Syllabus for Bihar Agriculture Service Category-1 (Agronomy)

Paper-1

Meaning and scope of Agronomy, National and International Agricultural Research Institutes of India, Agro-climatic zones of India and Bihar, Weather and climate, micro-climate, weather elements, Formation and classification of clouds, Basics of weather forecasting. Dry land agriculture. Area, production and productivity of major crops in India and Bihar. Tillage, crops stand establishment, Planting geometry and its effect on growth and yields of cropping systems, harvesting, Classification of crops. Concept of multiple cropping, multistoried, relay and inter- cropping and their importance in relation to food production. Basic elements of crop production, Factors affecting crop production. Irrigation, definition and objectives, water resources and irrigation development in India and Bihar, Sail plant water relationships. Definition, principles and components of organic farming. Sustainable agriculture: Introduction, definition, goal and current concepts, factors affecting ecological balance and ameliorative measures; Land degradation and conservation of natural resources, Definition, principles and components of farming system.

Plant cell: an Overview; Diffusion and osmosis; Absorption of water, transpiration and Stomatal Physiology; Mineral nutrition of Plants: Functions and deficiency symptoms of nutrients, nutrient uptake mechanisms; Photosynthesis: Light and Dark reactions, C3, C4 and CAM plants; Respiration: Glycolysis, TCA cycle and electron transport chain; Plant growth regulators: Physiological roles and agricultural uses, Physiological aspects of growth and development of major crops: Growth analysis, Role of Physiological growth parameters in crop productivity

Indian history of Plant Breeding, major objectives and achievements of plant breeding in India, Centre of diversity and its importance in crop Improvement. Nature of Pollination of crops, parthenocarpy in plants. Germplasm conservation and its utilization, concept of gene and gene pool. Hybridization & methods of handling segregating generations. Mass selection, back cross method, recurrent selection. Crop ideotype-concept and importance. Male sterility and self—incompatibility- mechanism and their utilization in crop improvement. Pure line, Synthetic and composite variety and their development, Hybrid production and importance in different crop plants. Wide hybridization and constrains related to it. Mutation and types of mutagens. Quantitative and qualitative characters. Components of genetic variation, correlation and regression. Cell division-mitosis and meiosis. Mendel's laws of inheritance and their exceptions, linkage and crossing over. Polyploidy and its importance in crop breeding. Tot potency in plant, meristem culture, anther culture. Transgenic- achievements and future prospects. Plant breeder's rights and regulation for plant variety protection. Basic principles of seed production, kinds of seed and Indian seed Act 1966. Seed Act and Seed Act enforcement. Duty and powers of seed inspector, offences and penalties. Seeds Control Order 1983, Varietal Identification through Grow Out Test and Electrophoresis, Molecular and Biochemical test. Seed storage; general principles, stages and factors affecting seed longevity during storage. Measures for pest and disease control during storage. Seed marketing: structure and organization, sales generation activities, promotional media. Factors affecting seed marketing

Economic importance of insects, General morphology and anatomy of insect, Classification of insects, Apiculture, sericulture and lac culture, Important insect and non-insect pests of important field crops, vegetables, orchard and plantation crops and their management.

Storage pests and their management. Integrated pest management. Biological control of pests. Plant quarantine measures. Different categories of pesticides, their formulation and modes of action. Insect toxicology and concept of LD_{50}/LC_{50} MRL and waiting period, Recent techniques of pest management. Plant protection equipment's and its -application in pest management. Insecticide act, 1968 & puts, 1971.

Introduction, important plant pathogenic organisms, fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, Spiro plasmas, viruses, viroids, algae, Protozoa and phanerogamic parasites with examples of diseases caused by them. General characters, reproduction and classification of fungi. Definition and objectives of Plant Pathology. Survival and Dispersal of Plant Pathogens. Plant disease epidemiology. General principles of plant diseases management. Integrated plant disease management' (IDM). Economic importance, symptoms, cause, epidemiology and disease cycle and important diseases of important field crops, vegetables, Horticultural crops and their management. General characteristics of plant pathogenic nematodes its morphology and biology. Classification of nematodes up to family level with emphasis. General symptoms caused by nematodes and their management

Public Finance—Meaning, Principle, Sources, Direct Tax, Indirect Tax. Nationalized and Commercial Banking System, Agricultural Credit, Agricultural Co-operative Structure and Function. Agricultural Marketing - Definition, classification, marketable surplus & marketed surplus, Marketing Channel, Price-Spread, Market Structure. Agricultural Price Policy. FCI, SWC, CWC, APMC, State Trading, Production Economics — Classical Production Function. Relationships between output & input. Agri.Business Management, Product Life Cycle, strategies in different stages of PLC; pricing and promotion strategies: Marketing mix, Capital Management, Balance Sheet, project loss statement, Project Life Cycle.

Definition and importance of horticulture, Classification of horticulture. Area and production of different fruit vegetables and flower crops planting systems, high density planting, planning and establishment of new orchard. Propagation methods and use of growth regulators in horticultural crops. Package of practices of important fruits, vegetables and ornamental crops. Maturity indices, harvesting and postharvest handling of fruits and vegetables. Pre harvest factors affecting quality on postharvest shelf life of fruits and vegetables. Principles of preservation by heat, low temperature, chemicals and fermentation. Preparation of jams, jellies, preserves, pickles, ketchup, sauce.

