U. P. Education Service Selection Commission, Prayagraj

SYLLABUS

Agricultural Agronomy
(Subject Code -95)

Unit 1: Crop Ecology and Geography

Principles of crop ecology; Ecosystem concept; Productivity of ecosystem; Physiological limits of crop yield and variability in relation to ecological optima; Crop adaptation; Climate shift and its ecological implication; Greenhouse effect; Agro-ecological and agro climatic regions of India; Geographical distribution of cereals, legumes, oilseeds, vegetables, fodders and forages, commercial crops, condiments and spices, medicinal and aromatic plants; Adverse climatic factors and crop productivity; Photosynthesis, respiration, net assimilation, solar energy conversion efficiency and relative water content, light intensity. Water and CO2 in relation to photosynthetic rates andefficiency; Physiological stress in crops; remote sensing: Spectral indices and their application in agriculture, crop water stress indices and crop stress detection.

Unit 2: Weed Management

Scope and principles of weed management; Weeds' classification, biology, ecology and allelopathy; Crop weed competition, weed threshold; Herbicides classification, formulations, mode of action, selectivity and resistance; Persistent of herbicides in soils and plants; Application methods and equipment; Methods of weed control, Biological weed control, bio- herbicides: Integrated weed management; recent development in weed management; Special weeds, parasitic, perennial and aquatic weeds and their management in cropped and non-cropped lands; weed shifts in cropping systems; weed control schedules in field crops, vegetables and plantation crops; Role of GM crops in weed management; cost: benefit analysis of weed management.

Unit 3: Soil Fertility and Fertilizer Use

History of soil fertility and fertilizer use; Concept of essentiality of plant nutrients, their critical concentrations in plants, functions and deficiency symptoms, nutrient interactions, diagnostic techniques with special emphasis on emerging deficiencies of secondary and micro-nutrients; Soil fertility and productivity and their indicators; features of good soil management; Fertilizer materials including liquid fertilizers, their composition, mineralization, availability and reaction products in soils; Water solubility of phosphate fertilizers; Slow release fertilizers, nitrification inhibitors and their use for crop production; Principles and methods of fertilizer application; Integrated nutrient management; Bio-fertilizers, Agronomic and physiological efficiency and recovery of applied plant nutrients; criteria for determining fertilizer schedules for cropping systems, direct, residual and cumulative effects, Fertilizer related environmental problems including ground water pollution; Site-specific nutrient management; Contamination of heavy metals in peri-urban soils and their remediation.

Unit 4: Dryland Agronomy

Concept of dryland farming; dryland farming vs rainfed farming; History, development, significance and constraints of dryland agriculture in India; Climatic classification and delineation of dryland tracts; Characterization of agro-climatic environments of drylands; Rainfall analysis and length of growing season; Types of drought, drought syndrome, effect on plant growth, drought resistance, drought avoidance, drought management; Crop Planning including contingency plans and other strategies for aberrant weather conditions, crop diversification, varieties, cropping systems, conservation cropping and mid-season corrections for aberrant weather conditions; Techniques of moisture conservation in-situ to reduce evapotranspiration,

runoff and to increase infiltration; rain water harvesting and recycling concept, techniques and practices; Mulching, Antitranspirants, Timeline and precision key factors for timely sowing, precision in seeding, weed control; Fertilizer placement, top dressing and foliar application, aqua-fertigation; Concept and importance of watershed management in dryland areas.

Unit 5: Crop Production and Management of Problematic Soils

Problem soils and their distribution in India; Salt-affected, acidic and water logged soils; Contribution of shallow water table to crop water requirements; salt tolerant crops; Response of crop to acidity, salinity, sodicity, excess water and nutrient imbalances; Reclamation of problem soils, role of amendments, and drainage, Crop production techniques in problem soils - crops, varieties, cropping system and agronomic practices. Management strategies for flood prone areas crop and crop calendar for flood affected areas; Crop production and alternate use of problematic soils and poor quality water for agricultural production;.

Unit 6: Crop Production

Crop production techniques for cereals, millets, pulses, oilseeds, fiber crops, sugar crops, tobacco, fodder & pasture crops, medicinal, aromatic & under-utilized crops and agro-forestry system including origin, history, distribution, adaptation, climate, soil, season, improved varieties, fertilizer requirements, intercultural operations, water requirement. weed control, quality components, industrial use, economics and post-harvest technology.

