## 15 PLANTATION, SPICES, MEDICINAL & AROMATIC CROPS

**Unit 1**: **Production technology of Plantation Crops**

Role of plantation crops in national economy, export potential, IPR issues, clean development mechanism, classification and varietal wealth. Plant multiplication including invitro multiplication, systems of cultivation, multitier cropping, photosynthetic efficiencies of crops at different tiers, rainfall, humidity, temperature, light and soil pH on crop growth and productivity, high density planting, nutritional requirements, physiological disorders, role of growth regulators and macro and micro nutrients, water requirements, fertigation, moisture conservation, shade regulation, weed management, training and pruning, crop regulation, maturity indices, harvesting. Postharvest processing practices. GAP and GMP in plantation crop production and processing. Cost benefit analysis, organic farming, management of drought, precision farming. Crops: Coffee, tea, cashew cocoa, rubber, palmyrah, oilpalm, coconut, arecanut, wattle and betel vine. Role of commodity boards and developmental institutions in plantation crops.

**Unit 2**: **Production Technology of Spice Crops**

Introduction, importance of spice crops-historical accent, present status - national and international, future prospects, botany and taxonomy, climatic and soil requirements, commercial varieties/hybrids, site selection, seed / planting material production including rapid multiplication and micropropagation, sowing/planting times and methods, seed rate and seed treatment, nutritional and irrigation requirements, intercropping, mixed cropping, intercultural operations, weed control, mulching, physiological disorders, harvesting, post-harvest management and processing practices, plant protection measures precision farming, quality control of : Black pepper, cardamom, clove, cinnamon, nutmeg, allspice, turmeric, ginger, garlic, coriander, fenugreek, cumin, fennel, ajwain, dill, celery, tamarind, garcinia, curryleaf, saffron, and vanilla. Role of commodity boards in spices development.

**Unit 3**: **Production Technology of Medicinal and Aromatic Crops**

Herbal industry, WTO scenario, Export and import status, Indian system of medicine, Indigenous Traditional Knowledge, IPR issues, Classification of medicinal crops, Systems of cultivation, Organic production, Role of institutions and NGO's in production, GAP in medicinal crop production. Production technology, Post-harvest handling – Drying, Processing, Grading, Packing and Storage, processing and value addition; GMP and Quality standards in herbal products. Influence of biotic and abiotic factors on the production of secondary metabolites, Regulations for herbal raw materials, Phytochemical extraction techniques. Aromatic industry, WTO scenario, Export and import status, Indian perfumery industry, History, Advancements in perfume industry. Production technology, Post-harvest handling, Distillation methods, advanced methods, Solvent extraction process, TLC, HPLC, GC, steam distillation, Perfumes from non-traditional plants, Quality analysis, Value addition, Aroma chemicals, quality standards and regulations. Institutional support and international promotion of essential oil and perfumery products. Medicinal crops: Senna, periwinkle, coleus, aswagandha, glory lily, sarpagandha,

dioscorea sp., Aloe vera, Phyllanthus amarus, Medicinal solanum Isabgol, PoppyStevia rebaudiana, Mucuna pruriens, Satavari, Long pepper, sweat flag, Belladona and Cinchona

Aromatic Crops: Palmarosa, lemongrass, citronella, vettiver, geranium, artemisia, Mentha, Ocimum, eucalyptus, rosemary, thyme, patchouli, lavender, marjoram, and oreganum.

**Unit 4**: **Breeding of Plantation, Spice, Medicinal and Aromatic Crops**

Species and cultivars, cytogenetics, survey, collection, conservation and evaluation, blossom biology, breeding objectives, approaches for crop improvement, introduction, selection, hybridization, mutation breeding, polyploidy breeding, improvement of quality traits, resistance breeding for biotic and abiotic stresses, molecular aided breeding and biotechnological approaches, marker-assisted selection, bioinformatics, IPR issues, achievements and future thrusts. Crops: Coffee, tea, cashew, cocoa, rubber, palmyrah, oilpalm, coconut, arecanut, black pepper, cardamom, ginger, turmeric, fenugreek, coriander, fennel, celery, ajwain, nutmeg, cinnamon, clove and allspice. Medicinal crops, *viz*. Cassia angustifolia, Catharanthus roseus, Gloriosa superba, Coleus forskohlii, Stevia, Withania somnifera, Papaver somniferum, Plantago ovata, Dioscorea sp, Chlorophytum sp, Rauvolfia serpentina, Aloe vera, Phyllanthus amarus, Medicinal Solanum

Aromatic crops: Geranium, vettiver, Lemon grass, Palmarosa, citronella, rosemary, Patchouli, Eucalyptus, Artemisia, Ocimum sp, and Mint.

**Unit 5**: **Processing of Plantation Crops, Spices, Medicinal and Aromatic Plants**

Commercial uses of spices and plantation crops. Processing of major spices - cardamom, black pepper, ginger, turmeric, chilli and paprika, vanilla, cinnamon, clove, nutmeg, allspice, coriander, fenugreek, curry leaf. Extraction of oleoresin and essential oils; Processing of produce from plantation crops, viz. coconut, arecanut, cashewnut, oil palm, palmyrah, date palm, cocoa, tea, coffee, rubber etc; Processing of medicinal plants– dioscorea, gloriosa, stevia, coleus, ashwagandha, tulsi, isabgol, safed musli, senna, aloe, catharanthus, etc. Different methods of drying and storage. Microbial contamination of stored product. Influence of temperature and time combination on activeprinciples; Extraction and analysis of active principles using TLC/HPLC/GC. Distillation, solvent extraction from aromatic plants– davana, mint, rosemary, citronella, lavender, etc. Study of aroma compounds and value addition

**Unit 6**: **Organic Spice and Plantation Crop Production Technology**

Importance, principles, perspective, concept and component of organic production of spice and plantation crops; viz. Pepper, cardamom, turmeric, ginger, cumin, vanilla, coconut, coffee, cocoa, tea, arecanut; managing soil fertility, pests and diseases and weed problems in organic farming system; crop rotation in organic horticulture; processing and quality control for organic foods; methods for enhancing soil fertility, mulching, raising green manure crops. Indigenous methods of composting, preparation of panchagavya, biodynamics, etc.; pest and disease management in organic farming; ITK’s in organic farming. Role of botanicals and bio-control

agents; GAP and GMP- certification of organic products; organic production and export-opportunity and challenges.