

SYLLABUS
SOIL SURVEY OFFICER/RESEARCH ASSISTANT/TECHNICAL
ASSISTANT IN SOIL SURVEY
AND SOIL CONSERVATION

(Cat.No: 489/2021)

CROP PRODUCTION

Module 1 (15 Marks)

Agronomy - scope, seeds and sowing, tillage and tilling, crop density and geometry. Growth and development of crops, factors affecting growth and development, crop rotation - its principles, adaptation and distribution of crops. Crop nutrition- manures and fertilizers, nutrient use efficiency- soil and climatic requirements - area and production - varieties - seed rate spacing - methods of sowing/planting - manuring schedule, cultural practices and yield of major field crops of Kerala, viz, rice, tapioca, sugarcane, pulses, sesamum and fodder crops, viz, guinea and hybrid napier. planting geometry and their effect on crop growth and yield - cropping systems - terminology - plant interactions in multiple cropping systems - criteria for assessing yield advantage - major cropping systems of Kerala - (rice based - coconut based - cassava based - homestead farming) - organic farming - precision farming - Integrated farming system - sustainable agriculture - LEIA - HEIA - LEISA - sustainable technologies for crop production. Soil moisture constants-Evapo-transpiration, potential evapo-transpiration and consumptive use, Reference crop evapo-transpiration (ET_o)- Crop co-efficient (K_c)- K_c values for different crops. Main empirical methods of calculation of ET_o- Effective rainfall, Water requirement of crops- Scheduling irrigation- Methods of irrigation-.Surface , subsurface, overhead and micro irrigations. Irrigation efficiency- Water productivity and water use efficiency- Agricultural drainage-causes of water logging and types of drainage.

SOIL CONSERVATION

Module 2 (20 Marks)

History of soil erosion, definition, classification. Nature and extent soil erosion in India. Mechanics of soil erosion by water and glaciers. Factors and processes of soil erosion; its impact on environment and biosphere. Universal soil loss equation - defining all parameters and its use. Rainfall erosivity and soil erodibility. Mechanics of wind erosion - factors, process, wind erosion equation. Management of soil and nutrient losses. Shifting cultivation - principles, extent and impact. Methods of soil erosion control - vegetative measures like crop rotation, afforestation, agro stological technique, etc. and mechanical measures like contour bunding, trenching, gully plugging, strip cropping, terracing, etc. Conservation farming system. Reclamation of ravine lands. Sand dune stabilization. Grazing and its impact on soil erosion. Forest fire and soil erosion. Control measures of grazing and forest fire. Precision agriculture: Geo-informatics- GIS and Remote sensing concepts application in agriculture-Global positioning system (GPS), components and its functions. SSNM- Site Specific Nutrient Management -Nanotechnology- definition, concepts and techniques, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors. Soil conservation needs -Techniques - Conservation tillage.-Contour farming. -Strip cropping-Windbreaks.-Crop rotation. -Cover crops-Buffer strips.-Grassed Waterways. Concept conservation farming and irrigation, role of vegetation, conservation tillage and mulch in various land climate conditions. Biological measures in dryland, rainfed, arid, semi-arid, and humid lands. Water use efficiency soil fertility, selection of draught tolerant plants, role of grasses, legumes in conservation, pasture and range-land management and its improvement. Management of waterways, canal bank, bench terrace through biological means.

CROP PROTECTION

Module 3 (20 Marks)

Categories of pests of agriculture -Economic classification of insects- External Morphology, Anatomy and general Physiology, structure and function of digestive, circulatory, respiratory, excretory, reproductive, endocrine, exocrine, nervous systems and sense organs. Types of metamorphosis-Integrated Pest Management: Principles of IPM, concept of economic threshold and economic injury levels, tools of IPM - Biocontrol of pests -Microbial control - Regulatory control. Pesticides: Insecticide act and rules. Newer trends in insect pest management - pheromones, Insect Growth Regulators, Chitin synthesis Inhibitors, biotechnological methods. Distribution, bioecology, nature and symptoms of damage and management strategies of major insect pests of field crops of Kerala ,vegetable crops: solanaceous ,cruciferous , leafy vegetables polyhouse vegetables; tuber crops , fruit crops, plantation crops, ornamentals, medicinal and aromatic plants and stored products pests. Economically important insects silkworms, lac insects, pollinators, predators, parasites, weed killers, soil builders, scavengers and insects used for scientific investigation. Damage in major crops and management of nematodes, mites, rodents, birds, molluscs (snail) .

