APN CAPaBLE Training Program on

Integrating Geospatial Technologies in Climate-Smart Agriculture Planning and Management in South Asia

Capacity Building on Integrating Geo-spatial Technologies in Climate-smart Agriculture in Bhutan

Bhumtang (21-24 June 2023)
and
College of Natural Resources - Lobesa (15-18 August 2023)

December 2023

Report on

Capacity Building on Integrating Geo-spatial Technologies in Climate-smart Agriculture in Bhutan
December 2023

Background

Bhutan, a small kingdom in the southern foothills of the Himalayas known for its commitment to environmental conservation and Gross National Happiness, is increasingly embracing innovative approaches to address the challenges posed by climate change in its agricultural sector. Recognizing the vital role of agriculture in the nation's economy and the vulnerability of its predominantly agrarian communities to climate variability, Bhutan is actively exploring the integration of geospatial technologies into its agricultural practices. This intersection of geospatial technologies and agriculture, often referred to as geospatial agriculture or precision farming, holds immense promise in enhancing climate resilience and sustainability - a concept encapsulated by the term Climate-smart Agriculture.

Climate-smart Agriculture (CSA) is promoted worldwide by the Food and Agriculture Organizations of the UN as a tool enhance food security without compromising the environment. CSA involves the strategic integration of technology and data-driven solutions to optimize farming practices, mitigate climate risks and ensure food security in the face of changing climate patterns. For Bhutan with a diverse agro-ecological zones and varying climatic conditions, the application of geospatial technologies becomes particularly crucial. These technologies encompass a range of tools, including Geographic Information System (GIS), remote sensing, Global Positioning System (GPS) and satellite imagery, which can be leveraged to gather, analyze and interpret spatial data for informed decision-making in agriculture.

However, due to lack of knowledge and skills, these technologies are rarely used in the country. Therefore, through funding support from the Asia Pacific Network and in partnership with the Mid-west University, Nepal, two separate trainings on *Integrating Geospatial Technologies in Climate-Smart Agriculture*, were conducted in Bumthang and at the College of Natural Resources in June and August 2023, respectively.

Objectives

The training was organized to enhance the capacity of the Bhutanese farmers, researchers, agriculture extension officials and local leaders in adapting to climate challenges through the application of geospatial technologies in climate-smart agriculture. It was also expected to enable them to optimize resource use and enhance overall productivity. By combining traditional agricultural knowledge with cutting-edge geospatial technologies, it is expected that the farmers will be able to create a resilient and sustainable agricultural system that will not only withstand impacts of climate change but also contribute to the nation's broader goals of environmental conservation and socio-economic development.

This initiative aligns with Bhutan's commitment to the United Nations Sustainable Development Goals and its unique philosophy of prioritizing holistic well-being over mere economic growth. As Bhutan endeavors to integrate geospatial technologies in climate-smart agriculture, it could

become a model for levering innovation to ensure food security, protect ecosystems and enhance the livelihoods of its farming communities in the face of an increasingly uncertain climate future.

Training programs

First training

The first training was conducted in the Bumthang district from 21-23 June 2023. The four-day training saw 10 participants (five females and five males) from three different districts namely Bumthang, Lhuentse and Trongsa. Amongst the participants, one was a local leader (Gup), two were farmers, another two were district agriculture officers and the remaining five were agriculture extension officials. Fifteen other participants from three other districts couldn't make it to the training due to monsoon rain-triggered roadblocks.

Second training

The second training was conducted at the College of Natural Resources, Royal University of Bhutan, Lobesa, from 15-18 August 2023. Thirty-three participants comprising farmers, local leaders, agriculture extension officials, district agriculture officers, academics, researchers and agriculture students attended the four-day training. These participants were from six different districts.

Including the first training, a total of 43 participants from diverse backgrounds representing nine of the 20 districts in the country were trained on integrating geo-spatial technologies in climate-smart agriculture planning and management.

Training content

The training program (see Annexure 2), included about 30% theory and 70% hands-on practice. The participants were also taken on a field visit to successful climate-smart farms. As part of practicing the lessons learned, the participants worked in different groups on various themes revolving around CSA and geospatial technologies, including mapping potential agricultural and vulnerable areas based on various bio-physical conditions and other related information.

