AGRONOMY

Crop growth analysis in relation to environment. Agro-ecological zones of India. Quantitative agro-biological principles and inverse yield nitrogen law; Mitscherlich yield equation, its interpretation and applicability; Baule unit. Effect of lodging in cereals; physiology of grain yield in cereals. Optimization of plant population and planting geometry in relation to different resources. Concept of ideal plant type and crop modeling for desired crop yield. Scientific principles of crop production; crop response production functions. Concept of soil - plant relations; yield and environmental stress. Integrated farming systems, Organic farming and resource conservation technology including modern concept of tillage, dry farming, determining the nutrient needs for yield potentiality of crop plants. Concept of balance nutrition and integrated nutrient management; precision agriculture.

Soil fertility and productivity - factors affecting; soil orders and their fertility status, features of good soil management; problems of supply and availability of nutrients; relation between nutrient supply and crop growth; organic farming - basic concepts and definitions. Soil organic matter- role, losses and restoration. Tillage: types, tillage in relation to soil productivity, soil type and climate. Tillage practices, soil suitability for tillage methods. Criteria of essentiality of nutrients; Essential plant nutrients – their functions, nutrient deficiency and toxicity symptoms; transformation and dynamics of major plant nutrients. Preparation and use of farmyard manure, compost, green manures, vermicompost, industrial wastes as source of nutrients, biofertilizers, Regulation of soil organic matter, C: N ratio and its implications and enriched organic manures. Other organic concentrates, their composition, availability and crop responses; recycling of organic wastes and residue management. Commercial fertilizers; composition, relative fertilizer value and cost; crop response to different nutrients, residual effects and fertilizer use efficiency, fertilizer mixtures and grades; agronomic, chemical and physiological methods of increasing fertilizer use efficiency; nutrient interactions. Time and methods of manure and fertilizer application; foliar application and its concept; relative performance of organic and inorganic manures; economics of fertilizer use; integrated nutrient management; use of vermicompost and residue wastes in crops. Fertilizer management in cropping systems, sustainable agriculture and soil fertility, Nutrient management in problematic soils, precision nutrient management.

Determination of soil pH, EC, organic C, total N, available N, P, K and S and Ca and Mg and Micronutrients (Fe and Zn) in soils. Determination of total N, P, K and S in plants. Identification of deficiency symptoms of major and minor nutrients. Interpretation of interaction effects and computation of economic and yield optima. Composting methods, Rapid tissue tests, soil testing kits as tools of soil fertility diagnosis. Use of LCC and SPAD meter and pot culture studies using selected test crops for site specific nutrient management. Visits to fertilizer testing laboratory/ commercial bio-fertilizer units / vermicompost/ fertilizer units.

Weed biology and ecology, weed classification, crop-weed competition including allelopathy, weed indices. Principles of weed management (preventive, control and eradication). Herbicides: introduction and history of their development; classification based on chemical, method and time of application and selectivity; mode and mechanism of action of herbicides. Herbicide structure- activity relationship; factors affecting the efficiency of herbicides; herbicide formulations, herbicide mixtures; herbicide resistance and management. Weed control through bio-herbicides, mycoherbicides and allelochemicals. Degradation of herbicides in soil and plants; herbicide resistance in weeds and crops; herbicide rotation. Weed management in major crops and cropping systems; parasitic weeds; weed shifts in cropping systems; aquatic and perennial weed control. Integrated weed management; cost: benefit analysis of weed management.

Properties of water and its role in plants; History and development of irrigation, water resources of India, major irrigation projects, extent of area and crops irrigated in India and different states.Soil water movement in soil and plants; transpiration; soil-water-plant relationships; water absorption by plants; plant response to water stress, crop plant adaptation to moisture stress condition. Soil, plant and meteorological factors determining water needs of crops; scheduling, depth and methods of irrigation; microirrigation system; fertigation; management of water in controlled environments and polyhouses. Consumptive use and water requirement of crops, scheduling of irrigation. Water management of the crops and cropping systems; quality of irrigation water and management of saline water for irrigation; water use efficiency. Fertiliser use in relation to irrigation. Excess of soil water and plant growth; water management in problem soils; drainage requirement of crops and methods of field drainage, their layout and spacing.