DETAILED SYLLABUS FOR THE POST OF ASSISTANT MANAGER IN STATE FARMING CORPORATION OF KERALA LTD

CAT NO: 072/2024

TOTAL – 100 MARKS

Module 1: AGRONOMY (10 Marks)

Agronomy - scope, seeds and sowing, tillage and tilth, crop density and geometry. Classification of crops – agronomic, botanical, ontogenic. Growth and development of crops, factors affecting growth and development, crop rotation and its principles, adaptation and distribution of crops. Crop nutrition-essential nutrients – criteria of essentiality, classification, functions and deficiencies - manures and fertilizers - nutrient use efficiency – fertilizer calculations. Specialty fertilizers – 100 per cent water soluble, fortified, customised, slow release fertilizers, nitrification inhibitors. Biological nitrogen fixation – biofertilizers. Weeds – importance, classification, invasive weeds of Kerala, crop weed competition, allelopathy, concepts of weed management – principles and methods, herbicides – classification, selectivity and resistance, allelopathy. Herbicide calculations, calibration of sprayers and spraying specifications for herbicides. Integrated weed management in rice, banana, coconut. Agriculture –scope- Importance of agriculture and agricultural resources available in India; Farming system components - Cropping system and pattern, multiple cropping system-Sustainable agriculture-problems and its impact on agriculture, indicators of sustainability, adaptation and mitigation, conservation agriculture strategies, HEIA, LEIA and LEISA, ecological principles of LEISA. Homestead farming system. Economic importance – soil and climatic requirements – area and production – varieties – seed rate spacing – methods of sowing/planting -manurial schedule- cultural practices and yield of major field crops of Kerala, viz, rice, tuber crops (cassava, sweet potato, yams and aroids), sugarcane, pulses, groundnut, sesamum and fodder crops, *viz*., guinea and hybrid napier.Irrigation- Water management of principal crops of Kerala.- Water resources and irrigation development in India and Kerala. Soil moisture constants-Evapo-transpiration, potential evapo-transpiration and consumptive use, Reference crop evapo-transpiration (ETo)- Crop co-efficient (Kc)-Kc values for different crops. Main empirical methods of calculation of ETo- 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. Quality of irrigation water. Agro ecology of Kerala – agro ecological zones and agro ecological units, monsoon in Kerala, cropping seasons of Kerala. Rainfed agriculture – dry farming, dryland farming, rainfed farming. Drought – classification, drought adaptation mechanisms in crops, drought management in major crops of Kerala. Watershed – types – characteristics and management.

MODULE 2: SOIL SCIENCE & AGRICULTURAL CHEMISTRY (10 Marks)

Soil-Pedological and edaphological concepts. Weathering - soil formation - factors and processes - soil profile. Soil physical properties - soil texture - soil consistency - soil crusting-bulk density and particle density of soils and porosity - their significance and manipulation- Soil compaction - Soil colour. Soils of India - geological processes and formations – characterization of soils of Kerala. Soil colloids – properties – nature - types and significance. Layer silicate clays - their genesis and sources of charges. Adsorption of ions - ion exchange - CEC and AEC - Concept of pH - soil acidity - saline, sodic and calcareous soils. Soil organic matter – composition – decomposability – humus - fractionation of organic matter. Carbon cycle - C: N ratio. Soil biology – biomass - soil organisms and their beneficial and harmful roles. Soil fertility evaluation – soil testing – rating of soil fertility (organic carbon, major, secondary and micronutrients). Problem soils of Kerala - characteristics, problems and management/reclamation; Salt affected soils- Arid soils -Acid soils- submerged soils-Eroded soils-Acid sulphate soils-Degraded soils. Organic farming and food security- Tools and practices of organic farming. Organic certification – accreditation agencies, certification agencies, NSOP, NPOP. Precision agriculture: Geo-informatics- GIS and Remote sensing concepts application in agriculture-Global positioning system (GPS),components and its functions.Nanotechnology-definition, concepts and techniques, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors

Module 3: PLANT BREEDING AND GENETICS (10 Marks)

Heredity, Mendelian principles of heredity, Cell division –.Mutation, classification, Methods of inducing mutation & CIB technique, mutagenic agents and induction of mutation. Qualitative & Quantitative traits, Polygenes and continuous variations, multiple factor hypothesis, Domestication, Acclimatization, Multiline concept. Hardy-Weinberg Law, Genetic basis and methods of breeding cross pollinated crops, modes of selection; Heterosis and inbreeding depression, development of inbred lines and hybrids, composite and synthetic varieties. Major breeding objectives for crop improvement and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality. Seed production technology in self pollinated, cross pollinated and vegetatively propagated crops. Hybrid seed production technology in Maize, Rice, Sorghum, Pearl millet and Pigeonpea, etc. Ideotype concept and climate resilient crop varieties for future. Germplasm – Methods of conservation and utilization in crop improvement. Micropropagation -organogenesis and embryogenesis-different stages of micropropagation - commercial micropropagation, quality assurance of tissue culture plants. Plant tissue culture for crop improvement. Intellectual Property Rights – meaning, GATT, WTO, TRIPs, WIPO, patents, copyrights, trademark, industrial design, geographical indications, integrated circuits, trade secrets. Patent Act 1970 and patent system in India.

