

Workshop Proceedings

# Managing Mountain Watershed for Rural Development in Nepal: Integration of Research into Teaching

September 15 – 16, 2005  
Pokhara, Nepal

Organized by  
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Project  
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## **Introduction**

Prof. Mohan K. Balla

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Dr. Bishal K. Sitaula

Coordinator (UiN), NUFU Project, Norwegian University of Life Sciences, Norway

## **Background**

The Institute of Forestry, Tribhuvan University, Nepal in collaboration with the Norwegian University of Life Sciences, Norway is implementing the *Education, Research and Training for Sustainable Management of Natural Resources in Watersheds of Nepal* Project. The project is being implemented since 2002 with the financial support of the Norwegian Council for Higher Education (NUFU), Norway. The main objective of the is to develop and implement an integrated teaching and research program for management of natural resources with special focus on sustainable development of watersheds with activities related to: 1. M. Sc. Curriculum development, teaching and capacity building, 2. Research and 3. Integration of teaching and research. A workshop on “Managing Mountain Watershed for Rural Development in Nepal: Integration of Research into Teaching” held on September 15 and 16 2005 in Pokhara is one of the activities undertaken under the Project.

## **Theme**

Reducing poverty and hunger and sustaining the natural resources base remain vital challenges for mountain region of Nepal. Watersheds in the mountain region in Nepal are sites of primary production for subsistence livelihood. These mountain watersheds are geologically fragile, erodible, and are deteriorating rapidly due to population pressure and overuse of natural resources. The complex interlinked factors such as increase in demand for food, fuelwood and timber of rapidly increasing human and livestock population and uncontrolled grazing by unproductive livestock in sloppy terrain are leading to watershed degradation. This has specifically led to loss of topsoil and plant nutrients through soil erosion. Declining crop productivity forces households to expand cultivation into the more marginal lands in sloppy watersheds. This may have lead to repetition of a vicious cycle- declining land productivity, rising poverty, and growing food insecurity. Hence, proper management of mountain resources and socio-economic development of the people requires interdisciplinary integrated approach.

This workshop focused on watershed management research/development issues and poverty alleviation program in mountain region. Invited presenters brought a wealth of practical knowledge, and local and international experiences. The presenters’ papers helped to strengthen the publication capacity of IOF, ensured the exchange of research results and experiences that contributed towards sustainable management of mountain watersheds and gave insight into integration of these into teaching as case examples, practical and demonstration sites.

Altogether, eight courses taught in M. Sc. Watershed Management (WM) and M. Sc. Natural Resources Management and Rural Development (NRMRD) programs were chosen and relevant presenters with a wealth of practical knowledge and experiences were invited to make presentations and write papers. Below is the list of courses selected for writing the theme papers:

Course Code	Course Title	Offered in
WME 706	Watershed Management	M. Sc. WM and M. Sc. Forestry
WME 709	Soil Genesis, Classification and Survey	M. Sc. WM
WME 710	Land Degradation and Rehabilitation	M. Sc. WM
SFB 710	Agroforestry	M. Sc. WM and M. Sc. Forestry
SFM 711	Development Economics	M. Sc. NRMRD
SFM 720A	Rural Development	M. Sc. NRMRD
WME 806	Geo-informatics, Resource Mapping and Analysis	M. Sc. WM, M. Sc. NRMRD and M. Sc. Forestry
WME 814	Land Evaluation and Land Use Planning	M. Sc. WM

Unfortunately, the resource person invited to make presentation on Rural Development could not make it due to unavoidable circumstances. In addition to the theme papers, Coordinator (UiN) Dr. Bishal K. Sitaula made presentation on land degradation and a paper titled 'Estimation of erosivity (R) and erodibility (K) factors for soil erosion prediction on rainfed cultivated land in the Middle Mountain region of Nepal' has been included in the proceedings.

Altogether 72 persons including resource persons from the Institute of Forestry - Pokhara and Hetauda Campuses, different government and non-government organizations, academic institutions, projects in Pokhara and Kathmandu and currently enrolled M. Sc. students participated in the workshop. All workshop participants worked hard in different groups in identifying and listing down problems in integrating research into teaching and mitigation measures or suggestions/recommendation for effective integration of research into teaching (presented in Annex I)

It is hoped that the proceedings of the workshop will be helpful as a reference and teaching material in the subject areas covered and therefore, in the achievement of the stated project objectives.

