Annexure-B

SYLLABUS FOR AGRICULTURE DEVELOPMENT OFFICER

PAPER- I

1. Agronomy:

Agro-climatic zones of India and Arunachal Pradesh; crop classification; tillage operations and implements; cultural practices, crop varieties, seed selection, sowing methods, seedling raising, crop rotation, cropping intensity, multiple, inter-, mixed, and rainfed cropping systems. Production technologies of major crops: cereals (rice, maize, wheat, millets), pulses (black gram, green gram, pigeon pea, soybean, chickpea, lentil, field pea), oilseeds (mustard, sunflower, sesamum, groundnut), fibre crops (cotton, jute), sugarcane, potato, and fodders (napier, cowpea). Integrated farming systems with crop-livestock-horticulture components, resource recycling, diversification, and organic practices using biofertilizers and conservation measures. Watershed management with ridge-to-valley approach, soil-moisture conservation, water harvesting, and community-based planning. Weed classification, effects, competition, control methods, herbicide types, selectivity, resistance, and allelopathy. Agrometeorology: weather variables, monsoon dynamics, weather hazards (drought, flood, frost, hail), greenhouse effect, climate change, and instruments (thermometers, rain gauges, etc.). Soil-plant-water relations, irrigation quality and methods (surface, sprinkler, drip), water use efficiency, scheduling, and fertilizer efficiency. Contingency crop planning for aberrant weather. Conservation agriculture: minimal tillage, mulching, cover cropping, dryland farming, soil and water conservation techniques. Drought, its types, and drought mitigation strategies. Applications of nanotechnology such as nano-fertilizers, nano-pesticides, and nano-sensors, and the use of geospatial tools (GIS, GPS, remote sensing) for precision farming and real-time crop monitoring. Organic farming: concept, definition, production technologies of major crops, and certification processes. Natural farming: concept, definition, and its core pillars—Beejamrit, Jeevamrit, Acchadana, and Waaphasa with emphasis on its ecological approach, traditional compatibility, and zero-budget nature. Differences between Conventional, Organic and Natural farming, low-external-input, climate-resilient farming systems in the context of Arunachal Pradesh.

2. Horticulture:

Definition, scope, importance, and classification of horticultural plants. Fundamental principles of plant propagation with emphasis on the importance of rootstocks. Production technologies for major fruit crops including orchard layout, systems of planting, and crop establishment. Management of orchard soil, irrigation, and drainage systems, along with cultural practices involved in various horticultural operations. Planning and management of nurseries and orchards. Importance and scope of fruits with reference to classification, uses, varieties, soil and climate requirements, cultural practices, and production challenges. Important fruit crops of Arunachal Pradesh such as citrus, pineapple, banana, kiwi, walnut, and pear; potential crops including apple, persimmon, dragon fruit, and plum; and underutilized fruits with scope for mainstreaming including Garcinia species, rambutan, bael, aonla, ber, jamun, fig, tamarind, passion fruit, carambola, and jackfruit. Classification and production of vegetables with emphasis on regionally important crops like cabbage, cauliflower, tomato, brinjal, and chilli, alongside potential crops such as broccoli and sweet

pepper. Underutilized vegetables including yam, colocasia, asparagus pea, winged bean, stinging nettle, and wild leafy greens. Major spice crops like ginger, turmeric, and large cardamom, along with underutilized spices such as wild turmeric, zedoary, black turmeric, large cardamom, and local landraces of ginger and chili. Tuber crops covering origin, distribution, and cultivation of tapioca, sweet potato, and colocasia. Elementary principles of processing and preservation of horticultural produce. Scope of landscaping and floriculture in Arunachal Pradesh, including principles of landscaping, landscape uses of trees, shrubs, and climbers. Importance and scope of ornamental crops, medicinal and aromatic plants (MAPs), and processing and value addition in ornamental crops and MAPs. Post-harvest handling and processing of fruits and vegetables, causes and extent of post-harvest losses, harvesting techniques, field handling, storage principles, and methods of preservation.

3. **Plant Physiology:**

Absorption of Water, Water Movement in Plants, Solute Absorption – Factors and Mechanisms, Transpiration and Evapo-transpiration – Factors and Regulation, Mineral Nutrition – Essential Elements and Deficiency Symptoms, Enzymes and Enzymatic Activity in Plant Processes, Photosynthesis – Carbon Assimilation and Light/Dark Reactions, Respiration and Photorespiration, Nitrogen Metabolism – Nitrate Reduction and Ammonia Assimilation, Fat Metabolism, Plant Growth Hormones – Types and Functions, Role of Growth Regulators in Agriculture and Horticulture, Photoperiodism – Concept and Agricultural Importance, Vernalization – Mechanism and Role in Crop Production.

