

M.SC. LAND AND WATER MANAGEMENT (BY THESIS)

Course Description

KCU: 800 Biostatistics

Importance of biostatistics; Descriptive and inferential statistics, Measures of central tendency and dispersion, Types of distribution, Computer packages (eg spread sheets, Genstat, SPSS, CANOCO, SAS), Hypotheses testing: Parametric, Non-parametric tests, ANOVA, Factorial experiments, experimental designs, Correlation, Regression, Mean separation tests, Data classification: Ordination, Multivariate data analysis; Discriminant analysis, Logistic regression, Principal component analysis, Detrended correspondence analysis, Detrended canonical correspondence analysis, Modeling and Simulation.

KCU: 801/ PUCU Research Methods

Types; social and scientific, observation, experimental and survey. Main steps of research projects; identification of research problems, formulation of research questions, hypotheses, and objectives, planning, literature review. Sampling strategies & designs. Methods of data collection. Data cleaning and management. Data analysis, interpretation, report writing: Writing technical reports, Styles of writing and referencing. Dissemination: publication, seminars, information packaging. Research ethics. Intellectual Property Rights (IPR).

KCU: 802 Philosophy and practice of sustainability science

Team building and management, principles of Integrated Agriculture Research for Development (IAR4D), collaboration and partnership development, organizing and facilitating interdisciplinary teams, mutual gains approach to negotiations (MGAN), emotional intelligence, Stakeholder analysis, International, national and regional developmental goals & trends, Scenarios analysis and strategic interventions, gender dimension and cross-cutting issues, social capital dynamics, Systems theory

KRM: 800 Soil Genesis and Classification

Soil forming processes, soil forming factors and their influences on development of soils; Variability of chemical, physical and mineralogical properties of soils as affected by climate and topography; Soil profile development; Soil survey: types & tools, GPS, remote sensing, GIS; Soil classification systems (WSR and USDA taxonomy) and use of indigenous knowledge (local names in relation to international classification); Land capability classification (FAO) and Rating techniques, case studies including use of GIS (Field visits)

KRM: 801 Soil Biology and Biochemistry

Soil organisms as related to soil ecology: plant growth and environmental problems; Soil organic matter and ecosystems concept; sources of energy and nutrients for soil organisms, organic matter decomposition and energy flow, microbial processes and nutrient mobilization, C/N ratio and its significance, nitrification and denitrification processes; Pesticide transformation and bio-degradation; Rhizosphere effect, mycorrhizal association and nutrient availability and uptake; N-fixation by free living and symbiotic organisms, isolation, preservation and utilization of organisms (Practicals, projects)

KRM 803: Advanced Soil Fertility and Plant Nutrition

Nutrient requirements for growth, soil physical and chemical fertility, management of soil fertility; Indicators of fertility status; On farm soil fertility gradients; nutrient balances; types of fertilizers, their nutrient composition; manufacture, blending, mode of application, and effects on the environment; organic manures, crop residues; crop response curves, economics of fertilizer use; soil testing and fertilizer use recommendations; Use of various analytical techniques and instrumentation (wet & dry methods) (Practicals, projects and field visits).

KRM 805: Soil Water and Plant Relations

Soil physical and chemical properties that affect plant growth including; root growth and penetration, soil compaction, soil-plant-air continuum, soil temperature; Consumptive water use; Evaluation of soil-water availability; Factors influencing plant-water relations; Moisture stress and plant response; Drought tolerance mechanisms of plants.

KRM 806: Agro-Meteorology

Acquisition and management of the information of meteorology, hydrology, pedology, land use, Atmospheric radiation balance, measurement instruments, air temperature and sensible heat transfer, soil heat fluxes, soil temperature, environmental factors and agricultural production, critical plant processes,; water balance assessment (evaporation, evapotranspiration), field photosynthesis, respiration, carbon balance; water use efficiency in crop production; climate change: global warming, simulation models, greenhouse gases, carbon sequestration, impact of human activities on climate change.

KRM 808: Soil and Water Conservation

Principles of water and soil conservation; water and wind erosion, effects of erosion on land productivity, and on water and air quality, influence of soil characteristics on soil erosion, control; cropping systems and soil fertility; water harvesting and control run-off; irrigation and drainage; water use efficiency of crops; methods of soil and moisture conservation; hands-on experience with erosion & productivity (Field courses/trips)

KRM 809: Irrigation and Drainage

Irrigation as an agriculture operation, the need for irrigation; water application methods (surface irrigation, drip, sub-irrigation and overhead irrigation); soil moisture an irrigation practices, texture, structure and the moisture characteristics in soils, classification of soil and plant indicators; saline and alkali soils, quality of irrigation water; plant response to saline

and alkali soils, soils reclamation and management of salty affected soils. Drainage for irrigated soils; the reasons for drainage, methods of drainage system, leaching requirements of salts.

KRM 813: Agriculture and Environment

Agriculture-environment nexus, population dynamics, global warming and climate change and early warning systems, clean production mechanisms in agriculture, carbon trading and credits, land degradation and desertification, agriculture and biodiversity, biogeochemical cycles focusing on: C,N,P and Water, biofuels and food security implications, pollution and waste management, ecological conflicts focusing on: plant resources, water, land, wildlife), biotechnology (GMOs) and biosafety regulations, politics of sustainability, International environmental dialogues, case studies.

KRM 817: Land Use Planning and Policy

Common law controls; local, regional, and state planning devices, Principles of planning at farm level; zoning; environmental controls; growth management strategies, Aesthetic controls. Historic preservation and cultural property claims and conflict resolution, Rural land tenure (ownership, utilization, subdivision, conservation), Endangered species laws, Land use policy; legal, political, and economic factors involved in decision making.

KRM 820 Land Degradation and Productivity Management

Understanding land degradation types, causes and effects (land tillage, population pressure, pastoralism); soil erosion; its impact on soil fertility, productivity and cost implication; irrigation practices and soil degradation, fertilizer use and effects on land productivity. Principles of soil conservation and management, soil erosion control, cropping systems, water use efficiency and water management (water harvesting) management of salt affected soils, effective land use, and field trips essential.

KRM 830 Thesis

Selection of thesis topic will be done by the student in consultation with supervisors. The research will be conducted in the second year of study and will culminate with thesis submission. The thesis will be examined according to the university regulation that is written and oral presentation (defence).