MODULE 4: SEED AND SEED TECHNOLOGY (10 Marks)

Seed certification, field inspection- Foundation and certified seed production of important cereals (Rice, wheat and maize), pulses (Cowpea, mung, urd, pigeonpea, field bean and soyabean), oilseeds (Sesame, coconut, sunflower, groundnut), fodder (Guinea grass, napier grass and lucern), and vegetables (Bhindi, tomato, brinjal, chillies and cucurbitaceous vegetables). Seed Act and Seed Act enforcement- Central Seed Committee, Central Seed Certification Board, State Seed Certification Agency, Central and State Seed Testing Laboratories. Seeds Control Order 1983 and Seed Bill 2004, IPR- Intellectual Property Rights

Module 5: HORTICULTURE (10 Marks)

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 – selection of site for crops - climate, soil, socio-economic factors; Techniques of training and pruning , 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 .Important seed and herbal classification ,medicinal plants -different methods of classification, active principles, aromatic plants- Botany, varieties, production technology, active principles and uses, plantation crops of Kerala – commercially cultivated varieties,production technologies – improved propagation methods..Ornamental and flowering plants (Floriculture) — cultivation of commercial ornamental and flower crops. Gardening and landscaping-scope and methods. Post harvest management of major horticultural crops of Kerala

MODULE 6: OLERICULTURE (10 Marks)

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.

MODULE 7: AGRICULTURAL ECONOMICS (10 Marks)

.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, classification and characteristics of agricultural markets- demand, supply and producer's surplus of agri-commodities: nature and determinants of demand and supply of farm products, producer's surplus.

Module 8 **05 marks**

Definition of forest and forestry. Classification of forest and forestry, branches of forestry and their relationships. Definition, objectives and scope of Silviculture. Status of forests in India and their role. History of forestry development in India. Trees and their distinguishing features. Growth and development. Forest reproduction. Site factors. Classification of climatic factors. Role played by light, temperature, rainfall, snow, wind, humidity and evapo-transpiration in relation to forest vegetation. Bioclimatic and micro climate effects. Edaphic factors - influence of biological agencies, parent rock, topography on the soil formation. Soil profile – physical and chemical properties. Physiographic factors - influence of altitude, latitude, aspect and slope on vegetation. Biotic factors - influence of plants, insects, wild animals, man and domestic animals on vegetation.. Influence of forests on environment. Tending and cultural operations. Thinning-kinds of thinning - improvement felling-salvage cuttings- pruning- pollarding, lopping. Forest types of India and their distribution. Plant- forest succession, competition and tolerance.

Module 9 **05 marks**

Regeneration of forests – objectives, ecology of regeneration- Natural and Artificial regeneration. Advance growth, coppice, root sucker. Regeneration survey. Artificial regeneration. Factors governing the choice of regeneration techniques. Choice of species. Preparation of planting material - field planting-site preparation- planting density spacing -marking- boundary demarcation, fencing, alignment and staking-kinds of pit making-patterns of planting, Plant protection and sanitation measures, - forest nutrition- fertilization in trees. Silvicultural system -definition, scope and classification. Even aged and uneven aged forests and their crown classes. Detailed study of the silvicultural systems: Clear felling systems including clear strip, alternate strip and progressive strip systems. Shelterwood system -Uniform system, Group system, Shelterwood strip system, Wedge system, Strip and group system, Irregular shelterwood system, Indian irregular shelterwood system. Seed tree method. Selection system and its modifications. Accessory systems. Coppice system -Simple coppice system, Coppice of the two rotation system, Shelterwood coppice system, Coppice with standard system, Coppice-with-reserve system, Coppice selection system, Pollard system. Conversion and its implications. Choice of silvicultural system. Dauerwald concept. Culm selection system in Bamboo, Silvicultural systems followed in other countries. Plantation silviculture - Choice of species- Plantation establishment- Plantation maintenance-. Nutrition in plantations- nutrient deficiencies, symptoms of deficiency- use of fertilizers- - Major pest and disease in plantations. Dynamics of stand growth- stand density management in plantations- spacing-planting density regulation- Thinning regimes- improvement fellings- CCF-MCA- Site quality evaluation- stand basal area site index concept in plantation forestry- plantation productivity assessment- growing stock assessment Clonal plantations. LULUCF and REDD concepts, AR-CDM concepts.