Importance of plant pathogens - fungi, bacteria, fastidious vascular bacteria, virus, viroids, phytoplasma, spiroplasma, algae, protozoa, nematodes, phanerogamic parasites. Diseases due to abiotic/biotic causes: Causes/ factors affecting disease development- disease triangle and tetrahedron. Categories of diseases-IDM; Principles of crop diseases management – plant quarantine – cultural control – biological control (biocontrol agents, PGPR), physical methods (soil solarisation, heat treatment), chemical control – fungicides – inorganic, organic, systemic, antibiotics – plant diseases resistance. Epidemiology: Principles and methods of plant disease management- symptoms, etiology, disease cycle and management of diseases of rice, pulses, vegetables, tubers, citrus, mango, banana, pineapple, papaya, guava, cashew, coconut, arecanut, cocoa, black pepper, ginger, cardamom, tree spices, oil palm, betelvine, coffee, tea, rubber and ornamentals. Methods of control: Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control. Survey, surveillance and forecasting of diseases. Development and validation of IDM module- IDM programmes in cereals, vegetables, pulses, tuber crops, spices and plantation crops and ornamentals.

Module 4 (30 Marks)

CROP IMPROVEMENT

Horticulture - area, production, productivity of horticultural crops in India and Kerala – branches of horticulture – major fruit crops (Pomology) – importance, nutritional value, production technologies . Commercial orchards, gardens and plantations – climate, soil, socio-economic factors; Techniques of training and pruning , top working - cultural operations – plant protection – harvesting, storage, marketing. problems of unfruitfulness - internal factors, external factors. Plant growth regulators in horticulture -Plant propagation techniques - definition and basic concepts, type-structures - commercial propagation of horticultural crops; Micro propagation of horticultural plants. Plantation crops of Kerala – classification, commercially cultivated varieties .Herbal and aromatic plants- active principles and uses .Ornamental Flowering -Gardening and landscaping-scope and methods - Post harvest management of major horticultural crops of Kerala.

Importance and scope of vegetable crops in India with special reference to Kerala-Production and management of warm season and cool vegetables of Kerala. Types of vegetable farming-Systems of vegetable cultivation- traditional and specialized systems;. Factors affecting vegetable production- Basic principles in vegetable production- nursery, sowing and transplanting, care and management. Plant protection special precautions in vegetables- Seed production in cool season vegetables, post harvest handling- losses; causes and measures to reduce losses; Packing and transport . marketing of vegetables.

Germplasm – Methods of conservation and utilization in crop improvement. Induction of variability – Hybridisation, Mutation and Polyploidy and its utilization in crop improvement. Exploitation of heterosis in crop improvement – coconut, tapioca, rice, maize and vegetable crops. Improved varieties of crops – coconut, rice pulses and oil seeds. Production of quality seedlings in coconut.

Seed Act 1966 – seed certification agencies, procedure, field inspection, seed testing, seed certification standards and classes of seed. Seed Bill 2004. Biological Diversity Act 2002. Convention on Biological Diversity, National Biodiversity Board. Intellectual Property Rights – Protection of Plant Varieties and Farmers Act (PPVFRA) and Geographical Indications.

Module 5 (15 Marks)

SOCIAL SCIENCES

Agricultural economics- Basic concepts: Goods and services, desire, want, demand, utility, cost and price, wealth, tax, capital, income and welfare. Theories- Utility theory; law of diminishing marginal utility, equi-marginal utility principle. Agricultural Marketing: Concepts and definitions of market, marketing, agricultural marketing, market structure, marketing mix and market segmentation. Extension Programme planning- Meaning, Process, Principles and Steps in Programme Development. Extension systems in India: various extension/ agriculture development programmes launched by ICAR/ Govt. of India (IADP, IAAP, HYVP, KVK, IVLP, ORP, ND,NATP, NAIP, etc.)

NOTE: - It may be noted that apart from the topics detailed above, questions from other topics prescribed for the educational qualification of the post may also appear in the question paper. There is no undertaking that all the topics above may be covered in the question paper.