Agricultural extension, its importance, Extension teaching methods, Etawah Pilot Project. Community Development Programme. Panchayati Raj System, High Yielding Variety Programme, National Demonstration Programme, Krishi Vigyan Kendra, AIMA, Institutional Village. Linkage Programme (IVLP), IRDP. Demonstrations. Leadership, Attitude. Knowledge. Skill, Training. Communication skill. Local leaders, Adoption and Diffusion. Innovations and their characteristics, Kisan Call Centers, 'Entrepreneurship in Agriculture. SWOT analysis.

Concepts and components of e-Agriculture, concepts and applications, Use of ICT in Agriculture. Smartphone Apps in Agriculture for farm advises, market price, postharvest management etc; Geospatial technology for generating valuable agri-information. Decision support systems, concepts, components and applications in Agriculture, Agriculture Expert System, Soil Information Systems etc for supporting Farm decisions. Preparation of contingent crop-planning using IT tools.

Syllabus for Bihar Agriculture Service Category-1 (Agronomy)

Paper-2

Origin, geographic distribution, economic importance, soil and climatic requirement, varieties, cultural practices and yield of crops — Cereals : Rice, Maize, Sorghum, Pearl millet, minor millets, Wheat, Barley; Pulses: Pigeon pea, Mungbean, Urdbean, Chickpea, Lentil, Peas, Bean; Oilseeds: Ground nut, Sesame, Soybean, Rapeseed and mustard, Sunflower, Safflower and Linseed ; Sugar crops: Sugarcane and Sugar beet; Fibre crops- Cotton, Jute and Sunhemp, Medicinal and aromataic crops : Mentha, Lemon grass, Citronella, Isabgol; Commercial crops: Potato and Tobacco; Forage crops : Sorghum, Maize, Cowpea, Cluster bean, Napier, Berseem, Lucerne and Oat. Calculation of seed rate, fertilizers, weedicide and yield estimation. Preparation of cropping scheme for irrigated and dry land situations.

Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture; Geo-informatics- GIS, GPS and Remote sensing concepts and application in agriculture; Nanotechnology, definition, concepts and techniques, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors, Use of nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity. Pedological and Edaphological concepts, Earth Crust, Composition and weathering of rocks and minerals factors and processes of soil formation, Type of soil, production importance and their management. Concept of soil quality and soil health- physical, chemical and biological indicator of soil quality. Movement of soil water. Soil health assessment techniques. Soil as a source of plant nutrients. Criteria of nutrients essentiality and their function, forms of nutrient in soil. Mechanism of nutrient transport to plants and factor affecting nutrient availability to plant. Acidic, calcareous and salt affected soils: their characteristics, nutrient availabilities and reclamation (Mechanical, chemical and biological methods). Fertilizer and insecticides and their effect on soil, Indian standards for water quality, use of saline water in agriculture, Different approaches of soil fertility evaluation. Role of microbes in soil fertility and crop production: Carbon, Nitrogen, Phosphorus and Sulphur cycles. Biological nitrogen fixation- symbiotic, associative and asymbiotic. Azolla, blue green algae and mycorrhiza. Rhizosphere and phyllosphere. Microbes in human welfare: silage production, biofertilizers, biopesticides, biofuel production and biodegradation of agro-waste.

Methods of soil moisture estimation, crop water requirement, Scheduling of irrigation, Methods of irrigation, surface, sprinkler and drip irrigation, Irrigation efficiency and water use and efficiency, Conjunctive use of water, Irrigation water quality and its management, Water management of important field crops. Agricultural drainage.

Organic farming; Introduction, concept, 'relevance in present context; Organic production requirement; Biological intensive nutrient management, recycling of organic residues, bio-fertilizers; Soil improvement and amendments; Integrated diseases and pest management; Quality considerations, certification, labeling and accreditation processors, marketing, exports.

Rainfed agriculture: Introduction, types, History of rainfed agriculture and watershed in India; Problems and prospects of rainfed agriculture in India ; Soil and climatic conditions prevalent in rainfed areas; Soil and water conservation techniques, Drought: types, effect of water deficit on physio-morphological characteristics of the plants, Crop adaptation and mitigation to drought; Water harvesting: importance, its techniques, Efficient utilization of water through soil and crop management practices,Management of crops in rainfed areas, Contingent crop planning for aberrant weather conditions, Concept, objective, principles and components of watershed management, factors affecting watershed management.

Definition, Principles and components of Farming System:, Useful IFS modules for lowland, upland and dry land situations,. Principles of integration of different enterprises for the preparation of farming system modules. Utilization of wasteland through farming system. Maintenance of records of IFS modules and evaluation of IFS modules against existing farming system

Weeds, their characteristics, harmful and beneficial effects, classification, multiplication and dissemination, crop- weed competition, physical, cultural, chemical and biological control of weeds, integrated -weed management; Herbicide classification, formulations, methods of application, weed management in major field and horticultdral crops. Aquatic and problematic weeds and their control.

Fertilizers and manures, types, application, methods, nutrient use efficiency and integrated nutrient management (WM). Factors influencing nutrient —use efficiency. Biofertilizers and their advantage. Preparation of organic manures, vermi compost, FYM, green manuring, Measures to overcome deficiencies and toxicities of nutrient.

Types and systems of farming. Farm planning and budgeting. Risk and Uncertainty. Principles of production and costs. Cost of cultivation, net returns, Farm records, Balance sheet, Profit —loss analysis.