will lead to a deduction of marks.

Contents

Type: L: Lecture, FL: Field Lecture, D: Demonstration, GD: Group Discussion, A: Assignment PL: Practical/Lab, S: Seminar, OL: Observatory Learning, SR: Student Reflection, SE: Student Exercise

Contents	Approach	Time (h)	Facilitator
Module 1: Introduction to Climate- smart Agriculture			
 1.1 Climate change impacts on agriculture 1.2 Overview of CSA concept and principles 1.3 CSA practices in Bhutan 	L/GD	4	Dr. Sonam Tashi

Module 2: GIS integration in CSA 2.1 Importance of GIS in CSA 2.2 Introduction to GIS software (commercial and free) 2.3 Data collection using GPS handsets, digital datasets (satellite datasets and analogue datasets) 2.4 Spatial analysis techniques for climate smart decision-making in agriculture 2.5 Mapping of climate risks, vulnerabilities, and opportunities in agriculture 2.6 Monitoring and evaluation of CSA practices using GIS	L/GD/PL	33	Dr. Ugyen Thinley Dr. Sonam Tashi & Dr. Ugyen Thinley
Module 3: Implementation of CSA practices using GIS 3.1 Crop modelling and yield mapping using GIS 3.2 Land use planning for CSA using GIS 3.3 Water management and conservation using GIS 3.4 Case studies of successful CSA practices using GIS	L/PL/A	43	Dr. Ugyen Thinley

Prerequisites

Basic skills of computer, basic background in GIS and Remote Sensing, and foundation in Agriculture.

Materials and Resources

ArcGIS software, QGIS software, Laptop/PC, Land Use Land Cover map, DEM, National and International Administrative Boundary map, Building Footprints, GPS handsets, satellite datasets (Landsat, sentinel), scanner.

Reading List

Ahmad, F., Farooq, A., Goparaju, L., & Rizvi, J. (2020). The Geospatial Understanding of Climate-Smart Agriculture and REDD+ Implementation: Indian Perspective. *Ekológia* (Bratislava), 39(1), 72-87.

- Faurès, J. M., Bartley, D., Bazza, M., Burke, J., Hoogeveen, J., Soto, D., & Steduto, P. (2013). *Climate smart agriculture sourcebook*. FAO, Rome, 557.
- Kazemi Garajeh, M., Salmani, B., Zare Naghadehi, S., Valipoori Goodarzi, H., & Khasraei, A. (2023). An integrated approach of remote sensing and geospatial analysis for modeling and predicting the impacts of climate change on food security. Scientific Reports, 13(1), 1057.
- Koley, M. S., & Jeganathan, C. (2030). *Geospatial Technology: the emerging global trend towards the new horizon of sustainable agriculture.*
- Mathenge, M., Sonneveld, B. G., & Broerse, J. E. (2022). Application of GIS in Agriculture in Promoting Evidence-Informed Decision Making for Improving Agriculture Sustainability: A Systematic Review. *Sustainability*, 14(16), 9974.
- Tenzin, J., Phuntsho, L., & Lakey, L. (2019). *Climate smart agriculture: Adaptation & mitigation strategies to climate change in Bhutan*. Climate Smart Agriculture: Strategies to Respond to Climate Change; Shrestha, RB, Boktiar, S., Eds, 37-61.





Wild Edible Plants of Bhutan Himalaya

Credit: 8

College of Natural Resources Royal University of Bhutan Lobesa, Punakha, Bhutan

The syllabus of this programme may change from time to time based on emerging needs, learning conditions, experiences, and resources.

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Course Director	: Karma Wangchuk (karmaw.cnr@rub.edu.bt)
Code	: MAP903
Duration	: Two Weeks

Course Overview

This two-week course is designed to introduce participants to the rich diversity of wild fruits and vegetables found in the Himalayas of Bhutan. The course will cover the identification, cultivation, and culinary uses of these wild plants. The course will also explore the nutritional benefits of incorporating wild plants into one's diet and the importance of conservation and sustainable harvesting practices, as well as the cultural significance of these plants in the traditional Bhutanese way of life. The course will be delivered through theory, fieldwork/practicals, assignments, and self-study. The participants will be assessed using various methods, such as written assignments and field trip reports.

