



A quick assessment of soil conditions through Focus Group Discussions, Participatory Rural Appraisals, and Soil Sampling in the mid-hills region of Nepal

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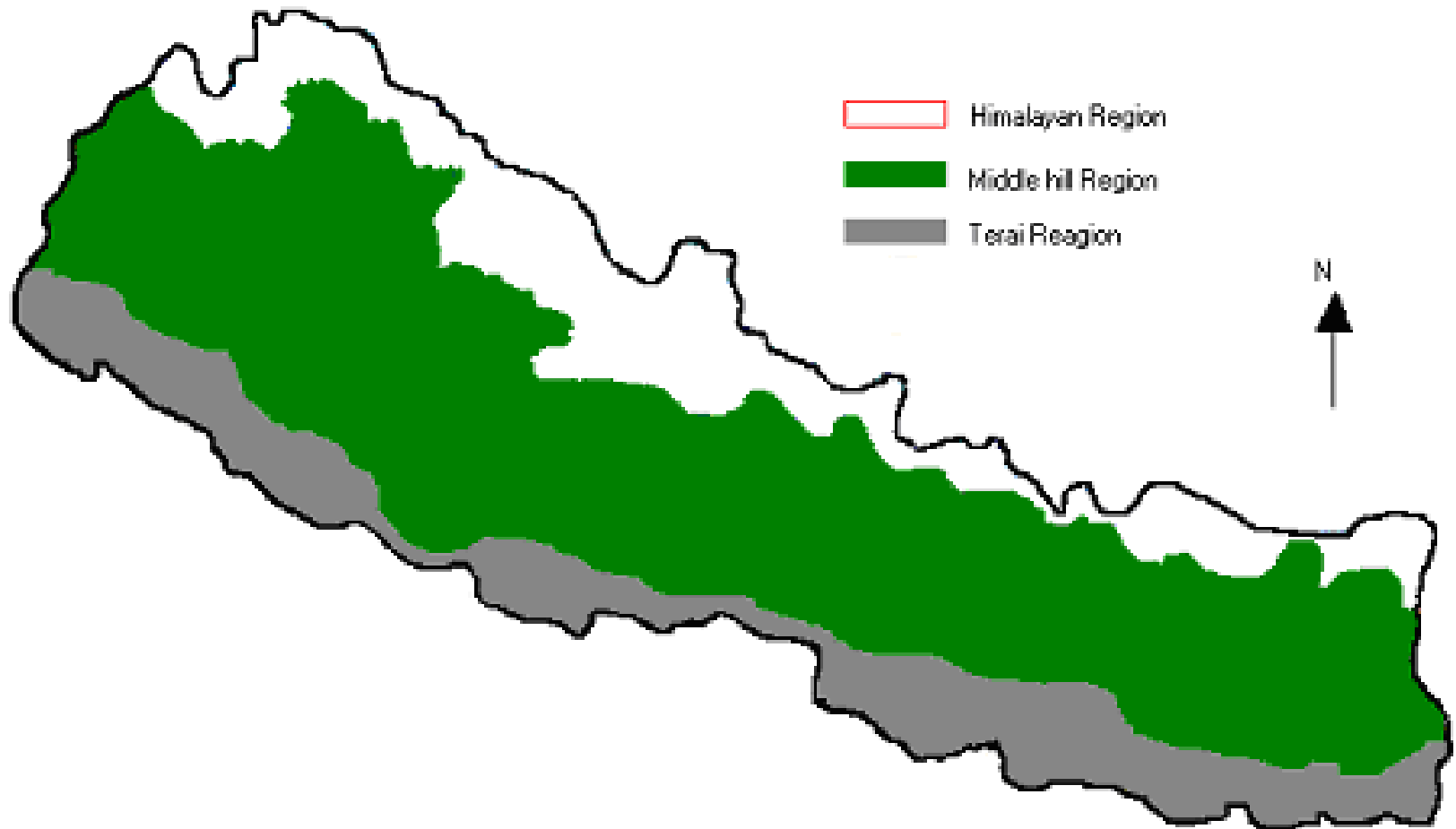
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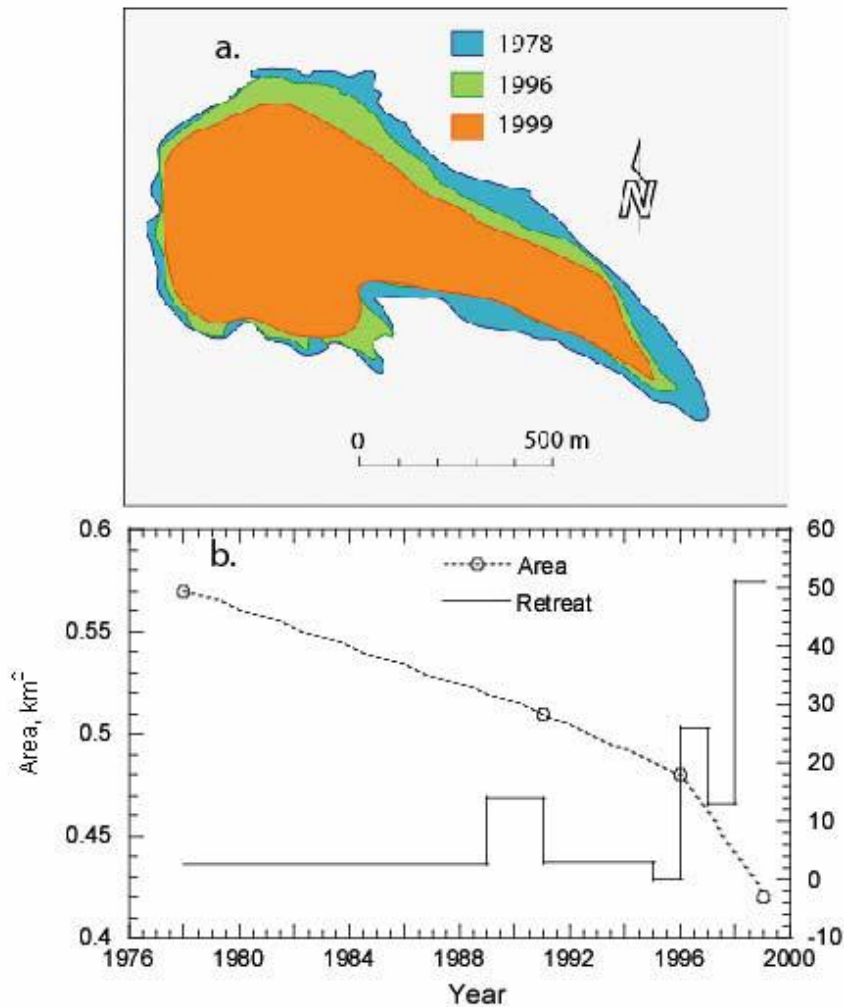
Three physiographic regions of Nepal





