Soil Survey, Soil Mapping and Soil Status in Nepal

YG Khadka
Soil Science Division,
Nepal Agricultural Research Council
Khumaltar, Nepal
Nepal: at a glance

Location: Between of China on the North and India on the East, South, and West (Sandwich)

Total Population: 26 million

Total Area: 1,471,811 km²

Occupations: Mainly Subsistence Agriculture

Physical: Two third of terrain is mountain,
Climate is wet in summer and dry in winter. Five physiographic regions:
- High Himalayas, High Mountains, Middle Mountains, Siwalik and Plain Terai;

Major river systems - Koshi, Gandaki, and Karnali along with more than 6000 tributaries
First soil Survey - 1965
Khajura Forest Area
Govt. Agri. Farm
Nepalgunj-Surkhet road

Thereafter soil survey work was carried out annually till ........1995
SURVEYED DISTRICTS

- Terai = 20 Districts
- Mid Hill = 33
- High Hills = 2
- Forest Area - Khajura district
- Tobacco Growing Area in Dhanusha district
- Resettlement Project, Nawalparasi district

Soil survey districts = 55

✓ In addition, a semi detail soil survey of the some potential areas of cotton, tea, coffee, citrus and feasible areas for irrigation development have also been accomplished.
✓ Contribution of the division for preparing Land System Maps of the country under the Land Resource Mapping Project (LRMP) funded by the CIDA in 1986

✓ Most of the survey results have been presented in the form of narrative reports.
SURVEYED DISTRICTS

Terai districts = 20
SURVEYED DISTRICTS

Mid hill districts = 33
High hill districts = 2
Non Surveyed Districts

District yet to be surveyed = 20
Surveyors of that time...

- Bidur Kumar Thapa
- Manik Lal Pradhan
- Ram Hari Singh Basnyat
- Purna Lal Maharjan
- Dambar Bahadur Tamang
- Tej Bahadur KC
- Prabhakar Bikram Shah
- Ram Bahadur Maskey
- Krishna Bahadur Karki
- Dil Prasad Sherchan
- Subhash Nand Vaidya
- Sushil Shrestha
- Bishma Nath Regmi

Hats off to them!!
Map prepared from Soil survey of Morang district
Analog map converted to digital form using GIS tool
Brief History

- Started in 1995 - ICIMOD
- Network Established 1999 - CIMMYT, Nepal
- Hardware & software support - Cornell University
  - Computer + ArcView 3.1 software
Objective

- To prepare spatial and non spatial database related with Agriculture
- To assist the soil survey and mapping
- To develop spatial analytical procedures to address the researchable issues for effective decision making processes.
Soil Maps
Resource maps
Soil map of Bhaktapur district

Legend
- Ustifluvents, Fluvaquents and Ustochrepts
- Ustochrepts and Haplustalfs
- Haplustalfs and Ustochrepts
- Ustochrepts, Dystochrepts and Haplumbrepts

0 5000 m
pH map of Chitwan district

LEGEND
- Strongly Acidic (<4.5)
- Moderately Acidic (4.5-5.5)
- Slightly Acidic (5.5-6.5)
- Neutral (6.5-7.5)
- Slightly Alkaline (7.5-8.5)

Prepared by: GIS Unit, SSD, NARC
Land use change map - Rupandehi district 1978-1990

LEGEND

- Background
- Agriculture
- Forest
- Non-Agriculture
- Changed Area

Meters
19,466.67
Soil Classification of Nepal

- Soils of Nepal are not classified in detail

- LRMP (1986) - reported dominant 14 soil groups covering 4 soil orders that are encountered in Nepal

- Major soil orders of Nepal according USDA taxonomy - Entisols, Inceptisols, Mollisols, and Alfisols. Soil orders Spodosols, Histosols, Utisols, and Aridisols are occasionally found

- Soils originating from weathered soft rocks (Phyllite, Quartzite, sandstone, Granites, Gneiss and Schists) are characterized by high degree of porosity and poor slope stability, shallow soil depth, course texture and acidic reaction are common problem
Specific Soil Problems and Threats to Soil of Nepal

- Soil Productivity decline
- Soil Erosion and land degradation
- Soil organic matter decline
- Loss of soil nutrients
- Landslide and flooding
- Soil pollution and contamination
- Soil sealing
Causes of Land Degradation in Nepal

Population Growth

Food Deficit
- Cultivation of Marginal Lands, Intensive Agriculture
- Less Manure

Fodder Deficit
- Overgrazing, Excessive Lopping of Fodder
- Grassland Degradation

Wood Deficit
- Over-Cutting

Natural Causes

Cultivation of Marginal Lands

Grassland Degradation

Land Degradation

Reduced Fertility
Contd….  

Causes of Land Degradation in Nepal  

Geomorphology and Landform
Shifting Cultivation

- Practiced in Central and Western Midhills
- Regeneration of forests is hampered in long run
- Cultivation practice without replenish of plant nutrients threat sustainability
- Soil erosion due to lack of surface cover
Government Programs

Agriculture:

- Sloping Agricultural Land Technology (SALT)
- Integrated Plant Nutrients Management (IPNM)
- Technology of Sustainable Soil Management Practices (SSMP) Dissemination
- Delivery of Agricultural Inputs
- Upgrading livestock
- Rehabilitation by promoting horticultural crop in district level
Contd..

Forestry:

- Community and Private Forestry Program
- National and Leasehold Forest
- Soil Conservation and Watershed Management Program
- Conservation of Ecosystems and Genetic Resources
- River Training Programs
Conclusion and Recommendations

a. Polices

- Study on land degradation and its trends at National and Regional Level

- Awareness of land degradation and incorporation of environmental education in school education

- Implement integrated package programs that include vegetative, agronomic, and water management measures to tackle soil erosion problems with watershed management approach

- Involvement & mobilize local people in implementation of soil and land conservation activities
Contd...

- Formulate clear policy, strategies and programs, which should be given high priority to tackle rehabilitation of degraded lands.

- Formulate proper land use policy, which direct people to use according its suitability.

- Establish and maintain linkages and networking with all related sectors (Forestry, Agriculture, Livestock, Water Resources, Roads and so on).

- Mobilize people’s participation in implementation of soil conservation activities.

- Preparing a **national action program** to address the issues of land degradation and desertification.
b. Technical Aspects

- Afforestation on degraded forest and establish and maintain linkages and networking with all related sectors
- Land gradation and land consolidation
- Mulching on dry degraded lands
- Liming on acidic lands
Contd…

- IPNM, conservation tillage, fallowing, and scientific management techniques (such as use of legumes in the cropping systems, strip cropping, cover cropping etc.)

- Promotion of Sloping agricultural land technology (SALT) in sloping land

- Promotion of erosion control techniques such as contouring, terracing or other bioengineering approach in sloping land
Thank you