Learning Outcome

On completion of the course, the participants will be able to:

- 1. Understand the basic botany of wild plants.
- 2. Identify wild fruits and vegetables found in the Bhutan Himalaya region.
- 3. Explore the culinary uses of wild plants.
- 4. Understand the nutritional and health benefits.
- 5. Examine the cultural significance of wild plants in the traditional Bhutanese way of life.

Learning and Teaching Approach

Following contact and independent study approach will be used for the course.

Туре	Approach	Total Hours
	Lecture	9
Contact	Group discussion/presentation	1
	Field visits /practicals	48
Independent	Assignment	22
Total		80

Assessment Approach

The following assessments are mandatory to be completed by the participants, which include written assignments, nutritional analysis projects and field trip reflection reports.

Assessment Approach

4. Written Assignment (40%)

Participants will write an essay of 1500-2000 words regarding the cultural, culinary and medicinal significance of wild fruits and vegetables found in Bhutan Himalaya. The written essay will be assessed using the following criteria:

- 5 Introduction
- 15 Content
- 5 Language
- 5 Structure
- 5 Evidence
- 5 References

5. Field trip reflection report (60%)

To gain the field experience and exposure of wild fruits and vegetables of Bhutan Himalaya, the participants will go for a field trip to nearby forest and village to study the different wild fruits and vegetables and their application in Bhutanese cuisines. After every field trip, each participant will write a reflection report and it will be assessed as follows:

- 5 Context and introduction
- 30 Content
- 10 Language and critique
- 5 Format
- 5 Originality
- 5 Conclusion

Grading Scheme

Grade	Judgement of performance	Mark
A+	Outstanding	80% and above
A	Very good	70 - 79.9%
В	Good	60 - 69.9%
С	Satisfactory	50 - 59.9%
D	Fail	49.9% and below

Important notes

Plagiarism

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Deadlines

Timely completion and submission of tasks and assignments are crucial, and as such, each student should understand and meet deadlines associated with his/her assigned tasks and assignments. Those failing to meet the deadline will lead to a deduction of marks.

Contents

Type: L: Lecture, FL: Field Lecture, D: Demonstration, GD: Group Discussion, A: Assignment P/L: Practical/Lab, S: Seminar, OL: Observatory Learning, SR: Student Reflection, SE: Student Exercise

Contents	Approach	Time (h)	Facilitator
 Module 1: Introduction to Wild Fruits and Vegetables of Bhutan Himalaya 1.1 Overview of Bhutan Himalayan region and its flora 1.2 Ecological importance of wild plants in the region 1.3 Cultural Significance of wild plants 1.4 Traditional beliefs and customs, Importance of wild plants in Bhutanese festivals and ceremonies, Role of wild plants in preserving Bhutanese cultural identity, Conservation, and sustainable harvesting of wild edible plants 	L	10	Dr. DB, Tandin Gyeltshen
Module 2: Botany of wild fruits and vegetables2.1 Basic botany of wild edible plants2.2 Taxonomy of wild edible plants2.3 Common wild fruits and vegetables2.4 Practical session on identification of wild fruits and vegetables2.5 Field trip to explore and identify the different wild fruits and vegetables (In and around Punakha and Wangdue) 2.6 Written assignment	L & D & P/L & F/L	30	Dr. DB, Ugyen Dorji
 Module 3: Use of Wild Edible Plants in Bhutan Himalaya 3.1 Traditional Bhutanese dishes using wild Edible plants. 3.2 Nutritional and health benefits of incorporating wild plants into one's diet 3.3 Preparing food from wild plants in Bhutanese cuisine 3.4 Practical session (Pickle, Soup (mushroom, bamboo, vassica, patsa- cane, wild flower, damroo, nakey) 3.4 Field trip to Tsirang/Dagana/Trongsa 3.5 Report writing 	L & D & P/L & F/L	40	KW, Ugyen
Total		80	

Materials and Resources

Plant identification book, Magnifying glass, Knife/Pruning shears, Hand gloves, Camera, GPS, LCD screen, Projector, Whiteboard, Marker pens, Raw materials for practical session, Microscope.

