

SEMESTER-V

HORT 301: Orchard and Estate Management**2(1+1)****Theory**

Orchard & estate management, importance, objectives, merits and demerits, clean cultivation, sod culture, Sod mulch, herbicides and inorganic and organic mulches. Tropical, sub-tropical and temperate horticultural systems, competitive and complimentary effect of root and shoot systems. Biological efficiency of cropping systems in horticulture, systems of irrigation. Soil management in relation to nutrient and water uptake and their effect on soil environment, moisture, organisms and soil properties. Factors influencing the fruitfulness and unfruitfulness. Rejuvenation of old orchards, top working, frame working, Integrated nutrient and pest management. Utilization of resources constraints in existing systems. Crop model and crop regulation in relation to cropping systems. Climate aberrations and mitigation measures of Horticultural crops.

Practical

Layout of different systems of orchard and estate, soil management, clean, inter, cover and mixed cropping, fillers. Use of mulch materials, organic and inorganic, moisture conservation, weed control. Layout of various irrigation systems.

Suggested Reading:

Kumar, 1990. *Introduction to Horticulture crops*. Rajyalakshmi Publications, Nagercoil, Tamilnadu.

Palaniappan, S.P. and Sivaraman, K. 1996. *Cropping systems in the Tropics*. New age International (P) Ltd., Publishers, New Delhi.

Shanmugavelu, K.G. 1989. *Production Technology of Fruit Crops*. Oxford & IBH Publishing Co. Pvt.Ltd., New Delhi.

WS. Dhillon and Bhatt. 2011. *Fruit Tree Physiology*. Narendra Publishing House, New Delhi.

B .C. Mazumdar. 2004. *Principles and Methods of Orchard Establishment*. Daya Publishing House, New Delhi.

T. Pradeep Kumar, B. Suma, Jyothi Bhaskar and K.N.Satheson. 2008.

Management of Horticultural Crops. New India Publishing Agency, New Delhi.

B .C. Mazumdar. 2004. *Orchard Irrigation and Soil Management Practices* Daya Publishing Agency, New Delhi. Daya Publishing Agency, New Delhi

HORT 302: Medicinal and Aromatic Crops**3(2+1)****Theory**

History, scope, opportunities and constraints in the cultivation and maintenance of medicinal and aromatic plants in India. Importance, origin, distribution, area, production, climatic and soil requirements, propagation and nursery techniques, planting and after care, cultural practices, training and pruning, nutritional and water requirements. Plant protection, harvesting and processing of under mentioned important medicinal and aromatic plants. Study of chemical composition of a few important medicinal and aromatic plants, extraction, use and economics of drugs and essential oils in medicinal and aromatic plants. Therapeutic and pharmaceutical uses of important species. Storage techniques of essential oils. Medicinal Plants: *withania*, periwinkle, rauwolfia, dioscorea, isabgol, opium poppy *Ammi majus*, belladonna, cinchona, pyrethrum and other species relevant to local conditions. Aromatic Plants: citronella grass, khus grass, flag (baje), lavender, geranium, patchouli, bursera, menthe, musk, occimum and other species relevant to the local conditions. Marketing.

Practical Collection of medicinal and aromatic plants from their natural habitat and study their morphological description, nursery techniques, harvesting, curing and processing techniques and extraction of essential oils.

Suggested Reading:

Chadha, K.L. ICAR, 2001. Hand Book of Horticulture. Directorate of Information and Publications of Agriculture, Pusa, New Delhi.

Azhar Ali Farooqui and Sreeramu, B.S. 2001. Cultivation of medicinal and aromatic plants. United Press Limited.

Atal, E.K. and Kapur, B. 1982. Cultivation and Utilization of Medicinal and Aromatic plants. CSIR, New Delhi.

Kumar, N. J.B.M. Md. Abdul Khaddar, Ranga Swamy, P. and Irulappan, I. 1997. Introduction to Spices, Plantation Crops Medicinal and Aromatic Plants. Oxford & IBH, New Delhi.

Jain, S.K. 1968. Medicinal Plants .National Book Trust New Delhi. Oxford & IBH, New Delhi.

Dastur, J.F. 1982. Medicinal plants of India Pakistan Taraprevala sons and co-private Ltd, Bombay.