4. **Genetics and Plant Breeding:**

Genetics, principles of inheritance, Chromosomal theory of inheritance, Cell component, concept of cytoplasmic inheritance, Concepts of sex determination, mutation, methods of induction, and applications in crop improvement, evolution, elementary concept of genes, gene action, structure and function of DNA and RNA, molecular basis of transcription and translation. Principle of inheritance, interaction of gene and modification of F_2 ratio, linkage and crossing over. Planting breeding and modern science, classification of crops according to breeding behavior. Application of breeding methods. Application of principle of plant breeding to the improvement of major crops like rice, wheat, maize, vegetable, pulses, oil seeds. modes of reproduction, apomixis, self-incompatibility, and male sterility. Methods for improvement of self-, cross-, and asexually propagated crops including mass and pure line selection, hybridization, population improvement methods, and hybrid seed development, and pre-breeding support development of climate-resilient and high-yielding varieties. Application of biotechnology through marker-assisted selection, varietal identification, and GM crop detection, plant genetic resources, breeding objectives, and legal aspects like plant breeder and farmer rights, Maintenance of genetic purity during seed production, Seed certification, phases and procedure for seed certification, field inspection. Seed Act and Seed Act enforcement. Varietal Identification through Grow Out Test and Electrophoresis, Molecular and Biochemical test and organic seed production.

5. **Soil Science:**

Soil Profile, Composition of soil, classification and soils of India, Soil physical and chemical properties: soil-texture, structure, density and porosity, soil colour, and plasticity. Soil air,

composition, Soil temperature and its effect on plant growth. Soil colloids-minerals and organic minerals, their natures and properties. Concept of soil pH. Development/reclamation of Acid/Alkalic soils. Organic matter-humus, its formation, nature and properties, CN ratio in soil and its significance. Important biological process in soil, ammonization, ammonification, nitrification, denitrification and nitrogen fixation. Concept of soil productivity and fertility, essential elements for plants, their forms, availability and functions Critical levels of different nutrients in soil and Plants. Methods of fertilizer recommendations to crops, Deficiency symptoms of nutrients in plants. Fixation and release of nutrients in soil, Factor influencing nutrient use efficiency (NUE), Methods of application under rainfed and irrigated conditions. Nitrogen fixation, symbiotic and non-symbiotic nitrogen fixation. Biofertilizers and their use. organic manures - importance of organic manures, properties and methods of preparation of bulky and concentrated manures. Land capability classification, soil survey definition, purpose and types. Chemical fertilizers, nano Fertilizers, Reclamation and management of Acidic, Saline and sodic soils, Soil pollution - behaviour of pesticides and inorganic contaminants, prevention and mitigation

PAPER– II

1. Plant Pathology:

Concept of diseases in plants, importance of plant diseases. Classification of plant diseases, various parasitic and non-parasitic causes of plant diseases. Diagnosis of plant disease, stage of disease, development i.e. inoculation, penetration, infection, invasion, growth and reproduction, effect of environment including adaphic factors in plant disease. Principles of disease management. Concept of integrated control measures. Symptoms, etiology, disease cycle and management of common diseases of major field crops, vegetables, fruit crops, major pulses, oil seeds, commercial crops like sugarcane, potato, chilies etc. Methods of detection and diagnosis of diseases. Calculation and dynamics of economic injury level and importance of Economic threshold level.

Importance of microbiology, classification of micro-organism, different types of bacteria, brief classification of bacteria structure and classification of moulds and viruses. Antibiotics and antibodies. Microbiology of soil, water, air and food.

2. Entomology & Nematology:

Categories of pests. Concept of IPM, Practices, scope and limitations of IPM. Different methods of pest control with special reference to Bio Intensive Pest Management, Identification of biocontrol agents, different predators and natural enemies. Mass multiplication of *Trichoderma, Pseudomonas*, *Trichogramma*, NPV etc. Classification of insecticides, toxicity of insecticides and formulations of insecticides. classification of pesticides and their physical, chemical and biological properties. Types of formulations, Insecticide and their precautionary measures. Chemical control importance, hazards and limitations. Different types of plant protection equipment, their maintenance and their use in. Recent methods of pest control, repellents, hormones, attractants, gamma radiation. Insecticides Act 1968- Important provisions. Symptoms of poisoning, first aid and antidotes. Insect pests, mites, rodents, birds and microorganisms associated with stored grain and their management. Factors affecting losses of stored grain and role of physical, biological,

mechanical and chemical factors in deterioration of grain, Stored grain pest and their control, rodent and their control measures. Importance of beneficial Insects, Identification of major parasitoids and predators commonly being used in biological control. Productive insects with special reference to sericulture, apiculture and lac-culture. Insect orders bearing predators and parasitoids used in pest control and their mass multiplication techniques. Important species of pollinator, weed killers and scavengers with their importance. Nematodes – Their pathogenicity, relationship with other micro-organisms. Different types of harmful and useful insects. Identification, nature and extent of damage caused by insect, life history, seasonal occurrence, management practices of major pests of field crops, fruits and vegetables.