Reading list

- Yangdon, P., Araki, T., Rahayu, Y. Y. S., & Norbu, K. (2022). Ethnobotanical study of wild edible fruits in eastern Bhutan. *Journal of Ethnobiology and Ethnomedicine*, 18(1), 27. <u>https://doi.org/10.1186/s13002-022-00526-8</u>
- Belwal, T., Bhatt, I. D., & Devkota, H. P. (Eds.). (2022). *Himalayan Fruits and Berries: Bioactive Compounds, Uses and Nutraceutical Potential*. Elsevier.
- Kunwar, R. (2017). Wild Edible Vegetables of Lesser Himalayas. Ethnobotancial and Nutraceutical Aspects, Volume 1. Springer.





Ethnomedicine of Eastern Himalayas Credit: 8

College of Natural Resources Royal University of Bhutan Lobesa, Punakha, Bhutan

The syllabus of this programme may change from time to time based on emerging needs, learning conditions, experiences, and resources.

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Course Director	: Dr. Sonam Tashi (<u>stashi.cnr@rub.edu.bt</u>)
Code	: MAP902
Duration	: Two weeks

Course Overview

The course contains topics on traditional medicinal plants, their classification and ethnomedicine and local medicinal practices and plant-based therapies amongst the diverse ethnic communities inhabiting the Eastern Himalaya region. The course also contains discussion conservation to reduce pressure on wild collection of medicinal herbs and for their future sustainability. This course aims to bridge the gap between traditional knowledge and modern scientific understanding, offering insights into the rich biodiversity of medicinal plants and the cultural context that shape ethnomedicinal practices.

The two-week course will be delivered using learner-centred approaches and assessment of the learning will be done through different methods, including group presentations and assignments.

Learning Outcomes

On completion of the course, the participants will be able to:

- 1. Describe roles and importance of ethnomedicines.
- 2. Identify/classify different ethnomedicines of plant, animal, and mineral origins.
- 3. Explain different traditional healing practices.
- 4. Describe threats to sustainability of wild medicinal plants.
- 5. Explain the domestication and conservation practices of traditional medicinal plants.

Learning and Teaching Approach

The course will be delivered through a combination of lectures, practical and field visits. Lectures will comprise introduction to importance of traditional medicines, healing practices, identification and classification of medicinal plants used in ethnomedicine. As part of learning, the participants will also visit relevant institutions, communities and medicinal herb gardens and farms in the country.

Туре	Approach	Total hours
	Lecture	16
Contact	Field visit	26
	Herbarium collection	10
Indonandant	Field visit report	16
study	Documentation	8
	Self-study	4
Total		80

Assessment Approach

The course will be assessed from a total of 100 marks. The assessment of the learning will be done in the form of assignments and written examination as detailed below.

A. Herbarium collection (50%)

Herbarium collections provide systematic and organized documentation of medicinal plants used in traditional healing practices. Each specimen serves as a tangible record, containing essential information about the plant's taxonomy, habitat, and traditional uses. This assignment highlights the significance of the herbarium collection as a valuable tool in documenting and preserving the rich botanical diversity associated with ethnomedicine.

