SOIL SCIENCE

Definition and concept of soil; weathering and soil formation; soil profile development, features of a typical soil profile;

Mineralogical properties of soil-important primary and secondary minerals and their influence on soil behavior;

Physical properties of soil- texture, structure, density, temperature, colour, consistency, air. Soil:water phenomenon-retention and release of moisture, water holding capacity, field capacity, wilting point, available water capacity, management of soil moisture for optimizing plant growth, methods of measurement of soil moisture.

Chemical properties of soil- formation of organic and inorganic soil colloids, types of clay minerals, clay : humus complex. soil pH, cation and anion exchange capacity, role of clay. availability of nutrient ions to plants, dynamic ion exchange equilibrium and sustainable nutrient uptake by plant, soil pH in relation to nutrient availability, optimum soil pH for availability of most nutrients, management/reclamation of acid soil, saline soil, sodic soil, sick soil.

Biological properties of soil- Role of macro- and micro organisms and their influence on soil conditions, important microflora involved in mineralization of nutrient elements, biological nitrogen fixation and role of associated microbes (for both symbiotic and non-symbiotic processes), role of mycorhhiza in mineralization of nutrients in degraded soil, decomposition of organic matter, C:N ratio and state of decomposition, humus, terms associated with mineralization, immobilization, nitrification and nitrogen losses, role of organic matter in improving soil behavior especially in organic farming.

Mineral nutrition-essential nutrient elements for plant growth as per Arnon's essentiality criteria, Macro- and micro-nutrients and their role in plant growth and development, deficiency symptoms, nutrient deficiency induced plant ailments such as khaira disease of rice, heart rots in fruits and vegetables, Lime induced iron chlorosis, major organic and inorganic sources of nutrients for environment friendly biomass production cultures; soil fertility, management of soil fertility for sustainable yields under different climatic conditions, poly houses, minimum tillage cultures. permaculture, assessment/evaluation of soil fertility for optimum/balanced use of nutrients, methods of soil analysis, soil testing. importance of

soil health card in evolving best practices for different land uses. Soil erosion, runoff loses, land degradation, watershed management; Soil pollution, nature and extent, preventive measures, management alternatives.

Application of statistics for experimental designs, analysis of variance, correlations for data interpretations.

Soil survey and classification-Types of soil survey, basis for selection of suitable method of survey. soil classification, important soil orders. importance of modern nomenclature for understanding nature of soil behavior.

Organic and inorganic fertilizers, Soil erosion. types and causes of erosion, conservation measures and watershed management.

Major constraints of Indian soils for raising biomass productivity and measures for improvement. role of soil in mitigating impact of GHGs, climate change leading to global warming, soil as a source/ sink for carbon and carbon cycle.