Country profile: Nepal

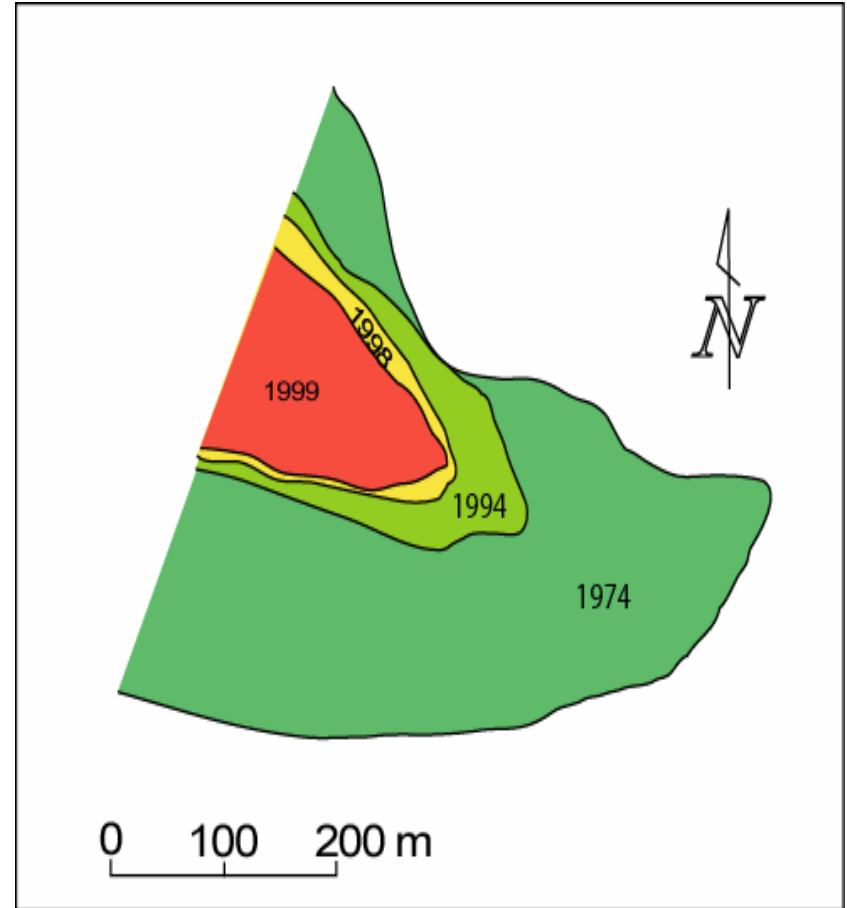
Data/information	Source
7.5 million people (1/4 th of country's population) living below poverty line.	Newsletter of the Adapting Livestock Systems to Collaborative Research Support Program, Spring 2011
Nepal is the poorest country in South Asia and the 13 th poorest nation in the world; in 2009, 43 of 75 districts faced food deficit and 23 were chronically insecure.	Newsletter of the Adapting Livestock Systems to Collaborative Research Support Program, Spring 2011
Approximately 55% Nepalese live below the international poverty line of \$1.25/day.	World Bank, World Development Indicators, cited by US AID's Feed The Future Initiative: Nepal, FY 2010 Implementation Plan.
More than 80% of the population works in agriculture sector that accounts for 38% of GDP.	Feed The Future Initiative: Nepal, FY 2010 Implementation Plan.
Nearly half of children six months to five years of age are anemic; 49% of under-five children suffering from stunting; 13% suffering from wasting; and 39% underweight.	UNICEF State of the World's Children and 2005 Ethiopia Demographic and Health Survey, cited by USAID's Feed the Future Initiative: Nepal, FY 2010 Implementation Plan.



Retreat of AX010 glacier in Sorong Himal Nepal: a. Map showing the changes in the glacier area b. Changes in the glacier and the rate of terminus retreat c. Photographs of glacier terminus between 1978-1996

Source : WWF Nepal Program 2005.

Lirung Glacier (1985 and 2002) and Rika Samba Glacier in Hidden Valley, Kali Gandaki Basin (1974 and 1999) in Nepal



Source: WWF Nepal Program 2005.