Each student will prepare a herbarium with at least 10 high and low medicinal plant specimens as part of the medicinal plant identification and classification exercise. The neatly developed herbarium should be submitted three days prior to the end of the study period, and it will be graded using the following criteria:

- 5 Specimen identification
- 10 Collection quality (preservation condition, natural colour and shape)
- 15 Documentation (habitat, associated flora and ethnomedicinal uses)
- 17 Labelling of plant specimens
- 3 Overall presentation

B. Field Visit Report (25%)

Students will be taken on a field trip to Tsirang to explore holistic approaches to healthcare that have sustained the communities there, emphasizing the intricate balance between nature, culture, and well-being. The students will interact with traditional healers, medicine men and knowledgeable community members. Through these interactions, students are expected to gain insights into the indigenous knowledge systems, herbal remedies and spiritual practices that form the foundation of ethnomedicine in the Eastern Himalayas.

Three days after the trip, the students will submit a field trip report of 2,000-2,500 words. The following criteria will be used to evaluate the report:

- 1 Attractive title
- 10 Comprehension of ethnomedicine practices
- 10 Critiques of healing practices
- 4 Clarity, structure, and organization of the report

C. Documentation Assignment (25%)

Students will, through desktop reviews and interviews, explore, record, and analyze the ethnomedicinal knowledge and practices prevalent in the Eastern Himalayas. The assessment aims to evaluate the depth and breadth of the documentation, including the identification of medicinal plants, traditional healing methods, cultural beliefs, and the overall significance of ethnomedicines in the region.

The documentation assignment worth 2,000-2,500 words should be submitted a week before the end of the course. The assignment will be evaluated based on the following criteria:

- 8 Content (depth and accuracy of information provided)
- 3 Organization (logical structure of the document
- 5 Relevance
- 4 Originality

5 Clarity

Grading Scheme

Grade	Judgement of performance	Mark
A+	An outstanding performance	80% and above
A	Very good performance	70 - 79.9%
В	Good performance	60 - 69.9%
С	Satisfactory performance	50 - 59.9%
D	Fail	49.9% and below

Important notes

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Contents

Type: L: Lecture, FL: Field Lecture, D: Demonstration, GD: Group Discussion, A: Assignment P/L: Practical/Lab, S: Seminar, OL: Observatory Learning, SR: Student Reflection, SE: Student Exercise

Contents	Approach	Time (h)	Facilitator
Module 1: Understanding Eastern			
Himalayan Biodiversity			
1.6. Overview of the Eastern Himalayan region: Geographical, cultural, and ecological diversity.	L/GD	5	Sonam
1.7. Identification and classification of key medicinal plant species.		•	Tashi/????
1.8. Importance of biodiversity			
conservation in ethnomedicinal			
practices.			

Module 2: Cultural and Historical			
Perspectives			
2.3. Historical evolution of			
ethnomedicines in Eastern			Sonom
Himalayas.	L/GD	5	Tachi
2.4. Influence of various cultures and			1 4511
ethnic groups on medicinal practices.			
2.5. Role of traditional healers and their			
significance in the community.			
Module 3: Traditional Healing Systems			
3.5. Comparative analysis of traditional			
healing systems (Ayurveda,			
Traditional Chinese Medicine,			
Tibetan Medicine, etc.) in the			Sonam
Eastern Himalayan context.	L/GD/SR	20	Tashi/Loca
3.6. Integration of spiritual and ritualistic			I healers
elements in ethnomedicinal			
practices.			
3.7. Case studies showcasing traditional			
healing methodologies.			
Module 4: Medicinal Plant Identification			
and Usage			0
4.4. Field visits and practical sessions for			Sonam
the identification of medicinal plants.	- 1 / D		Tashi/Drun
4.5. Understanding plant parts used,	FL/D	20	gtsno
preparation methods, and dosage.			Sangay
4.6. Sustainable harvesting and			vvangdi
cultivation practices.			
Module 5: Ethnobotanical Research and			
Documentation			Sonam
5.5. Techniques for ethnomedicinal			Tashi/Drun
research and documentation.	1./A	45	gtsho
5.6. Recording indigenous knowledge	L/A	15	Sangay
and practices.			Wangdi/Sh
5.7. Ethical considerations in engaging			erub Dorji
with local communities.			
Module 6: Challenges and Opportunities			
6.6. Conservation challenges facing			
medicinal plant species in Eastern			
Himalayas.			Comore
6.7. Economic opportunities and	L/A/GD	5	Sonam
sustainable livelihoods through			Tashi
ethnomedicinal practices.			
6.8. Government policies and initiatives			
supporting traditional medicine.			
Module 7: Integrating Traditional and			
Modern Medicine			
7.1. Collaborative approaches to bridge			
traditional and modern medical			Sanam
systems.	L/A/GD	5	Tashi
7.2. Scientific validation of			Iasili
ethnomedicinal practices.			
7.3. Opportunities for interdisciplinary			
research and collaboration.			