The trainings were resourced by experts from the College of Natural Resources and the Mid-west University, Nepal. The resource persons were earlier involved in similar trainings at the national level.

Participants feedback

All participants thanked the organizers and the donor for the generous opportunity. They said the training provided new insights into sustainable farming. For over 80% of the participants, geospatial technologies such as GIS and GPS were very new and they were pleasantly surprised at the availability and the use of such technologies in making farms not only against against the impacts of climate change, but also making farms more robust, resilient and sustainable.

The participants like all the sessions, and emphasized that group exercises and field visits were more beneficial. At least 50% of the participants said they will try to implement what they

learned whilst others said that they are not fully confident to use the new technologies. All of them said they would have gained more confidence, if the training duration was increased, and also if they could get a refresher's course.

The training organizers and the resource persons agreed that training duration, particularly for those not familiar with geospatial technologies was short and that refreshers' could would greatly benefit the participants. The organizers will continue to explore for funds to provide refreshers' course to the same participants.

Fig. 1: Participants in Bumthang training

Fig. 2: Opening of training by chief guest

Fig. 3: Group work

Fig. 4: Group work presentation

Fig. 5: Field visit to model climate-smart agriculture farm

Fig. 6: Presentation of training certificate

Fig. 7: Resource persons and the Project PI

Fig. 8: Training participants at the College of Natural Resources, Lobesa

Fig. 9: Online opening remarks from Nepal

Fig. 10: Group exercise presentation (1)

Fig. 11: Group exercise presentation (2)

Fig. 12: Training certificate award

Appendix 1: Training rationale

Training Workshop
on
Integrating Geospatial Technologies in Climate-Smart Agriculture Planning and Management in South Asia

21-24 June 2023

Organized by the College of Natural Resources and Mid-West University, Surkhet, Nepal
Funded by Asia Pacific Network

1. Background

Agriculture contributes one-third of the national GDP in Nepal (CBS, 2016), 23% in Pakistan (Plecher, 2019), and 18% in Bhutan (NSB, 2022). It employs 65%, 52%, and 44% of the population in Nepal (CBS, 2016), Bhutan, and Pakistan (FAO, 2019), respectively. Agriculture is affected by climate change (CC), and climate-smart agriculture (CSA) has been identified as a sustainable solution to CC challenges in agriculture. However, the current efforts in CSA are limited to conventional planning, extension, and dissemination approaches. The effective adoption of CSA requires smart, informed decisions for which the application of geo-spatial and other information technologies are crucial.

Changing land use, water resources, soil fertility, and increasing climate extremes pose a serious threat for sustainable agriculture in the rapidly populating and climatically changing south Asian region (Gupta & Deshpande, 2004; Christen et al., 2010). Notwithstanding, the present impacts of CC causing non-availability of water at the right time, the existing traditional practices, skills, and drought/flood risks mitigation practices on watersheds are not sufficient (Ahmad et al., 2004; Prabhakar & Shaw, 2008) to cope with the emerging issues and risks. Consequently, a significant impact of CC on livelihood has been reported in South Asia (Ashraf et al., 2011; Nelson et al., 2009; Rafiq & Blaschke, 2012). This is partly because concise future climate vulnerability and risks are not known. Geo-spatial technologies comprise a range of modern tools contributing to the geographic mapping and analysis of the earth and human societies (Albert, 2012). These technologies can be an important tool for agriculture planning and management (Rao et al., 2004; Sherrouse et al., 2011) and addressing CC issues (Sunderesan et al., 2013). Therefore, skilled human resources and improved knowledge of the application of geo-spatial technologies in climate-smart agriculture planning and management are urgently needed for sustaining food production, improving livelihood, and augmenting the economy.

Therefore, this training workshop is being organized, under the framework of the APN Project (CBA2020-13MY-Thakuri), to train key agriculture officials and local leaders by way of capacity building on the application of geo-spatial technologies in CSA planning and management. Similar training was also conducted in two other project countries, namely, Nepal and Pakistan.