Source: <http://www..>

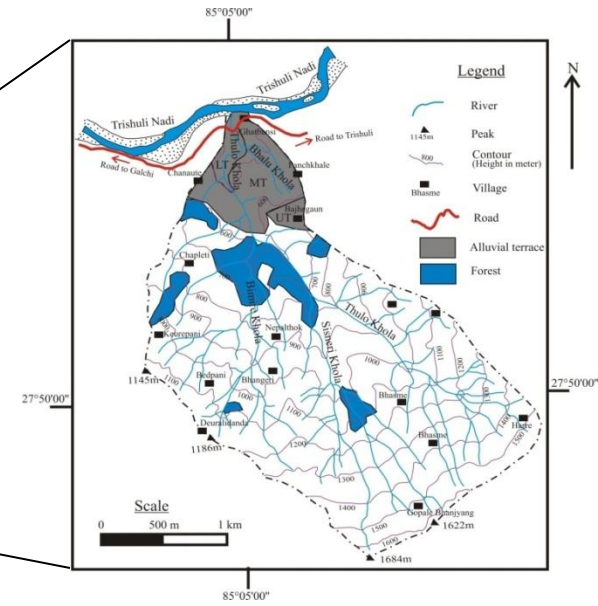


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Objective:

Quick assessment of soil conditions in an agricultural watershed in the mid-hill region of Nepal.

Study area – Thulokhola Watershed, Nuwakot



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Upper

Middle

Lower

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Community Livestock Groups (CLG) Workshops



Thulokhola local community welcomes the research team





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Focus group discussions across the three elevation levels in Thulokhola watershed



Questions asked during the focus group discussions in the Thulokhola watershed, Nuwakot, Nepal, in January 2012.

Theme	Questions
Agricultural production	What are the different agricultural crops grown in this area? are there any problems in agricultural production? have there been any changes in agricultural farming in recent years? have there been changes in household income? and what steps have been taken to adapt to these changes?
Forestry	What benefits are you getting from the forest? what types of changes ha the forest resources experienced in recent years (and why)? how have these changes on forest conditions impacted agricultural production? and what have you done to cope with these changes on forest resources?
Animal diseases and parasites	Have you noticed any new diseases in goats, cows, and buffalo in the past 10 years? how have these new diseases affected you? and what changes have you made in response to these diseases?
Animal breeding	Have you noticed any changes in pregnancy rates in goats, cows, and buffalo in the past 10 years? how have these changes in pregnancy rates have affected you? what changes have you made in response to the changes in pregnancy rates?
Water resource	Have you seen or noticed any change in your water supply in terms of quantity or quality? (quantity – levels gone up or down, quality – any noticeable smell, taste or clarity (muddy) problems), if there are changes, how have those changes affected you? what have you done to adapt to these changes? do you know of anyone using wells for water supply?
Natural hazards	Have you noticed any landslide, flood, and/or soil erosion problems in your farm? in your opinion what are the major causes of these natural hazards? what type of economic loss or loss of life and property are caused by these hazards? and, what are you doing to prevent and to minimize effects from these hazards?

Soils	Have you noticed any changes on soil fertility or soil quality in recent years? what changes on soil fertility management you have made? what fertilizer and manure rates do you apply to your land?
Women empowerment	How is the level of help from your husband on household chores such as fetching water, washing clothes, fetching fuel woods, etc. in recent years? has the involvement of women of social and community activities increased in recent years?
Governmental support	Have you been consulting any governmental agencies or organizations seeking help for solving your problems? have you been receiving any help from your VDC (Village Development Committee), politicians, and other agencies? do you have any plans for overcoming your problems?
Limitations/ constraints	What are the limitations or constraints to coping with/adapting to these changes?



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Participatory Rural Appraisals (PRAs) at three elevations, May 2012