 Module 8: Future Prospects and Sustainability 8.1. Innovations in ethnomedicine and the potential for drug discovery. 8.2. Sustainable practices for the long- term preservation of traditional knowledge. 8.3. The role of education and awareness in ensuring the continuity of ethnomedicinal practices. 	L/A/GD	5	Sonam Tashi
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Prerequisites

Basic understanding of ethnobotany, ecology or traditional medicine is recommended but not mandatory.

Note

The course may include guest lecturers by traditional healers, botanists, and experts in ethnomedicine, providing students with direct insights and real-world perspectives.

Materials and Resources

PowerPoint projector, whiteboard, marker pen and field notebook.

Reading List

- Brizzi, K., Deki, S., Tshering, L., Clark, S. J., Nirola, D. K., Patenaude, B. N., ... & Mateen, F. J. (2016). Knowledge, attitudes and practices regarding epilepsy in the Kingdom of Bhutan. *International health*, 8(4), 286-291.
- Chetri, B. K. (2019). Ethnobotanical study of south eastern foothills of Bhutan. *Asian Plant Res J*, 2(1), 1-20.
- Lepcha, S. R., & Das, A. P. (2011). Ethno-medico-botanical exploration along the international borders to Tibet Autonomous Region of China and the kingdom of Bhutan with special reference to the Pangolakha Wildlife Sanctuary, East Sikkim. East Sikkim: Recent Studies in Biodiversity and Traditional Knowledge in India, 257, 270.
- Ngawang, R. Indigenous medicinal plants of Bhutan. Ethnomedicine practices of Bhutan.
- Rabgyal, J., & Pelden, K. (2020). Sustainable harvesting practices for endangered medicinal plants of Bhutan.
- Seshagirirao, K., Harikrishnanaik, L., Venumadhav, K., Nanibabu, B., Jamir, K., Ratnamma, B. K., & Kunal, D. (2016). Preparation of herbarium specimen for plant identification and voucher number. *Roxburghia*, 6(1-4), 111-119.
- SujataDeo, R. D., Khubalkar, R., & Thombre, S. Modern Technique for Collection of Medicinal Plant (*Cleistanthus collinus*) and Preparation of Herbarium Specimen.

- Wangchuk, P., Namgay, K., Gayleg, K., & Dorji, Y. (2016). Medicinal plants of Dagala region in Bhutan: their diversity, distribution, uses and economic potential. *Journal of ethnobiology and ethnomedicine*, 12, 1-19.
- Yeshi, K., Aagaard-Hansen, J., & Wangchuk, P. (2021). Medicinal, nutritional, and spiritual significance of plants in Bhutan: their biodiscovery potential and conservation status. *Ethnobiology of Mountain Communities in Asia*, 1-25.
- Yeshi, K., Gyal, Y., Sabernig, K., Phuntsho, J., Tidwell, T., Jamtsho, T., ... & Wangchuk, P. (2019). An integrated medicine of Bhutan: Sowa Rigpa concepts, botanical identification, and the recorded phytochemical and pharmacological properties of the eastern Himalayan medicinal plants. *European Journal of Integrative Medicine*, 29, 100927.





Learning Statistics Using R Credit: 8

College of Natural Resources Royal University of Bhutan Lobesa, Punakha, Bhutan

The syllabus of this programme may change from time to time based on emerging needs and learning conditions, experiences, and resources.