HORT 303: Potato and Tuber Crops

2 (1+1)

Theory

Origin, area, production, economic importance and export potential of potato and tropical, sub-tropical and temperate tuber crops; description of varieties and hybrids. Climate and soil requirement, season; seed rate; preparation of field; planting practices; spacing; water, nutrient and weed management; nutrient deficiencies. Use of chemicals and growth regulators; cropping systems. Harvesting practices, yield; economic of cultivation. Post- harvest handling and storage, field and seed standards, marketing. Crops to be covered – potato, sweet potato, arrow root, cassava, colocasia, xanthosoma, amorphophallus, dioscorea, Jerusalem artichoke, horse radish and other under exploited tuber crops.

Practical

Identification and description of potato and tropical, sub-tropical and temperate tuber crops; planting systems and practices; field preparation and sowing/planting. Top dressing of fertilizers and interculture and use of herbicides and growth regulators; identification of nutrient deficiencies, physiological disorders; harvest indices and maturity standards, post-harvest handling and storage, marketing. Seed collection, working out cost of cultivation, project preparation of commercial cultivation.

Suggested reading:

S. Thamburaj. 2014. *Text book of vegetable, tuber crops and Spices*. ICAR, New Delhi.

B.R.Choudhary 2009. *A Text book on production technology of vegetables*. Kalyani Publishers. Ludhiana.

T.K.Bose. 2002. *Vegetable Crops*. Nayaprakash. Kolkata

P.Hazra. 2011. *Modern Technology in Vegetable Production*. New India Publishing Agency. New Delhi.

T.R.Gopal Krishnan, 2007. *Vegetable Crops*. New India Publishing Agency. New Delhi.

K.V.Kamath. 2007. *Vegetable Crop Production*. Oxford Book Company. Jaipur

M.S.Dhaliwal, 2008. *Handbook of Vegetable Crops*. Kalyani Publishers. Ludhiana

Singh, Umashankar, 2008. *Indian Vegetables*. Anmol Publications. Pvt.Ltd .New Delhi.

K S Yawalkar, 2004. *Vegetable crops in India*. Agri-Horticultural Pub. House. Nagpur.

M.K.Rana, 2008. *Olericulture in India*. Kalyani Publishers. Ludhiana

P.Hazra. 2006. *Vegetable science*. Kalyani Publishers .Ludhiana

Pratibha Sharma, 2007. *Vegetables : Disease Diagnosis and Biomanagement*. Avishkar Publishers. Jaipur

Uma Shankar. 2008. *Vegetable Pest Management Guide for Farmers*. International Book Distribution Co. Publication. Lucknow.

Nath Prem. 1994. *Vegetables for the Tropical Regions*. ICAR New Delhi

K.L.Chadha. 1993. *Advances in Horticulture*. Malhotra publishing house. New Delhi

- Shanmugavelu, K.G. 1989. Production technology of vegetable crops. Oxford and IBH publishing Co. Pvt. Ltd, New Delhi.
- Bose, T.K. 2003. Vegetable Crops. Naya udyog publishers, Kolkata. 2002. Naya Prakash, Calcutta.
- Prem Singh Arya, 1999. Vegetable Seed Production Principles. Kalyani Publishers, New Delhi.
- Choudhery, B., 1990. Vegetables. 8th edition. National Book Trust, New Delhi.
- Vincent Lebot, 2008. *Tropical roots and tuber crops*. CAVI.
- J.E. Bradshaw, 2010. Root and tuber crops. Springer Publications.

HORT 304: Organic Farming

3(2+1)

Theory

Introduction, concept, relevance in present context; Organic production requirements; Biological intensive nutrient management-organic manures, vermicomposting, green manuring, recycling of organic residues, biofertilizers; Soil improvement and amendments; Integrated diseases and pest management – use of biocontrol agents, biopesticides pheromones, trap crops, bird perches; Weed management; Quality considerations, certification, labeling and accreditation processors, marketing, exports.

Practical

Raising of vegetable crops organically through nutrient, diseases and pest management; vermicomposting; vegetable and ornamental nursery raising; macro quality analysis, grading, packaging, postharvest management.