Participatory Rural Appraisals

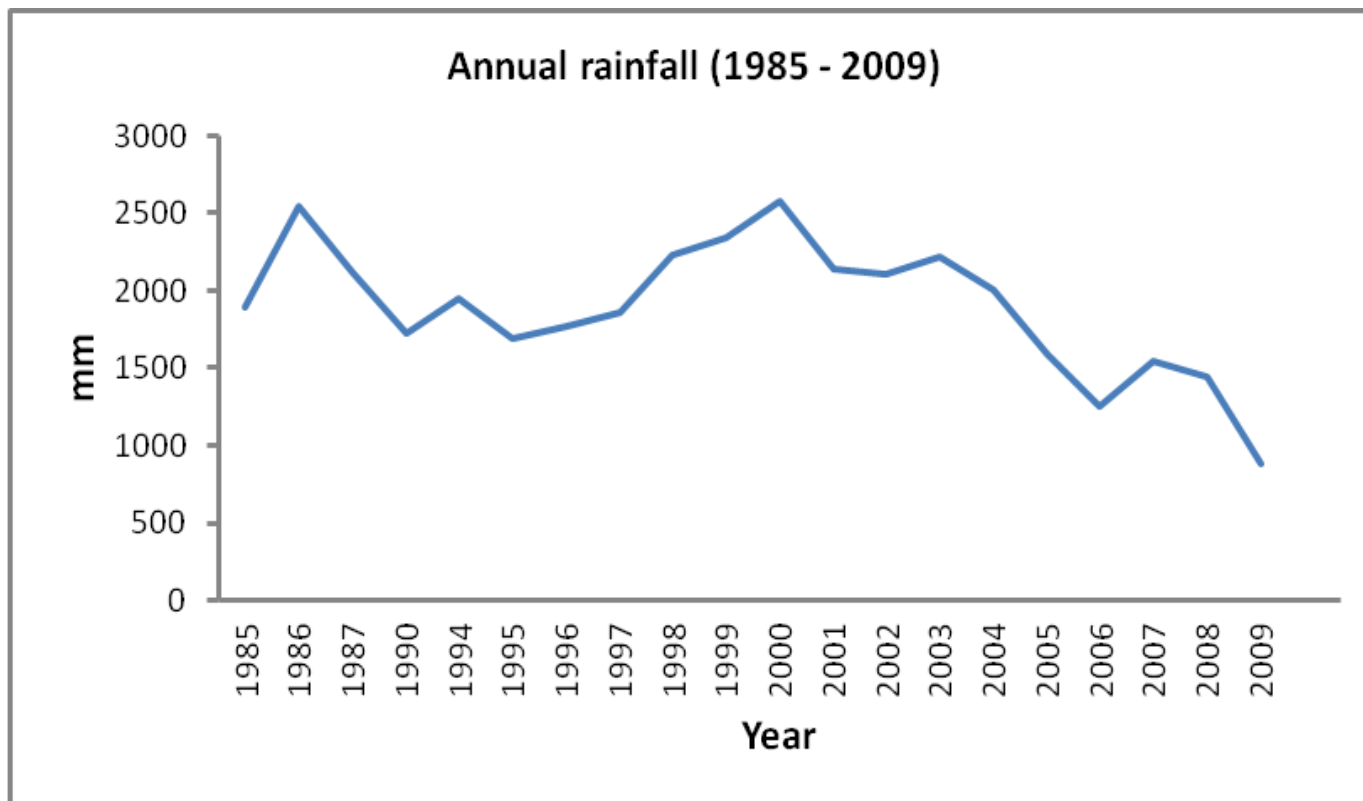
- Free style Participatory Rural Appraisals (PRAs) were done in each of the three elevations on May 21-22, 2012 in the Thulokhola watershed.
- The CLG members were not included in PRAs. Altogether 83 individuals attended the PRAs; with 28, 31, and 24 respectively in the upper, middle and the lower elevations.
- Of all the PRA participants in three elevations, 52% represented the 25-44 year age-group, 23% represented 45-64 year age-group, 22% 18-24 year age-group, and the remaining 3% were 65 and over. While 92% of the participants were in farmers, the remaining 8% were teachers and students.
- In the meetings, the participants were allowed to express climate change exposures freely first, and then each of these exposures was listed on a flip chart. The climate change exposures listed were then ranked in terms of their severity by the group. Then, the impacts of climate change exposures to livestock production system were described by the group.
- Following this description, the group was asked for climate change adaptation measures that they have implemented in their farms and their constraints and limitations.
- At the end of the session, the climate change exposures, impacts, adaptations, and constraints and limitations were summarized to the group.
- Along with the flip chart, notes were taken, attendance sheet was developed, and group discussion was recorded. These recordings were translated and transcribed.

