

SOIL CONSERVATION

(Subject Code-93)

Unit-1: Nature of Soil :

Modern concept of soil rock and minerals; Weathering of rocks and weathering indices; Factors of Soil formation; Soil forming processes; evolution of soil body in nature; Soil profile and concept of soil pedon; Soil classification, U.S. Soil Taxonomy- its advantages and limitations. Soils of India and Uttar Pradesh- their distribution and important physical and chemical characteristics. Soil survey –objectives, type of soil survey, land use capability classification. Soil properties in relation to soil erodibility.

Unit-2: Soil Physics in soil and Water Conservation :

Soil texture-mechanical analysis, Stocke's law. Soil texture in relation to plant growth. Soil structure-classification, pore-size, distribution. Management of highly permeable, slowly permeable and compacted soil. Soil structure and plant growth. Soil moisture constants, soil water potential, measurement of soil-water content and potential using conventional and modern techniques. Water flow-Darcy's law, Bernoulli's equation, Poiseuille's law and theories of saturated and unsaturated flow, hydraulic conductivity and diffusivity, and factors affecting it. infiltration, redistribution and evaporation of soil water. Control of soil water evaporation. Soil water balance and measurement of its components. Dynamic properties of soils – soil consistency, hydration, swelling, shrinkage, hardening and cracking. Soil tilth and tillage. Soil physical properties under different cropping systems.

Unit-3: Chemistry of Problem Soil and their Management :

Acid and salt affected soils – their origin, distribution, classification, reclamation and management practices; Waterlogged Soils – their classification, changes in soil pH, electrical conductivity, Redox potential and transformation of important plant nutrients during waterlogging, management of waterlogged soils for crop production. Fertility problems of eroded soils and their management; quality of irrigation water and use of brackish water for crop production.

Unit-4: Soil and water conservation engineering :

Hydrologic processes - Precipitation, infiltration, evaporation, evapo-transpiration, runoff etc. Stream gauging-site selection, measurement of stream stage, measurement of stream discharge, rating curves. Hydrograph-segments, components, factors affecting shape of hydrograph, unit hydrograph. Types of soil erosion; effects of soil erosion and factors affecting soil erosion; types and mechanisms of water erosion; rainfall erosivity and erodibility; factors affecting water erosion; empirical and quantitative estimation of water erosion; methods of management and prediction of runoff; soil losses in relation to soil properties and precipitation. Sedimentation- sources, factors affecting sedimentation, sediment sampling measurement and control measures. Soil erosion control practices, Planning, design and construction of bunds and terraces. Vegetative waterways and diversion ditches. Gully control vegetative measures, temporary check dams, permanent structure and their design.

Unit-5: Water management & conservation farming

Water management: Water requirement, factors affecting water requirement of crops, water use and water use efficiency; Irrigation scheduling-techniques, irrigation requirement of different crops and Irrigation water quality; Drainage, Effect of excess moisture on crop and management of waterlogged areas; Evaporation and Evapo-transpiration, measurement techniques and factors affecting ET. Conservation farming: Agronomy in soil conservation- Conservation cropping systems, cover cropping and strip cropping.

Unit-6: Irrigation and drainage :

Water resources and irrigation development in India. Water conveyance and control -design of open channels. Measurement of irrigation water-velocity -area method, water meters, weirs, Parshall flume, orifices etc. Water application methods and their design, comparative efficiency and economics of different methods of irrigation. Tube wells, hydraulics of wells, construction of tube wells, well development, common well troubles Pumps - construction, operation, maintenance, common troubles and remedies of centrifugal pumps, vertical turbine pumps, submersible pumps, propeller and mixed flow pumps, jet pumps, air lift pumps, hydraulic ram. Drainage: Causes of water logging, benefits of drainage, drainage co-efficient, surface drainage methods, design of drainage ditch, subsurface drainage methods, design of pipe drains. Drainage in relation to salinity control.

Unit-7: Watershed and wasteland management :

Watershed management : Concept, need, principles and components of watershed management; Integrated watershed management; Factors affecting watershed management; Runoff and soil loss management in a watershed; Socio-economic concept of watershed - peoples participation in watershed management. Application of Remote Sensing, GIS and Isotope Technology in survey and problem identification for planning and management of watershed. Problems of watershed management. Wasteland management : Definition, concept and types of degraded and wasteland. Factors responsible for land degradation; Characteristics of different types of degraded and wasteland; Problems of degraded land in Uttar Pradesh. Appropriate techniques for management of different types of degraded and wasteland.

Unit-8: Agro-forestry and Agrostology :

Agro-forestry; concept, need, scope, advantages and limitations of agro-forestry; Classification of agro-forestry systems; Prevailing agro-forestry systems in India and Uttar Pradesh; Edaphic and climatic requirement of multipurpose tree species; Tree crop interaction, nutrient cycling, allelopathy, shifting cultivation , taungya cultivation- social and farm forestry. Agrostology definition scope and types of grass covers, Ecological characteristics of important grass species; Grass land and grazing land of Uttar Pradesh and India; Establishment methods of grasses; types of grazing; grasses, and legumes for special problem sites Agronomy of important cultivated grasses.

Unit-9: Rain water harvesting and management :

Rain water harvesting : *In-situ* and *ex-situ* water conservation and runoff harvesting techniques-tillage, graded border strips, inter plot and inter row water harvesting. Ponds; site selection, types and their capacity calculation. Rainfed and dry land farming - Problems, characteristics and dynamics of soil productivity in dryland and rainfed areas. Moisture conservation techniques in dryland areas-vegetative cover, conservation tillage, mulching, cover crops, alley cropping, vegetative barriers. Contingent plan in rainfed farming.

Unit-10: Weather and Climate :

Weather and climate; climatic classification. Panman and Thornthwaite systems; humid and dry climates; continental, maritime and desert climates, drought and their types. Climatology of India; western disturbances, cyclones, arid and semi-arid regions. Agroclimatic zones of India. Meteorological parameters and importance on crop growth Influence of microclimate on plants, soil, water and cultural factors.