Appendix 2: Training program schedule and Agenda

Day I : Inaugural Session

Inaugural Session		
Time	**Activity**	**Responsible Person(s)**
09:00-09:15	Registration and arrival of guests/participants	
09:35-10:20	**Guests on the Dais**	
	Chief Guest: Dasho Dzongdag, Dr. Ratna Gurung, Bumthang district	
	Dr. Sudeep Thukuri, Dean/Project Coordinator, Graduate School of Science and Technology, Mid-west University (Online for the second training)	
	Mr. Sonam Gyeltshen, Chief District Agriculture Officer, Bumthang district	
	Dr. Ugyen Thinley, Dean, Academic Affairs, GIS expert, CNR	
	Mr. Ugyen Dorji, Dean, Student Affairs, GIS expert, CNR	
	Dr. Sonam Tashi, Dean, Research and Industrial Linkages, CNR	
10:25-10:30	Welcome note	Dr. Sonam Tashi
10:30-10:40	Workshop and Project Overview	Dr. Sudeep Thakuri, Project Coordinator, MU (online for the second training)
10:40-10:50	Opening Address	Dasho Dzongdag, Dzongkhag Administration, Bumthang
10:55-11:25	Group Photo and Refreshment	

Technical Sessions		
Technical Session I: Climate-smart Agriculture- Theory and Practice		
11:25-12:20	Climate-smart Agriculture	Dr. Sonam Tashi
12:20-12:35	Questions and Answers	All
12:35-13:35	Lunch Break	
Technical Session II: Climate-smart Agriculture and Geo-spatial Applications		
13:35-15:45	Introduction to GIS - Getting to know software and data types	Dr. Ugyen Thinley/Mr. Ugyen Dorji
15:45-16:00	Tea/Coffee	
16:00-17:00	Handling of GIS data and geo-spatial data generation	Dr. Ugyen Thinley/Mr. Ugyen Dorji/Dr. Sudeep Thukuri
17:00-17:20	Questions and Answers	All

Day II: Technical Sessions		
Technical Session III: Climate-smart Agriculture and Geo-spatial Applications		
9:00-10:40	Continue Handling of GIS data and geo-spatial data generation	Dr. Ugyen Thinley/Mr. Ugyen Dorji/Dr. Sudeep Thakuri
10:40:11:00	Tea/Coffee	
11:00-12:50	Continue Handling of GIS data and geo-spatial data generation	Dr. Ugyen Thinley/Mr. Ugyen Dorji/Dr. Sudeep Thakuri
12:50-13:50	Lunch Break	
13:55-15:40	Processing of the geo0spatial data including image processing	Dr. Ugyen Thinley/Mr. Ugyen Dorji
15:40-16:00	Tea/Coffee Break	

16:05-17:00	Continue Processing of the geo-spatial data including image processing	Dr. Ugyen Thinley/Mr. Ugyen Dorji
17:00-17:20	Questions and Answers	All

Day III : Technical Session		
Technical Session IV: Crop Suitability Analysis using GIS and Field Trip		
09:00-10:50	Crop Suitability Analysis using GIS and Climatic Data	Dr. Ugyen Thinley/Mr. Ugyen Dorji
10:50-11:10	Tea/Coffee Break	
11:15-12:40	Continue Crop Suitability Analysis using GIS and Climatic Data	Dr. Ugyen Thinley/Mr. Ugyen Dorji
12:40-12:45	Group division	Dr. Ugyen Thinley/Mr. Ugyen Dorji
12:45-13:45	Lunch Break	
13:45-16:50	Field Trip	All
16:50-17:05	Questions and Answers	Participants

Day IV: Group Presentation and Closing		
09:00-10:50	Reflection on field visit	All participants
10:50-11:10	Tea/Coffee Break	
11:15-12:45	Group work on assigned topics	All participants & resource persons
12:45-13:45	Lunch Break	
13:45-15:45	Group work presentation	All participants & resource persons
15:45-16:00	Tea/Coffee Break	
16:00-16:15	Training workshop feedback	All

Closing Ceremony		
16:15-16:40	Reflections	By one-two participants' representatives
16:40-16:50	Certificate Award	Chief Guest
16:50-16:55	Vote of Thanks	Dr. Sonam Tashi, CNR