Ph.D. Entrance Syllabus Agriculture –Agronomy

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PART--I

Research Methodology (50 Questions)

Research Aptitude: Research concept, steps involved, identification, selection and formulation of research problem, justification, hypothesis; literature collection---textual and digital resources (internet)

Advances in Microscopic Techniques- LM, EM, Confocal Microscopy,Karyotyping, Image analysis softwares.-Use of HPLC, amino acid analyzer and Bomb Calorimeter.Centrifuge, paper chromatography, spectrophotometer. Basic concepts of extraction and quantification of nucleic acid and proteins .Protein and nucleic acid electrophoresis, Northern and southern blots, FISH and GISH.Protein and DNA band profiling through gel documentation system, PCR, cloning, sequencing, microarray.

Research design, data collection and interpretation: Research design; sampling techniques, collection and documentation, presentation, analysis and interpretation of data

Scientific writing: Forms of scientific writing--- Article, notes, reports, review article, monographs, dissertations, popular science articles, bibliographies,

Formulation of scientific communication: Outline preparation, drafting title, sub titles, tables, illustrations; Formatting tables---title, body footnotes; figures & graphs---structure, title and legends, Impact factor, citation indices, plagiarism

Computer application: MS office, excel, power point, graphics (Sigma plot), statistical software (SPSS)

Biostatistics: StatisticalMethods:Measuresofcentraltendencyanddispersal;probability,distributions(Binomial,Poissonandnormal);Samplingdistribution;Differencebetweenparametric and non---parametric statistics; Confidence Interval; Errors; Levels of significance; Regression and Correlation;t---test; Analysis of variance; X^2test; Basic introduction to Multivariate statistics, etc.

Part-II

Agronomy (Subject specific 50 questions)

Crop Ecology and Geography

Principles of crop ecology; Ecosystem-concept and determinants of crop productivity; 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.

Weed Management

Scope and principles of weed management; Weed classification, biology, ecology and allelopathy; Weed seed dormancy, 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, chemical and biological weed control, bio-herbicides: Integrated weed management; Special weeds, parasitic and aquatic weeds and their management in cropped and non-cropped lands.

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 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**;**

Dry land 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, effect on plant growth, drought resistance, drought avoidance, drought management; Crop Planning including contingency, crop diversification, varieties, cropping systems and mid-season corrections for aberrant weather conditions.

Crop Production-

Crop production techniques for cereals, millets, pulses /grain 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.

Sustainable Land Use Systems

Tillage - Concept, types, tilth, tools and implements; Modern concepts of tillage and conservation agriculture; Land capability classification, Alternate land use and Agro forestry systems; Types, extent and causes of wasteland; Shifting cultivation; Concept of sustainability.

Soil-Plant-Water Relationship

Importance of water in agriculture; Hydrological cycle; runoff and infiltration, factors affecting infiltration; Soil water relations, water retention by soil, soil moisture characteristics, field capacity, permanent wilting point, plant available water and extractable water; Soil irrigability classifications, Determination of soil water content, computation of soil water depletion, soil water potential and its components; Movement of soil water-saturated and unsaturated water flow; Evapotranspiration (ET), PET, AET and its measurements.

Irrigation Water Management

History of irrigation in India; Major irrigation projects in India; Water resource development; Crop water requirements; Concepts of irrigation scheduling, Different approaches of irrigation scheduling; Concept of critical stages of crop growth in relation to water supplies; Methods of Irrigation.

Management of Problematic Soils and Crop Production

Problem soils and their distribution in India, acidic, saline, waterlogged and mined- soils; Response of crop to acidity, salinity, 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; Degraded lands and their rehabilitation. Management strategies for flood prone areas.

Cropping and Farming Systems and Organic Farming

Cropping system – Definition, principles, classification; Cropping system for different ecosystem; Interaction and indices; Non-monetary inputs and low cost technologies. LEIA, HEIA and LEISA