Syllabus for Bihar Agriculture Service Category-5 (Plant Protection)
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, Soil 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.

Application of Remote Sensing, GPS and GIS techniques in agriculture, 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.

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.

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, Prokaryotes: classification of prokaryotes according to Bergey's Manual of systematic Bacteriology. 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.Generalsymptoms 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, 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, ATMA. 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.

Syllabus for Bihar Agriculture Service Category-5 (Plant Protection) Paper-2

History of Entomology in India. Factors for insect abundance. Metamorphosis and diapause in insects. Types of larvae and pupae. Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretory (Endocrine) and reproductive system in insect. Types of reproduction in insects. Classification of class Insecta upto Orders. Insect Ecology: Introduction, Environment and its components. Effect of abiotic factors- temperature, moisture, humidity, rainfall light, atmospheric pressure and air currents. Effect of biotic factors- food competition, natural and environmental resistance and Concept of Balance of life in nature, biotic potential and environmental resistance and causes for out break of pests in agro-ecosystem. Pest surveillance and pest forecasting. Categories of pests. IPM; Introduction, importance, concept, principles and tools of IPM – Host plant resistance, Cultural, Mechanical, Physical, Legislative, Biological (parasites, predators & transgenic plant pathogens such as bacteria, fungi and viruses), methods of control. Chemical control – importance, hazards and limitations. Classification of insecticides, toxicity of insecticides and formulations of insecticides. Study of important insecticides. Botanical insecticides – neem based products, Cyclodiens, Organophosphates, Carbamates, Synthetic pyrethroids, Novel insecticides, Pheromones, Nicotinyl insecticides, Chitin synthesis inhibitors, Phenyl pyrazoles, Avermectins, Macrocyclic lactones, Oxadiazimes, Thiourea derivaties, pyridine azomethines, pyrroles etc. Nematicides, Rodenticides, Acaricides and fumigants. Recent methods of pest control. Practices, scope and limitations of IPM. Insecticides Act 1968 – Important provisions. Application techniques of spray fluids. Phytotoxicity of insecticides. Symptoms of poisoning, first aid and antidotes. Beneficial insects: parasites and predators used in pest control and their mass multiplication techniques. Important groups of microorganisms, bacteria, viruses and fungi used in pest control and their mass multiplication techniques. Important species of pollinators, weed killers and scavengers - their importance.

Importance of plant diseases, cause of diseases, different groups of plant pathogens-fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, spiroplasmas, viruses, viriods, algae, protozoa and phanerogamic parasites with examples of diseases caused by them. History of Plant Pathology, Bengal famine, Irish famine and other important examples of economic consequences of plant diseases. Terms and concepts in Plant Pathology. Examples of Endemic, sporadic,epidemic and pandemic diseases. Phenomenon of infection – pre-penetration, penetration and post penetration. Pathogenesis. Defense mechanism in plants– Structural and Bio-chemical (pre and post-infection)., Etiology, symptomatology and Epidemiology of some economically important plant diseases- Leaf spot , Blast , sheath rot ,sheath blight and Bacterial leaf blight disease of rice, loose smut , rust and kernel bunt disease of wheat, red rot of sugarcane, Leaf blight of maize, Downy and powdery mildews of vegetables, Late blight of potato, Downy mildew of grape, rust of linseed, panama disease of banana, Damping off of vegetable seedlings etc. Survival and dispersal of Plant Pathogens. Diseases management –Importance, general Principles – Avoidance, exclusion, protection – Plant Quarantine and Inspection – Quarantine Rules and Regulations. Cultural methods –

Rouging, eradication of alternate and collateral hosts, crop rotation, manure and fertilizer management, mixed cropping, sanitation, hot weather ploughing, soil amendments, time of sowing, seed rate and plant density, irrigation and drainage. Role and mechanisms of biological control and PGPR. Physical Methods – solar energy and hot water treatment ,Chemical methods , classification of fungicides, discovery of Bordeaux mixture, method of preparation of Bordeaux mixture, important systemic and contact fungicides, antibiotics and their mode of action. Methods of application of fungicides. Host plant resistance. Integrated plant disease management (IDM) – Concept and advantages.

Non insect pests mites, nematodes, rodents and birds. Vermiculture Distribution, biology, nature and symptoms of damage and management strategies of pests of important crops of Bihar and the country. History of phytonematology. Economic importance. General characteristics of plant pathogenic nematodes. Study of White tip of paddy, ear cockle of wheat, root knot of tomato & brinjal, Interaction between plant parasitic nematodes and disease causing fungi, bacteria and viruses. Different methods of nematode management. Cultural methods (crop rotation, fallowing, soil amendments, other land management techniques), physical methods (soil solarisation, hot water treatment) Biological methods, Chemical methods (fumigants, non fumigants). Resistant varieties. IDM.