Module 10 **05 marks**

Origin, distribution, general description, phenology, silvicultural characters, regeneration methods, silvicultural systems, and economic importance of the following tree species of India. Broadleaved species: *Tectona grandis, Shorea robusta, Dalbergia latifolia, Dalbergia sissoo, Anogeissus spp, Terminalia spp., Santalum album, Swietenia macrophylla, Albizia spp, Santalum album, Pterocarpus marsupium, Gmelina arborea, Pterocarpus santalinus, Azadirachta indica, Hopea parviflora, Lagerstroemia microcarpa, Bamboos, reeds and rattan, Quercus spp.* Conifers*: Abies pindrow, Picea*

smithiana, Cedrus deodara, Pinus roxburghii, Pinus wallichiana. Fast growing MPTs*:,Tropical pines, Eucalyptus spp, Casuarina equisetifolia, Leucaena leucocephala, Ailanthus triphysa, Grevillea robusta, Pongamia pinnata, Melia dubia, Acacia spp, Populus spp*

Module 11 **05 marks**

Agroforestry definition and scope. History of agroforestry. Classification of agroforestry system - structural, functional, socioeconomic, and ecological basis. Traditional agroforestry systems: shifting cultivation, taungya, homegardens. Land capability classification and land use . Plantation agriculture and plantation forestry. Choice of species for agroforestry. Provisional and regulatory services of agroforestry- Food and nutritional security- Tree crop interactions in Agroforestry-Positive and Negative interactions. Industrial agroforestry concept and importance. Agroforestry systems in different agro climatic zones, components, production and management techniques. Alley cropping, High-density short rotation plantation systems, silvicultural woodlots/energy plantations. Different types of Pastoral siviculture and silvopastoral systems Silvoagriculture systems- Agrosilviulture, Pastoral silviculture , Silvopastoral and Agrosilvopastoral systems and their mangement; agrihortisilviculture, silvihorticulture, hortipastoral , aquaforestry, shelterbelts and windbreaks ; live fences; fodder trees and protein banks. Canopy management. Diagnosis and design methods and approaches. Biophysical and ecological functions of agroforestry: Nutrient cycling and role of agroforestry in soil and water conservation. Carbon sequestration-Climate change mitigation and phytoremediation. Adverse effects of trees on soils - competition, allelopathy – causes and mechanisms. Soil fertility considerations in Agroforestry – nutrient needs of trees and crops, activities of soil fauna and microorganisms affecting plant growth. People's participation, rural entrepreneurship through Agroforestry and industrial linkages. Financial and socio-economic analysis of Agroforestry systems. Evaluation of tangible and intangible benefits.

Module 12 **05 marks**

Forest Protection – classification of injurious agencies. Forest Fire - causes and Management. Injury to forest due to man, lopping – fuel wood collection – Encroachment- - method of control. Forest weeds and weed management, management of woody climbers, parasites and epiphytes. Forest Pathology- tree disease classification, Principles of tree disease management, - Causes and symptoms- losses due to forest tree diseases, root diseases (wilt, root- and butt rot), stem diseases (heart rots, stem blisters, rusts, stem wilt, cankers, pink diseases, gummosis, water blister) and foliar diseases (rust, powdery mildew, leaf spot, leaf and twig blight, abnormal leaf fall, needle blight etc.) of Etiology, symptoms, mode of spread, epidemiology and management, including chemical, biological, cultural and silvicultural practices. Nursery diseases and their management. Disease due to physiological causes. Abiotic diseases. Forest Entomology in India. Methods and principles of pest control: Mechanical, physical, silvicultural, legal, biological and chemical. Principles and techniques of Integrated Pest Management in forests. Classification of forest pests: types of damages and symptoms; factors for outbreak of pests. Nature of damage and management: Insect pests of forest seeds, forest nursery and standing trees of timber yielding species of natural forest and Plantation forest species. Insect pests of freshly felled trees, finished timbers and their management.

Module 13 **05 marks**

Forest Mensuration- Definition, objectives and scope of forest mensuration. Scales and Units of measurement, error and accuracy. Measurement of individual tree parameters. Bark measurements. Crown measurement . Height measurement –principles, instruments.Trees stem form- classification of form factors and form quotient. Volume tables- classification and preparation. Tree biomass-estimation methods. Age determination of tree- objective and methods. Tree growth measurement – stump analysis, stem analysis and increment boring. Measurement of tree crops –crop diameter, crop height, crop age and crop volume. Stand growth, site quality, site index, stand structure, yield tables, preparation and stand table. Forest inventory – definition objectives, kinds of enumeration. Sampling-definition, advantages, kinds of sampling, random sampling, Non random sampling. Point sampling-horizontal and vertical point sampling.

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

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