Unit 7: Agricultural Statistics

Frequency distribution, standard error and deviation, correlation and regression analyses, coefficient of variation; Tests of significance-t, F and chi-square (X^2); Data transformation and missing plot techniques, Design of experiments and their basic principles, completely randomized, randomized block, split plot, strip-plot, factorial and simple confounding designs; Efficiency of designs; Method of statistical analysis for cropping systems including intercropping; Pooled analysis.

Unit 8: Sustainable Land Use Systems

Concept of sustainability; Sustainability parameters and indicator; Conservation agriculture (CA); climate change mitigation; Alternate land use systems; Types, extent and causes of wasteland; Shifting cultivation; Agroforestry, concept and importance, agro forestry systems; Agrostology, grassland ecology, problems and management of grassland; Agricultural and agro-industrial residues and its recycling, safe disposal; Allelopathy and biomass production; nutrient, water, weed, insect-pest and disease management in conservation agriculture; economic considerations in CA, adoption and constraints. Artificial intelligence: concepts and application.

Unit 9: Basics of Soil and Water

Soil and water as vital resources for agricultural production; Soil-plant water relationship; Fate of rain water received at the soil surface, runoff and infiltration reciprocity, factors affecting infiltration, means to enhance infilterability of soil, mechanical and biological means to reduce runoff and soil loss; Water harvesting for crop life saving irrigations; watershed management; Soil and water conservation.

Unit 10: Soil Water Relationship

Soil water relations, water retention by soil, soil moisture characteristics, field capacity, permanent wilting point, plant available water and exchangeable water, Soil irrigability, classification, factors affecting profile water storage, Determination of soil water content, computation of soil water depletion, soil water potential and its components, hydraulic head;

Movement of soil water saturated and unsaturated water flow; Field water budget, water gains and water losses from soil, deep percolation beyond root zone, capillary rise; Evapotranspiration (ET), scope for economizing water, measures for reducing direct evaporation from soil and crop canopies; Soil physical properties in relation to plant growth and development; Erodibility of soils and their prevention.

Unit 11: Plant Water Relationship

Plant water relations: Concept of plant water potential, plant water stress indicator, cell water relations, plant water potential and its components; Significance of osmotic adjustment, leaf diffusive resistance, canopy temperature, canopy temperature depression (CTD); Water movement through soil - plant atmosphere systems, uptake and transport of water by roots; Development of crop water deficit, crop adaptation to water deficit, morpho- physiological effect of water deficit; Drought tolerance, mechanisms of drought tolerance, potential drought tolerance traits and their measurements

Unit 12: Irrigation Water Management

History of irrigation in India; major' irrigation projects in India; Water resources development; Management of irrigation water; Crop water requirements; Concepts of irrigation scheduling, Different approaches of irrigation scheduling; Soil water depletion plant indices and climatic parameters; Concept of critical stages of crop growth in relation to water supplies; Methods of irrigation, merits and demerits of various methods; Measurement of irrigation water, application and distribution efficiencies; Management of water resources (rain, canal and ground water) for agricultural production; Irrigation legislation; Water quality, conjunctive use of water, irrigation strategies under different situation of water availability, Socio-economic aspects of on-farm water management; Irrigation water distribution; interaction between irrigation and fertilizers. Drainage, drainage requirement, types of drainage.

Unit 13: Organic Farming

Organic farming: concept, definitions and components, its relevance to India and global agriculture and future prospects; Principles of organic farming; Organics farming standards; Organic farming and sustainable agriculture; Management practices in organic farming; Selection and conversion of land, soil and water management; Soil fertility, components of organic nutrient management, ITKs and farmers' innovations in nutrient management; Water and fertilizer use efficiency; Nutrient recycling; Organic manures; Soil biota; Bio-fertilizers and biogas technology; Integrated organic farming systems; Multiple and relay cropping systems; Consumers' concerns on food quality and safety; Weeds, diseases and insect pest management; Socio-economic impacts; Marketing and export potential: Organic certification, standard and regulations; Principles and practices responsible for losses of organic agricultural produce; Spiritual values and ethics.

*****