3. **Extension Education:**

Concept, Philosophy and Principles of Extension Education, Objectives and Functions of Extension, Rural Development Programmes in India, Teaching-Learning Process in Extension, Extension Teaching Methods – Individual, Group and Mass Contact Methods, Communication – Elements, Models and Barriers, Adoption and Diffusion of Innovations, Attributes of Innovations, Rural Sociology – Social Stratification, Culture, Social Values, Social Change, Leadership, Social Institutions, Psychology and Behavioural Change, Motivation and Learning, Programme Planning and Evaluation, Monitoring and Feedback Mechanisms, Extension Reforms, Role of ICT in Agricultural Extension, Use of Mobile-based Services, e-Extension, Digital Platforms, Role of FPOs and SHGs in Rural Development, Participatory Rural Appraisal (PRA), Capacity Building and Skill Development, Public-Private Partnership in Extension, Linkages and Coordination among Extension Agencies, Gender Issues in Agriculture and Extension, Extension Approaches and Models, Entrepreneurship Development and Market-led Extension, Climate Smart Extension and Role in Sustainable Agriculture. various extension/ agriculture development programmes launched by ICAR/ Govt. of India, Concept of Entrepreneur, Entrepreneurship Development, Characteristics of entrepreneurs, Government policy and programs and institutions for entrepreneurship development, Financing of enterprise, Opportunities for Agri entrepreneurship and rural enterprise.

4. **Agri. Economics and Farm Management:**

Basic concepts of economics including wants, goods, wealth, welfare, value, price, and consumption; definition and scope of agricultural economics and its importance. Law of demand and supply, elasticity of demand and supply, and consumer behavior. Production function and laws of returns, cost concepts and cost curves, and farm income measures. Farm planning and budgeting, farm records and accounting, types and systems of farming, landholding and land tenure systems. Agricultural marketing: concept, types of markets, characteristics, marketing functions and market augmentation; concepts of producer surplus and consumer surplus, marketing efficiency—its definition and methods of measurement; price spread, marketing channels, market structure, and price determination. Agricultural price policy, minimum support price (MSP), and market intervention schemes. Risk and uncertainty in agriculture, crop insurance schemes, and their importance. Agricultural finance: sources, classification, and principles of agricultural credit; credit appraisal methods and repayment planning. Role of NABARD, commercial banks, cooperatives, and microfinance institutions in agricultural development. Impact of WTO on Indian agriculture,

agricultural subsidies, and the functioning of the Public Distribution System (PDS). Concepts of resource use efficiency, farm business analysis, and principles of farm management. Applications of tools like linear programming, input-output analysis, and cost-benefit analysis in decision-making. Natural resource economics, sustainable agriculture, and environmental economics. Agribusiness management including entrepreneurship, contract farming, and agro-based enterprises. Role of ICT in agricultural economics, Farmer Producer Organizations (FPOs) and their linkages to market, value chain, and supply chain management. Overview of agri export-import policy and its implications for rural and national economic growth.

5. **Agri. Engineering:**

Scope of Farm Mechanization – Benefits and Limitations, Sources of Farm Power – Human, Animal, Mechanical and Renewable, Internal Combustion Engines – Basics and Applications, Types and Components of Tractors, Tractor Maintenance and Operation, Primary and Secondary Tillage Implements, Intercultural Tools and Equipment, Sowing and Planting Equipment, Harvesting and Threshing Machinery, Soil-Plant-Water Relationship, Irrigation Methods – Surface, Sprinkler, and Drip, Irrigation Scheduling and Efficiency, Drainage Engineering – Types and Design, Land Surveying – Chain Survey, Levelling, Compass and Theodolite Survey, Soil and Water Conservation – Contour Bunding, Terracing, Check Dams, Vegetative Barriers, Erosion Control Structures, Watershed Management Concepts, Field Structures – Farm Roads, Fencing, Drying Yards, Godowns and Silos, Post-Harvest Technology – Threshing, Drying, Cleaning, Grading, and Packaging, Grain Storage – Structures and Principles, Renewable Energy – Solar, Wind, Biogas and Agricultural Applications, Protected Cultivation – Greenhouses, Shade Nets, Precision Agriculture Tools, ICT in Agricultural Mechanization, Farm Safety and Ergonomics.

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