### **Vote of Thanks and Acknowledgement**

We wish to extend vote of thanks and express deep appreciation to all individuals and organizations for their contribution and support in making the workshop a success.

- To the resource persons for their excellent deliberations and preparation of the written contribution despite their busy schedule.
- To the participants for their enthusiastic and active participation in sessions and working groups.
- To the Chairpersons of the sessions and working groups for conducting the sessions timely and effectively.
- To the Rapporteurs of the sessions and presenters of the working groups for their responsibility of preparing the draft of the discussion and presenting the group recommendations.
- Lastly, to NUFU, Norway for its financial support to implement the Project as a whole, of which the workshop is an important activity.

### **Workshop Organization**

The Institute of Forestry, Pokhara organized the workshop through the IOF – UMB - NUFU Project Executive Committee consisting of:

Mr. Ashok K. Mallik - Dean, IOF

Mr. Shri P.Dhaubhadel – Asstt. Dean, IOF

Mr. C. P. Upadhyaya - Campus Chief, IOF, Pokhara Campus

Prof. I. C. Dutta - IOF, Pokhara Campus

Dr. K. D. Awasthi - IOF, Pokhara Campus

Mr. R. P. Sharma - IOF, Pokhara Campus  
Prof. Mohan K. Balla – Project Coordinator.

The papers published in this Proceeding have not been edited for scientific content and the opinions and interpretations expressed in the papers are those of the authors and therefore, do not necessarily reflect the views of the editors and the Institute of Forestry.

## The Complementary Role of Research and Teaching in Courses Dealing with Integrated Watershed Management

R. M. BAJRACHARYA<sup>1</sup>, B.K. SITAULA<sup>2</sup>, M.K. BALLA<sup>3</sup>

### ABSTRACT

The effective teaching of natural science courses, particularly at the university level, must incorporate research in order to provide a connection to the “real world” setting. Research is an integral component of graduate teaching as it can elucidate the practical aspects of theory and the application of techniques and knowledge to actual situations. Students benefit from exposure to research through examples provided in the classroom and by visits to actual experimental research sites. The purpose of this paper is to offer instructors insights into the integration of research into the teaching of integrated watershed management courses by illustration of a number of research examples dealing with topics such as climate, hydrology, land use/management, water quality, soil erosion, and so on.

## Soil Genesis, Classification and Survey for Sustainable Land Management in Nepal

D. P. SHERCHAN<sup>1</sup> and P. SHARMA<sup>2</sup>

### Abstract

This article is an attempt to provide basic concepts on soil genesis, soil classification and survey and also to review research activities carried out in Nepal. It is imperative to understand first the soil properties, their behavior to change management and their distribution for developing a sound sustainable natural resource management program. The hills and mountains are major constraint on one hand, due to extreme and difficult terrain and on the other hand, the diverse agri-ecology domain provides ample opportunities for development. Since two third of geographic area consists of steep terrain that do not favor for an active soil forming process as result the Entisols and Inceptisols soils are dominant. At high altitude with relatively cool climate and vegetation, podzolization process is active. In the grass land and well drained land at high altitude and the Terai, the Mollisols soils is found. Aridisols soils are

common in high altitude rain shadow areas. The majority of soils are acidic due to acid forming rocks and also because of high and intensive rainfall.

In Nepal soil survey work was initiated since long time by the Department of Agriculture and later by the Land Resource Mapping Project. A general type of soil survey of 55 districts of Nepal has been accomplished by Soil Science Division. The indigenous soil classification system is most common among the farmers. Issues have been raised for developing own soil classification system in the country and soil survey program according to the potentiality of geographic areas. Soil information centre need to be established in the country to support development and research and academic activities.

## **Land Degradation and Rehabilitation**

BISHNU DAS SHRESTHA<sup>1</sup>

### **Abstract**

In Nepal, of about 17 environmental issues identified, land degradation and desertification are the most urgent issues in terms of program implementation. Both natural and manmade causes are responsible for land degradation. Water induced disaster is the major contributor (more than 50 %) to land degradation. International Soil Reference Information Center (ISRIC) study showed that about 13 % of the total soil degradation is caused by human activities. Soil fertility status in the hill is very much affected by soil erosion. Similarly cropping pattern also affects the soil loss. Massive soil erosion and soil mining have been the major factors contributing to the present loss of soil fertility decline. It has been estimated that the proportion of nutrients added back to soil through organic (forest, crop) and chemical fertilizers are:  $N_2 = 50\%$  ,  $P_2O_5 = 24\%$  ,  $K_2O = 6\%$  and  $Ca = 27\%$ . Both farmers and government are trying to maintain soil fertility. The Department of Soil conservation and Watershed Management (DSCWM) and Department of Water Induced Disaster Prevention (DWIDP) are working to prevent land from becoming irreversibly degraded.