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Course Director	: Dr. Jigme Tenzin
Code	: STS907
Duration	: 2 weeks

Course Overview

This two-week course will provide participants with a comprehensive understanding of the R programming language and its use in data visualization and statistical analysis. It will cover basic syntax in R programming, types of data, visualization and statistical inference. The course also emphasizes reproducible research practices and the use of R Markdown or Quarto for publishing high-quality reports, documents or publications. The course will be delivered through lectures and hands-on practice, aiming to provide practical experience in data analysis. The participants will be assessed using lab exercises, quizzes, and a final project.

Data is everywhere. Therefore, the course will analyze real-world data and reproducibility in scientific research and enhance one's career prospects.

Learning Outcomes

On completion of the course, the participants will be able to:

- 1. Demonstrate the basics of R as a programming language and statistical software.
- 2. Identify and work with different data types and structures in R, including vectors, matrices, and data frames.
- 3. Import and apply subsetting and manipulation techniques to explore and analyze data in R.
- 4. Create and customize various types of plots using basic and advanced plotting functions in R.
- 5. Calculate and interpret summary statistics and measures of correlation and explore data distributions using R.
- 6. Explore and visualize data using R.
- 7. Apply inferential statistics techniques to analyze and interpret data in R.
- 8. Practice reproducible research and publications.

Learning and Teaching Approach

The following teaching and learning approaches will be used for the course: lectures, practicals, assignments and self-study.

Туре	Approach	Total Hours	
Contact	Lecture	60	
	Practical	60	
Independent study	Lab Assignments	20	
	Self-study		
Total		80	

Assessment Approach

The following assessments are mandatory for the participants to complete, which include lab assignments, projects, and quizzes. The plagiarism policy is available at <u>www.rub.edu.bt</u> (Wheel of Academic Law - WAL).

A. Lab assignment (25%)

Questions will be provided to be completed by the participants as a lab exercise. Each correct answer will fetch one mark.

B. Project (50%)

The participants will take up a data analysis project after the completion of the lectures. They will use the existing or built-in dataset, bring in their own dataset, or simulate the data. This is to train the participants to analyze real-world data. The following criteria will be used to grade the project:

- 5 Problem definition
- 5 Aim
- 5 Descriptive analyses
- 10 Visualization
- 5 Inference
- 5 Interpretation
- 5 Documentation
- 10 Reproducibility

C. Final quiz (25%)

An individual participant will do an exam of 25 marks for 1 hour. The question will be from the course content.

Grading Scheme

Grade	Judgement of performance	Mark
A+	Outstanding	80% and above
А	Very Good	70 - 79.9%
В	Good	60 - 69.9%
С	Satisfactory	50 - 59.9%
D	Fail	49.9% and below

Important notes

Plagiarism

Plagiarism is the act of presenting someone else's work, ideas, or intellectual property as one's own without proper attribution. It is a serious violation of academic and professional integrity, and it undermines the values of originality, honesty, and scholarly rigour that we uphold.

Our university takes plagiarism seriously, and instances of plagiarism will result in severe consequences, including but not limited to academic penalties such as failure of the assignment, course or expulsion and legal consequences in cases of copyright infringement.

Deadlines

Timely completion and submission of tasks and assignments are crucial, and as such, each student should understand and meet deadlines associated with his/her assigned tasks and assignments. Those failing to meet the deadline will lead to a deduction of marks.