Soil sampling and analysis

- By involving farmers in collecting soil samples from their lands, ninety-six random soil samples were collected from irrigated and non-irrigated lands representing the three elevations and were analyzed for soil physical and chemical properties.
- Forty-one core samples were also collected for bulk density determination.

RESULTS and DISCUSSIONS

Droughts and declining annual rainfall



Data source: Department of Hydrology and Meteorology; Ministry of Science, Technology and Environment, Government of Nepal. Nuwakot Weather Station.

Climate change adaptation measures implemented at varying levels across the Thulokhola watershed by local communities as revealed from the farmers focus group discussions in Nuwakot district of Nepal.

Exposures	Adaptation measures implemented
Poor animal health due to diseases and parasites	Buying medicine, consulting a private veterinarian, providing good feed to animals, traditional treatment methods, vaccination of goats for PPR
Delayed pregnancies on cattle, goats, and buffaloes	Holding animals for an extended time, administering medicine, local remedies and traditional methods, selling goats and buffaloes for slaughter
Decline on soil fertility	Apply chemical fertilizers and manures, slicing terrace ridges and walls and filling the terrace, planting crops according to soil types, alteration of fields (<i>pakho</i> land) for a crop every year
Landslides and flooding	Planting trees, stone walls, worshiping the snake god, sand bags, leveling areas with sediment deposits and bringing back to cultivation after applying fertilizers and manures, wire retainers
Deforestation and forest degradation	Conserving forest along the stream bank, planting trees on the edges of the fields; travel farther for fuel wood, fodder, leaf litter, forages; no longer raising animals due to lack of pasture lands; planting trees in privately owned lands; reducing the number of livestock population; planting fodder trees on terrace ridges and edges of the fields; community forestry
Decline on crop yields and food production	Introducing hybrid seeds, use of chemicals for disease and pests control, traditional pest and diseases control methods, introducing winter crops, increased areas under cereals
Irrigation water shortages	Delayed planting of rice, pond construction for holding water in the stream, establishing turn-taking systems, reduction in acreage under vegetable crops, giving up winter crops, severe cuts in corn areas
Drinking water shortages	Water tanks at the sources, travelling distance for fetching water, diverting water from another water spring, installing pipes for drinking water, digging deeper <i>kuwas</i> (wells), travelling more for washing clothes, adjusting with available water, wake up earlier in the morning and go further to fetch drinking water, cutting the water supply to livestock, extending the intervals between baths, postponing washing clothes, planting trees on water sources

“In *pakho* land, the areas where we can hardly see pebbles here and there this year will have exposed pebbles and rocks in 3-4 years.”

Focus Group no. 1 in the upper elevation

“Our *pakho* soils have become *chimtyailo* (clayey), they are sticky and plants cannot grow on them.”

Focus Group no. 5 in the upper elevation

“Soil fertility in our lands has declined in recent years. Our soils were friable in the past, now they are clayey; we have very bad soils, we cannot make them friable anymore.”

Focus Group no. 3 in the middle elevation

Farmers perception and awareness on climate change exposures and their ranks (1 = most) from PRAs in the upper, middle and the lower elevations in the Thulokhola watershed, Nuwakot, Nepal.

Upper elevation		Middle elevation		Lower elevation	
Drought	1	Drought, patchy rains, less rains, extreme rain events	1	Drought	1
Drying-up water sources	2	Decline in crop productivity	2	Poor animal health	2
Decline in crop productivity	3	Poor animal health	3	Soil degradation	3
Wildlife crop damage (monkeys, mice and porcupines)	4	Drying-up water sources	4	Decline in crop productivity	4
Lack of fodder and forages	5	Lack of feed and forages	5	Lack of fodder and forages	5
Poor animal health	6	Animal breeding conditions	6	Drying-up water sources	6
Animal breeding conditions	7	Rising temperature	7	Animal breeding conditions	7
Increased women workload	8	Migrating water sources downhill	8	Increased diseases and pests on crops	8
Increased diseases and pests on crops	9	Drying or dying forest trees	9	Increased women workload	9
Invasive plants	10	Poor forages and feed quality	10		
Lack of firewood	11	Disappearance of plant species such as medicinal plants, oranges, papaya, jack-fruits, peach, litchi.	11		
Landslides	12	Phenological changes on plants (off-season bloom in citrus)	12		
Dried out of crops due to drought	13	Dry landslides	13		