## **Agroforestry Research and Development in Nepal**

DR. RAMJI PRASAD NEUPANE<sup>1</sup>

### **Abstract**

Sustainability of the farming systems owing to the stagnant agricultural production, depleting forest resources, small fragmented land holdings and intensive use of land for the subsistence needs of growing human and animal population has raised serious concern in Nepal. Experience of integrating woody perennials in the farming system through agroforestry has been the age old practice of Nepalese farmers to solve these problems. This paper reviews the efforts made in agroforestry research and development in Nepal and its potential role to promote sustainable livelihoods. Agroforestry has made a positive contribution to soil fertility improvement, soil conservation and watershed management, better utilization and enrichment of marginal farmlands

and improved household income. However, inadequate policies, unclear institutional mandates on agroforestry and low resources in research and development have contributed to constraint its promotion.

## **Development Economics**

DR. YADAV SHARMA GAUDEL<sup>1</sup>

### **Abstract**

This paper is based on the course on Development Economics offered in the M. Sc. Natural Resource Management and Rural Development (NRMRD). An attempt has been made to provide basic concepts of development problems and their solutions, knowledge on theoretical tools and classical and neoclassical economics, transformation of human resources into the process of economic development, capital mobilization, financial and trade policies and macro-economic management of a developing economy. Examples of case studies that can be integrated into teaching each of these have been proposed.

## **Land Evaluation and Land Use Planning**

KESHAR MAN STHAPIT<sup>1</sup> and JAGANNATH JOSHI (DR.)<sup>2</sup>

### **Abstract**

This paper is an attempt to provide information on the different types of land uses, land classification systems, land evaluation, land suitability and land use planning in Nepal. Land capability classification is imperative to land use planning. Land Resource Mapping Project (LRMP) has adopted land system approach in land capability classification and has distinguished seven classes of land capability in Nepal. Land use planning is done to select and put into practice those land uses that will best meet the needs of the people. However, land evaluation and land use planning are given low priority in Nepal.

## **GIS Application to Natural Resources Management**

KESHAB D. AWASTHI ( PH.D.)<sup>1</sup>

### **Abstract**

Natural resource management relies on the use of resource, economic and production data, which are often available at various non-comparable scales. This causes serious problems in data interpretation and on the availability and cross-compatibility of official data for detailed modeling and analysis. Integration of the spatial analytical capabilities of Geographic Information Systems and the constraint optimization power of mathematical programming facilitates the generation of composite data sets for extensive geographic regions. Integrated modeling offers the capacity to examine the spatial and temporal changes on the globe both induced by nature and human. Land use change detection based on remote sensing data allows the identification of major processes of change and, by inference, the characterization of land use dynamics. Empirical diagnostic models of land use change can be developed from these observations.

# **Estimation Erosivity (R) and Erodibility (K) Factors for Soil Erosion Prediction on Rainfed Cultivated Land in the Middle Mountains Region of Nepal**

K.R. TIWARI<sup>1</sup>, B.K. SITAULA<sup>1</sup>, and R.M. BAJRACHARYA<sup>2</sup>

## **Abstract**

Rainfall erosivity and erodibility estimates are essential for runoff and soil loss prediction. However, their determinations are tedious and time-consuming, hence it is desirable to have estimated values for broad areas preferably mapped. The review paper analysed available monthly/annual rainfall and soil data from different parts of the Middle Mountains in Nepal to estimate the erosivity (R) and erodibility (K) values for these areas. The rainfall erosivity (R) values, ranged from 3493.68 to 75211.87 MJ mm ha<sup>-1</sup> h<sup>-1</sup>yr<sup>-1</sup>. The western region (Pokhara) had the highest R value, which is extremely high for soil erosion potential. Similarly, soil erodibility (K) factors, ranged from 0.026 to 0.042 MJ mm t ha<sup>-1</sup>h<sup>-1</sup>, which can be considered moderate. The R and K values indicate high erosion potential in the Mid-western and Central Regions due to high rainfall erosivity, and medium erosion potential for rest of the Middle Mountain regions of the country.