Contents

Type L: Lecture, FL: Field Lecture, D: Demonstration, GD: Group Discussion, A: Assignment, P/L: Practical/Lab, S: Seminar, OL: Observatory Learning, SR: Student Reflection, SE: Student Exercise

Contents	Approach	Time (h)	Facilitator
Module 1: Introduction to R	L & PL	6	Dr. JT
1.1. Overview of R as a	L	0.30	
programming language and			
statistical software			
1.2. Installation and setup of R	L & P/L	1	
and Rstudio			
1.3. User interface	L	0.30	
1.4. Basic syntax and	L & P/L	1	
commands			
1.5. Scripts	L & P/L	1	
1.6. Packages	L & P/L	1	
1.7. Basic programming	L & P/L	1	
Module 2: Data types,	L & P/L	6	Mr. UD
structures, & function			
2.1. Data types (numeric,	L & P/L	2	
character, logical, etc.)			
2.2. Data structures (vectors,	L & P/L	2	
matrices, arrays, lists,			
data frames)			
2.3. Functions, loops, apply	L & PL	2	
family			
Module 3: Data import and	L & P/L	6	Mr. TW
manipulation			
3.1. Importing data (CSV,	L & P/L	1	
Excel, Google Sheet,			
databases, etc.,)			
3.2. Subsetting and	L & P/L	1	
manipulating data			
base R			
3.3. Data Wrangling using	L&P/L	2	
lidyverse			
3.4. Data cleaning and pre-	L&P/L	2	
processing (Concept			
		40	
Module 4: Data visualization		10	ן ט ר. טט

4.1. Introduction to data	L	1	
visualization			
4.2. Basic plotting functions	L & P/L	4	
and exploring data			
distributions			
(scatterplots, line			
graphs, bar charts,			
boxplot, histogram)		-	
4.3. Data visualization using		5	
ggpiot2 Modulo 5: Deceriptive		E	
statistics		5	Dr. JI
5.1 Introduction to summary		0.30	
statistics		0.50	
5.2 Central tendency	I&P/I	1	
5.3 Deviations		1	
5.4 Central Limit Theorem		2	
Module 6: Probability and	L&P/L	7	Dr. MCR
distribution		-	
6.1. Basics of probability	L & P/L	1	
6.2. Common probability	L & P/L	3	
distributions			
6.3. Visualization of	L & P/L	2	
distribution			
7. Module 7: Inferential	L & P/L	30	Dr. MCR
statistics			
7.1. Introduction to inferential	L & P/L	2	
statistics			
7.2. Measures of correlation	L & P/L	2	
and association			
(Pearson, Spearman			
rank correlation)			
7.3. Contingency tables (Chi-	L & P/L	3	
square test, Fisher's			
exact test)			
7.4. Hypotnesis testing (t-	L & P/L	1	
tests, T way ANOVA,			
repeated measures			
7.5 Regression analysis	I&P/I	6	
(simple linear			
regression, multiple			
regression)			
7.6. Factor and cluster	L & P/L	5	
analysis (PCA,			
Dendrogram)			
7.7. Nonparametric statistics	L & P/L	5	
(Wilcoxon test,			
Kruskal-Wallis test)			
Module 8: Reproducible	L & P/L	10	Dr. MCR
Research and Reporting			
8.1. Introduction to	L & P/L	2	
reproducible research			

8.2. RMarkdown and Quarto for creating reports and documents	L & P/L	3	
8.3. GitHub for version control and collaboration	L & P/L	5	

Materials and Resources

Laptop/PC, Software - R/RStudio, Quarto, Internet

Reading List

- Bryan, J., & von der Heyde, M. (2018). *Happy Git and GitHub for the useR.* (Version 3.0). Retrieved from <u>https://happygitwithr.com/</u>
- Dalgaard, P. (2008). Introductory statistics with R. Springer Science & Business Media.
- Diez, D. M., Barr, C. D., & Cetinkaya-Rundel, M. (2012). *OpenIntro statistics*. Boston, MA, USA: OpenIntro. Retrieved from https://www.openintro.org/book/os/
- Wickham, H., Çetinkaya-Rundel, M., & Grolemund, G. (2023). R for data science. " O'Reilly Media, Inc. Retrieve from https://r4ds.hadley.nz/
- Xie, Y., Allaire, J. J., & Grolemund, G. (2018). *R markdown: The definitive guide*. Chapman and Hall/CRC. Retrieved from <u>https://bookdown.org/yihui/rmarkdown/</u>