Physical and Chemical properties of soils (0-15 cm) for the three elevations of the Thulokhola watershed, Nuwakot, Nepal

Elevation	n	pH	OM(%)	N(%)	P₂O₅ (kg/ha)	K₂O (kg/ha)	Textural class
Un-irrigated land				Moderate 0.1-0.3%	Moderate 35-105 kg/ha	Moderate 110-280 kg/ha	
Upper	7	5.3	5.5	0.19	190.5	429.7	Sandy loam
Middle	11	6.0	4.2	0.15	187.0	462.8	Loam
Lower	3	5.3	3.6	0.14	68.1	378.1	Loam
Irrigated land							
Upper	7	5.2	3.4	0.14	54.2	257.7	Sandy loam
Middle	7	5.6	2.3	0.10	53.6	357.4	Loam
Lower	11	4.7	4.9	0.16	54.6	164.7	Loam

Physical and chemical properties of soils (15-30 cm) for the three elevations of the Thulokhola watershed, Nuwakot, Nepal

Elevation	n	pH	OM(%)	N(%)	P₂O₅ (kg/ha)	K₂O (kg/ha)	Textural class
Un-irrigated land				Moderate 0.1-0.3%	Moderate 35-105 kg/ha	Moderate 110-280 kg/ha	
Upper	7	5.2	4.4	0.16	134.5	245.3	Sandy loam
Middle	12	6.0	3.7	0.14	181.3	495.5	Loam
Lower	3	5.6	5.5	0.19	12	278.6	Loam
Irrigated land							
Upper	7	5.2	3.0	0.12	69.4	349.4	Sandy loam
Middle	7	5.3	2.5	0.17	30.1	248.7	Loam
Lower	11	4.8	4.4	0.16	74.2	146.4	Loam

Interpretation of N, P₂O₅ and K₂O results

	Low	Medium	High
N(%) (Kjeldhal Method)	<0.1	0.1 – 0.3	> 0.3
P ₂ O ₅ (kg/ha) (Bray and Kurtz No. 1)	< 35	35-105	>105
K ₂ O (kg/ha) (Flame Photometer)	<110	110-280	>280

Average bulk density (g cm⁻³) for non-irrigated and irrigated lands in the Thulokhola watershed, Nuwakot, Nepal

	Upper	Middle	Lower
Non-irrigated land			
n	7	10	2
Range	1.07-1.62	1.22-1.78	1.28-1.72
Average	1.33	1.50	1.50
Irrigated land			
n	7	7	8
Range	1.19-1.63	1.17-1.55	1.19-1.8
Average	1.36	1.31	1.45

Conclusions

- Soils in the Thulokhola watershed have turned more clayey, have degraded soil structures, and non-irrigated lands have exposed pebbles and rocks on their soil surfaces.
- Soils in non-irrigated lands do not sufficiently support root growth and more soil borne diseases are noticed in recent years. Soil productivity in the watershed has declined in recent years.
- Increasing drought conditions, erratic rain events, and drying-up water sources have severely impacted agricultural production.
- As soil acidity, soil compaction, soil erosion, and declining soil productivity are major soil problems in this watershed, immediate implementation of appropriate soil management practices is critical for sustaining agricultural production with the backdrop of climate change impacts.
- A participatory soil assessment approach such as this offers a great potential for quick assessment of soil conditions and community capacity-building on soil resource management especially in the regions where information on soils are lacking and the climate change impacts are severe.



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Thank You