PONDICHERRY UNIVERSITY
SYLLABUS FOR ENTRANCE EXAMINATION
(Ph. D in Agronomy)

MODERN CONCEPTS IN CROP PRODUCTION

- History and Development of crop production – Ecology and Principles of ecology – Climatological and geo-ecological zonation of India – Crop growth factors and their influence in crop production.

- Crop Growth - Growth analysis – Quantitative agro-biological principles and inverse yield nitrogen law -Mitscherlich yield equation, its interpretation and applicability – Baule unit -Crop response production functions - determining the nutrient needs for yield potentiality of crop plants, concept of balance nutrition and integrated nutrient management

- Physiology of grain yield in cereals - Optimization of plant population and planting geometry – Concept of ideal plant type and crop modelling for desired crop yield.

- Scientific principles of crop production – Cropping system and evaluation – Concept of soil plant relations - Yield and environmental stress - Use of growth hormones and regulators for better adaptation in stressed condition.

- Integrated farming systems**,** organic farming and resource conservation technologies; modern concepts of tillage; dry farming; precision agriculture. Modern crop production concepts: Aeroponic, Hydroponic, Smart farming, Robotic and terrace farming - use of GIS, GPS and remote sensing protected agriculture – Good Agriculture Practices.

PRINCIPLES AND PRACTICES OF SOIL FERTILITY AND NUTRIENT 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.

- Criteria of essentiality of nutrients; Essential plant nutrients – their functions, nutrient deficiency symptoms; transformation and dynamics of major plant nutrients.

- Organic farming - basic concepts and definitions. 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; composition, relative fertilizer value and cost; fertilizer mixtures and grades; Nano-fertilizers and their use; crop response to different nutrients, residual effects and fertilizer use efficiency; agronomic, chemical and physiological, methods of increasing fertilizer use efficiency; nutrient interactions.

- 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.

PRINCIPLES AND PRACTICES OF WEED MANAGEMENT

- Weed biology and ecology and classification, crop-weed competition including allelopathy; principles and methods of weed control and management; Classification of weeds; weed indices, weed shift in different eco-systems

- Herbicide's introduction and history of their development; classification based on chemical, 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, herbicide combination and 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.

- 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.

PRINCIPLES AND PRACTICES OF WATER MANAGEMENT

- Water and its role in plants; Irrigation: definition and objectives, water resources and irrigation development in India, Tamil Nadu and Puducherry. Major irrigation projects, extent of area and crops irrigated in India, Tamil Nadu and Puducherry.

- 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 losses.

- Crop water requirement - estimation of ET and effective rainfall. Soil, plant and meteorological factors determining water needs of crops; Irrigation scheduling, depth and methods of irrigation; micro irrigation systems; deficit irrigation; fertigation; management of water in controlled environments and polyhouses. Automated irrigation system. Irrigation efficiency and water use efficiency.

- Quality of irrigation water and management of saline water for irrigation. Water management of the major crops and cropping systems. Water management of crops under climate change. Hydroponics.

- 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. Soil moisture conservation, water harvesting, rain water management and its utilization for crop production.

AGRONOMY Of MAJOR CEREALS AND PULSES

- 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 **Kharif cereals** – Rice, Maize, Sorghum, Bajra, Finger Millet, Minor millets.

- 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 **Rabi cereals** –Wheat, Barley, Oats, Rye, Triticale.

- 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 **Kharif pulses** –Pigeon pea, Green gram, Black gram, Cowpea, Soybean, Lathyrus.

- 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 **Rabi pulses** – Chick pea, Lentil, Peas, Horse gram, Rajmash.

- Cereal and Pulse based cropping system, Present trends and future thrust, low cost and cost effective techniques, problem and prospects of cereals and pulse production; Mechanization in cereal and pulse production.

DRYLAND FARMING AND WATERSHED MANAGEMENT

- Definition, concept and characteristics of dry land farming; dry land versus rainfed farming; significance and dimensions of dry land farming in Indian agriculture.

- Soil and climatic parameters with special emphasis on rainfall characteristics; constraints limiting crop production in dry land areas; types of droughts, 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); anti-transpirants; soil and crop management techniques, seeding and efficient fertilizer use.

- Concept of watershed resource management, problems, approach and components

PRINCIPLES AND PRACTICES OF ORGANIC FARMING

- Organic farming - concept and definition, its relevance to India and global agriculture and future prospects; principles of organic agriculture; organics and farming standards; organic farming and sustainable agriculture; selection and conversion of

land, soil and water management - land use, conservation tillage; shelter zones, hedges, pasture management, agro-forestry.

- Biodiversity and its conservation, Organic farming and water use efficiency; soil fertility, nutrient recycling, organic residues, organic manures, composting, soil biota, efficient microorganisms and decomposition of organic residues, earthworms and vermicompost, green manures, bio-fertilizers and biogas technology.

- ITK practices, Biodynamic agriculture, Zero budget natural farming, Farming systems, selection of crops and crop rotations, multiple and relay cropping systems, intercropping in relation to maintenance of soil productivity.

- Control of weeds, diseases and insect pest management, biological agents and pheromones, bio-pesticides, Organic livestock management, Quality standards of organic products.

- Socio-economic impacts; marketing and export potential: inspection, certification, labeling and accreditation procedures; organic farming and national economy.