SCHOOL OF AGRICULTURE

Paper-I: Research Methodology

Research and Types of research: Meaning of Research- Objectives of Research- Motivation in Research. Research methods vs Methodology. Types of research – Descriptive vs. Analytical, Applied vs. Fundamental, Quantitative vs. Qualitative, Conceptual vs. Empirical. Research Process. Criteria of good Research. Research Formulation – Defining and formulating the research problem - Selecting the problem - Necessity of defining the problem - Importance of literature review in defining a problem – Literature review – Primary and secondary sources – reviews, treatise, monographs-patents – web as a source – searching the web - Critical literature review – Identifying gap areas from literature review - Development of working hypothesis. Data Collection and analysis: Execution of the research - Observation and Collection of data - Methods of data collection – Modeling, Mathematical Models for research, Sampling Methods- Data processing and Analysis strategies. Data Analysis with Statistical Packages – Hypothesis-testing, Generalization-and Interpretation

Paper – II: AGRONOMY

Fundamentals of Agronomy

Scope of Agronomy and Agronomist; Tillage and Types of tillage; Sowing; Planting geometry; Plant population; Crop nutrition - Essential elements; Importance of major, secondary and micronutrients; Growth and development of crops; Plant ideotypes; Cropping pattern and system; Organic farming - definition - prospects - principles and concepts; Farming system- components and their importance and maintenance - IFS; Harvest maturity symptoms - Harvesting, Storage and threshing of major agricultural crops

Crop Production

Crop production techniques for cereals, millets, legumes, oilseeds, fiber crops, sugarcane, tobacco, fodder and pasture crops including origin, history, distribution, adaptation, climate, soil, season, modern varieties, Seed rate, fertilizer requirements, crop geometry, intercultural operations, water requirement, weed control, harvest, quality components, industrial use, economics and post-harvest technology.

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; Persistence of herbicides in soils and plants; Application methods and equipment; Cultural, physical, mechanical weed control, Biological weed control, bio-herbicides: Integrated weed management; problematic weeds, parasitic and aquatic weeds and their management in cropped and non-cropped lands; weed control schedules in field crops; Role of GM crops in weed management.

Irrigation Water Management

Management of irrigation water; History of irrigation in India; Major irrigation projects in India; Water resources development; 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; Crop modeling, crop coefficients, water production functions; Methods of irrigation viz. surface methods, overhead methods, drip irrigation and air conditioning irrigation, merits and demerits of various methods, design and evaluation of irrigation methods; Measurement of irrigation water, application and distribution efficiencies; Management of water resources (rain, canal and ground water) for agricultural production; lrrigation legislation; Water quality, conjunctive use of water, irrigation strategies under different situation of water availability, optimum crop plans and cropping patterns in canal command areas; Estimation of ET by direct and indirect methods, Irrigation efficiencies; Design of irrigation canals, design of irrigation structures; Interaction between irrigation and fertilizers.

Soil Fertility and Fertilizer Use

History of soil fertility and fertilizer use; Concept of essentiality of plant nutrients, their critical concentrations in plants, nutrient interactions, diagnostic techniques with special emphasis on emerging deficiencies of secondary and micro-nutrients; Soil fertility and productivity and their indicators; 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 including fertigation; Integrated nutrient management and bio-fertilizers; Agronomic and physiological efficiency and recovery of applied plant nutrients; Criteria for determining fertilizer schedules for cropping systems direct and residual effects of ferilizer; Fertilizer related environmental problems including ground water pollution; Site-specific nutrient management.

Dryland Agronomy

Rainfed Agriculture: Introduction, types- Dry farming, dryland farming and rainfed farming - History of rainfed agriculture in India and constraints of dryland agriculture in India; Climatic classification and delineation of dryland tracts; Characteristics and prospects of rainfed agriculture - 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, crop diversification, varieties, cropping systems, conservation cropping and mid-season corrections for aberrant weather conditions; Techniques of moisture conservation insitu to reduce evapotranspiration, runoff and to increase infiltration; Rain water harvesting and recycling concept, techniques and practices; Timelines and precision key factors for timely sowing, precision in seeding, weed control; Fertilizer placement, top dressing and foliar application, Concept and importance of watershed management in dryland areas.

Agricultural Meteorology

Meteorology and Agricultural Meteorology; Atmosphere - Composition and vertical layers of atmosphere (stratification); Nature and properties of solar radiation - Physiological responses of different bands of incident radiation; Light; Air and Soil temperature and its importance in crop production; Relative Humidity and its importance in crop production; Wind and its effect on crops; Atmospheric pressure - cyclones, anticyclones, tornado, hurricane and storms; Clouds - types and their classification; Precipitation - forms - monsoon - Seasons of India; Rainfall - types and mechanism of Rainfall Cloud seeding and types - Agro climatic Zones of India and Telangana; Weather hazards; Weather forecasting - synoptic chart - crop weather calendar; Remote sensing; Impact of climate and weather on crop production and pest and diseases. Climate change; climate variability; Global warming; Causes of climate change and its impact on regional and national agriculture.

Sustainable Land Use Systems

Concept of sustainability; Sustainability parameters and indicators; Conservation agriculture; Alternate land use systems; Types, extent and causes of wasteland; Shifting cultivation; Agro-forestry systems; Agricultural and agroindustrial residues and its recycling and safe disposal

Soil Water Relationship

Soil water relations, water retention by soil, soil moisture characteristics, field capacity, permanent wilting point, plant available water and extractable water; 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; Erodability of soils and their prevention.

Management of Problematic Soils and Water

Problem soils and their distribution in India; Salt-affected, acidic, water logged soils; Ground water resources, water quality criteria and use of brackish waters in agriculture; Excess salt and salt tolerant crops; Hydrological imbalances and their corrective measures; Concept of critical water table depths for crop growth; Contribution of shallow water table to crop water requirements; 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; Drainage for improving water logged soils for crop production; Crop production and alternate use of problematic soils and poor quality water for agricultural and fish production; Amelioration of salt affected soils. Degraded lands and their rehabilitation.