Suggested Reading:

- A.K.Dahama. 2007. *Organic farming for sustainable agriculture*. Agrobios (India), Jodhpur.
- Arun. K. Sharma. 2011. *Handbook of Organic farming*. Agrobios (India), Jodhpur.
- S.P. Palaniappan and K.Annadurai. 2010. *Organic farming – Theory and Practice*. Scientific Publishers. Jodhpur.
- U.Thapa and P. Tripathy. 2006. *Organic farming in India- Problems and Prospects*. Agrotech publishing agency, Udaipur.
- G.K.Veeresh. 2006. *Organic farming*. Foundation Books. New Delhi.
- Purshit,S.S.2006.*Trends in Organic Farming in India*. AgrosBios(INDIA), Jodhpur.
- Thampan,P. K.1995.*Organic Agriculture*. PeckaytreeCropsDevelopmentFoundation, Cochin,Kerala.
- Sathe,T.V.2004.*Vermiculture and Organic Farming*. DaysPublishingHouse,NewDelhi.

HORT 305: Breeding of Vegetable, Tuber and Spice Crops

3(2+1)

Theory

Breeding objectives and important concepts of breeding self pollinated, cross pollinated and vegetatively propagated crops. Plant genetic resources, their conservation and utilization in crop improvement. Breeding for insect resistance, breeding for disease resistance, breeding for abiotic resistance, male sterility and incompatibility and their utilization in development of hybrids. Origin, distribution of species, wild relatives and forms of vegetable crops Tomato, Brinjal, Bhendi, Capsicum, Chilli, Cucurbits, Cabbage, Cauliflower, Tuber crops, Potato, Carrot, Radish, Spice crops (Ginger, Turmeric). Breeding procedures for development of hybrids/varieties in various crops. Genetic basis of adaptability and stability.

Practical

Floral biology and pollination mechanism in self and cross pollinated vegetables, tuber crops and spices. Working out phenotypic and genotypic heritability, genetic advance. GCA, SCA, combining ability, heterosis, heterobeltosis, standard heterosis, GxE interactions (stability analysis) Preparation and uses of

chemical and physical mutagens. Polyploidy breeding and chromosomal studies. Techniques of F1 hybrid seed production. Maintenance of breeding records.

Suggested Reading:

Hari Hara Ram, 2013. *Vegetable Breeding: Principle and Practices*. Kalyani Publishers. Ludhiana.

Vishnu Swaroop, 2014. *Vegetable Science & Technology in India*. Kalyani Publishers. Ludhiana.

Kallo, G, 1998. *Vegetable Breeding (Vol.I to IV)*. CRC Press. Florida. 1988.

H.P. Singh, 2009. *Vegetable Varieties of India*. Studium Press (India) Pvt Ltd. New Delhi.

M.S. Dhaliwal.2012. *Techniques of Developing Hybrids in Vegetable Crops*. Agrobios. Jodhpur.

P.K.Singh, 2005. *Hybrid Vegetable Development*. CRC Press. Florida.

M.S.Dhaliwal, 2009. *Vegetable Seed Production & Hybrid Technology*. Kalyani Publishers. Ludhiana.

Fageria, M.S., 2011. *Vegetable Crops- Breeding and Seed Production*. Kalyani Publishers, Ludhiana.

PPA(H) 306: Diseases of Vegetable, Ornamental and Spice Crops

2(1+1)

Theory

Etiology, symptoms, mode of spread, epidemiology and integrated management of diseases of the following vegetables, ornamental and spice crops: tomato, brinjal, chilli, bhindi, cabbage, cauliflower, radish, knol-khol, pea, beans, beet root, onion, garlic, fenugreek, ginger, potato, turmeric, pepper, cumin, cardamom, nutmeg, coriander, clove, cinnamon, jasmine, rose, crossandra, tuberose, gerebera, anthurium, geranium. Important post-harvest diseases of vegetables and ornamental crops and their management.

Practical

Observations of symptoms, causal organisms and host parasitic relationship of important diseases, examination of cultures of important pathogens of vegetables, ornamental and spice crops in field as well as in protected cultivation.

Suggested Reading:

Srikant Kulkarni, Yashoda R. Hedge. *Diseases of Plantation crops and their management-*, Agrotech publication Academy

S.L. Godara, BBS Kapoor, B.S. Rathore. *Disease management of spice crops-*, Madhu Publications

L.Darwin Christdhar Henry and H.Lewin Devasahayam *Crop diseases: Identification, Treatment and Management*. An Illustrated Handbook –, New India publishing Agency

Singh, R.S. 1994. *Diseases of Vegetable Crops*. Oxford IBH Publishing Co. Pvt. Ltd., New Delhi

Singh, R.S 1996. *Plant Diseases*. Oxford IBH Publishing Co. Pvt. Ltd., New Delhi

Sohi, H.S. 1992. *Diseases of Ornamental plants in India*. ICAR, New Delhi

Ranga Swamy, G. 1988. *Diseases of Crop Plants in India*. Prentice Hall of India Pvt. Ltd., New Delhi.

