

Syllabus for Agronomy Ph.D Entrance(2024-25)

Concepts in Crop Production:

Crop growth analysis in relation to environment; geo-ecological zones of India; Quantitative agro-biological principles and inverse yield nitrogen law; Mitscherlich yield equation, Baule unit; 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; Growth and development functions and indices; Yields and environmental stresses.-drought, waterlogging, temperature (high and low) and salinity; 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 plant; Precision agriculture and Modern crop production concepts: soil less cultivation, Aeroponic, Hydroponic, Robotic and terrace farming; use of GIS, GPS and remote sensing in modern agriculture, precision farming and protected agriculture; Conventional and conservation agriculture(CA) systems; Principles and practices of organic farming; Agro-meteorology and Crop Weather Forecasting; Constraints limiting crop production in dry land areas; types of drought, characterization of environment for water availability; crop planning for erratic and aberrant weather conditions; Stress physiology and resistance to drought, adaptation of crop plants to drought, drought management strategies; preparation of appropriate crop plans for dry land areas; mid contingent plan for aberrant weather conditions.; Tillage, tilth, frequency and depth of cultivation, compaction in soil tillage; concept of conservation tillage; tillage in relation to weed control and moisture conservation; techniques and practices of soil moisture conservation (use of mulches, kinds, effectiveness and economics); antitranspirants; soil and crop management techniques, seeding and efficient fertilizer use.; Concept of watershed, objectives and principles of watershed management, major components of watershed management; integrated watershed management.

Soil Fertility Management:

Soil fertility and productivity - factors affecting; 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; Criteria of essentiality of nutrients; Essential plant nutrients – their functions, nutrient deficiency symptoms; transformation and dynamics of major plant nutrients; Preparation and use of farmyard manure, compost, green manures, vermicompost, biofertilizers and other organic concentrates their composition, availability and crop responses; recycling of organic

wastes and residue management. Soil less cultivation; Commercial fertilizers (nitrogenous, phosphatic and potassic); composition, preparation, properties, soil reactions; fertilizer mixture and grades; concepts and approaches of fertilizer recommendations; concept of fertilizer use efficiency; Time and methods of manures and fertilizers application; foliar application and its concept; relative performance of organic and inorganic nutrients; economics of fertilizer use; integrated nutrient management; use of vermicompost and residue wastes in crops.

Weed Science

Weeds, and ecology and classification, crop-weed competition including allelopathy; principles and methods of weed control and classification management; weed indices, weed shift in different eco-systems. Weed introduction and characteristics, Economic importance: Harmful and beneficial aspects; Herbicides introduction and history of their development; classification based on chemical, physiological application and selectivity; mode and mechanism of action of herbicides; Herbicide structure - activity relationship; factors affecting the efficiency of herbicides; herbicide formulations, herbicide mixtures, sequential application of herbicides, rotation; weed control through use of nano-herbicides and bio-herbicides, myco-herbicides bio-agents, and allelochemicals; movement of herbicides in soil and plant, Degradation of herbicides in soil and plants; herbicide resistance, residue, persistence and management; development of herbicide resistance in weeds and crops and their management, herbicide combination and rotation.; Weed management in major crops and cropping systems; alien, invasive and parasitic weeds and their management; weed shifts in cropping systems; aquatic and perennial weed control; weed control in non-crop area; Integrated weed management; recent development in weed management- robotics, use of drones and aeroplanes, organic etc., cost: benefit analysis of weed management.

Water management

Water and its role in plants; Irrigation: Definition and objectives, water resources and irrigation development in of India and concerned state, major irrigation projects, extent of area and crops irrigated in India and in different states; Field water cycle, 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. Water availability and its relationship with nutrient availability and loses; Soil, plant and meteorological factors determining water needs of crops, scheduling, depth and methods of irrigation; micro irrigation systems;

deficit irrigation; fertigation; management of water in controlled environments and polyhouses. Irrigation efficiency and water use efficiency.; Water management of crop and cropping system, Quality of irrigation water and management of saline water for irrigation, water use efficiency, Crop water requirement- estimation of ET and effective rainfall; Automated irrigation system; Sources of excess water and its adverse effects on soil and plants; benefits of agricultural drainage; types of land requiring drainage; various methods of surface and sub-surface drainage; concept of drainage coefficient and bio-drainage; spacing of drains;. Water management of the major crops and cropping systems; Quality of irrigation water and assessing criteria and management. Water management on problem soils; Soil moisture conservation, water harvesting, rain water management and its utilization for crop production; Water management of crops under climate change scenario.

Agronomy of Field Crops

Origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition, quality components, handling and processing of the produce for maximum production of the following crops:

Cereals -Rice, Wheat, Maize, Sorghum, Major and Minor Millets

Rabi and Kharif Pulses- Lentil, Lathyrus, Bengal gram, Arhar,

Greengram, Blackgram

Rabi oilseeds – Rapeseed and mustard, Linseed and Niger;

Kharif oilseeds - Groundnut, Sesame, Castor, Sunflower, Soybean and Safflower;

Fiber crops - Cotton, Jute, Ramie and Mesta;

Sugar crops – Sugar-beet and Sugarcane;

Tuber crops -Potato, sweet potato, cassava, yam bean, amorphophallus

Fodder crops-berseem, Lucerne, hybrid napier, cowpea, rice bean