Saha, L.R. 2002. *Hand Book of Plant Diseases*. Kalyani Publishers

Arjunan, G. Karthikeyan, G. Dinakaran, D. Raguchander, T. 1999. *Diseases of Horticultural Crops*. Dept. of Plant Pathology, Tamilnadu Agricultural University Coimbatore.

ARG(H) 307: Introduction to Major Field Crops

2(1+1)

Theory

Meaning and scope of agronomy; Classification and distribution of field crops; Definitions and concept of multiple cropping, mixed cropping, intercropping, relay cropping and alley cropping; Cultural practices of raising major cereals- Rice, wheat; pulses- Chickpea, Lentil; oilseeds-Rapeseed-mustard, Groundnut; fibre crop-Jute, sugar crop-sugarcane; green manuring and crop rotation.

Practical

Identification of crop plants, seeds, manures, fertilizers, weeds and farm implements; Land preparation and different methods of sowing; Methods of fertilizer application; Application of herbicide; Harvesting of major field crops; Preparation of cropping scheme; Calculation on yield advantages and competition functions in inter and mixed cropping systems

Suggested Reading:

- B. Gurarajan, R. Balasubramanian and V. Swaminathan. Recent Strategies on Crop Production. Kalyani Publishers, New Delhi.
- Chidida Singh. 1997. Modern techniques of raising field crops. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
- Rajendra Prasad. Textbook of Field Crops Production - Commercial Crops. Volume II ICAR Publication.
- Rajendra Prasad. Textbook of Field Crops Production - Foodgrain Crops. Volume I ICAR Publication.
- S.R. Reddy. 2009. Agronomy of Field Crops. Kalyani Publishers, New Delhi.
- S.S. Singh. 2005. Crop Management. Kalyani Publishers, New Delhi.
- UAS, Bangalore. 2011. Package of Practice. UAS, Bangalore.
- Chidida Singh 1983. Modern Techniques of raising Field crops. Oxford & IBH, Publishing Co., New Delhi
- Rajendra Prasad 2002. Text Book of Field crops Production, ICAR, New Delhi.
- Reddy, S.R. 2004. Agronomy of Field crops, Kalyani Publishers, Ludhiana.
- Subhash Chandra Bose, M. and Balakrishnan, V. 2001. Forage Production South Asian Publishers, New Delhi.

AMP(H) 308: Agro-meteorology and Climate Change**2(1+1)****Theory**

Meaning and scope of agricultural meteorology. Earth atmosphere-its composition, extent and structure; Atmospheric weather variables; Atmospheric Pressure, its variation with height; Wind-types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze; Nature and properties of solar radiation, solar constant; short wave, long wave and thermal radiation, net radiation, albedo; atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature, atmospheric humidity, concept of saturation, vapour pressure, process of condensation, formation of dew, fog, mist, frost, cloud; Precipitation-process of precipitation, types of precipitation such as rain, snow, sleet and hail, cloud classification; Artificial rainmaking, Monsoon-its importance in Indian agriculture. Weather hazards-Droughts, floods, frost, tropical cyclones and extreme weather conditions such as heat wave and cold wave. Weather forecasting-types of weather forecast and their uses, climate change, climatic variability, global warming, causes of climate change and its impact on agriculture.

Practical

Visit to Agrometeorological Observatory-Site selection, exposure of instruments and weather data recording. Measurement of albedo and sunshine duration. Computation of radiation intensity using bright sunshine hour data. Measurement of maximum and minimum air temperature-its tabulation, trend and variation analysis. Measurement of soil temperature. Determination of vapour-pressure, relative humidity and dew point temperature. Measure of wind speed and wind direction. Preparation of wind rose. Measurement, tabulation and analysis of rain. Measurement of open pan evaporation. Computations of evapotranspiration.

Suggested Reading:

- A. K. Srivastava and P. K. Tyagi, 2011. *Practical Agricultural Meteorology*. New Delhi Publishing Agency, New Delhi.
- D. Lenka, 2006. *Climate, Weather and Crops in India*. Kalyani Publishers, New Delhi.

- G. S. L. H. V. Prasad Rao, 2008. *Agricultural Meteorology*. Prentice Hall of India Pvt. Ltd., New Delhi.
- H.S.Mavi and Graeme J. Tupper, 2005. *Agrometeorology – Principles and applications of climate studies in agriculture*. International Book Publishing Co., Lucknow.
- H.S.Mavi, 1994. *Introduction to Agrometeorology*. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
- H.V.Nanjappa and B.K.Ramachandrappa, 2007. *Manual on Practical Agricultural Meteorology*. Agrobios India. Jodhpur.
- S.R.Reddy, 1999. *Principles of Agronomy*. Kalyani Publishers, New Delhi.
- T.Yellamanda Reddy and G.H.Sankara Reddi, 2010. *Principles of Agronomy*. Kalyani Publishers, New Delhi.
- Pattersen,S.1958. *Introduction to Meteorology*. Mc. GrawHillBookCo.Inc.,NewYork
- Taylor,J.T.1967. *Agricultural Climatology*. PergmanPressLtd.,HeadingtonHillHall, Oxford,England
- Trewarthe,T.G.1968. *An Introduction to Climate*. McGrawHillBookCo.Inc.,NewYork.
- Mavi,H.S.1985. *Introduction to Agrometeorology*. Oxford&IBHPublishingCo.,NewDelhi.

AST(H) 309: Computer Application and Agri-informatics:

2(1+1)

Theory

Introduction to Computers. Input and output devices. Operating systems, definitions and types (DOS and Windows). Applications of MS Office for document creation and editing. Data presentation, interpretation and graph creation, Statistical analysis, mathematical expressions, Database, concepts and types, uses of DBMS in Agriculture. World Wide Web (WWW): Concepts and components. Introduction to computer programming languages, concepts and standard input/output operations.

e-Agriculture, concepts and applications, Use of ICT in Agriculture, Computer Models for understanding plant processes. IT application for computation of water and nutrient requirement of crops, Computer-controlled devices (automated systems) for Agri-input management, Smartphone Apps in Agriculture for farm advises, market price, postharvest management etc; Geospatial technology for generating valuable agri-information. Decision support system, concepts, components and application in Agriculture, Agriculture Expert System, Soil Information Systems etc for supporting Farm decisions. Preparation of contingent crop-planning using IT tools.

Practical

Study of Computer Components, accessories, practice of important DOS Commands, Introduction of different operating systems such as windows, Unix/Linux, Creating files & folders, File Management. Use of MS- WORD and MS- Power-profit for creating, editing and presenting a scientific Document. MS- EXCEL - Creating a spreadsheet, use of statistical tools, writing expressions, creating graphs, analysis of scientific data. MS-ACCESS: Creating Database, preparing queries and reports, demonstration of Agri-information system. Introduction to World Wide Web (WWW). Introduction of programming languages. Hands on Crop Simulation Models (CSM) such as DSSAT/Crop-Info/CropSyst/Wofost; Computation of water and nutrient requirements of crop using CSM and IT tools. Introduction of Geospatial Technology for generating valuable information for Agriculture. Hands on Decision Support System. Preparation of contingent crop-planning.

SWAG(H) 310: Introductory Agro-forestry

2(1+1)

Theory

Agroforestry – definition, objectives and potential. Distinction between agroforestry and social forestry. Status of Indian forests and role in India farming systems. Agroforestry system, sub-system and practice:

agri-silviculture, silvipastoral, horti-silviculture, horti-silvipastoral, shifting cultivation, taungya, home gardens, alley cropping, intercropping, wind breaks, shelterbelts and energy plantations. Planning for agroforestry – constraints, diagnosis and design methodology, selection of tree crop species for agroforestry. Agroforestry projects – national, overseas, MPTS – their management practices, economics of cultivation – nursery and planting (*Acacia catechu*, *Dalbergiasissoo*, *Tectona*, *Populus*, *Morus*, *Grewia*, *Eucalyptus*, *Quercus* spp. and bamboo, tamarind, neem etc.).

Practical

Identification and seeds and seedlings of multipurpose tree species. Nursery practices for poplar, *Grewiaoptiva*, *Morus alba*, *Acacia catechu*, *Dalbergiasissoo*, robinia, leucaena etc. Visit to agro-forestry fields to study the compatibility of MPTS with agricultural crops: silvipastoral, alley cropping, horti-silviculture, agro-silvipasture, fuel and fodder blocks. Visit to social forestry plantations – railway line plantations, canal plantations, roadside plantations, industrial plantations and shelterbelts. Rapid assessment of farmers needs for green manure, fodder, fuel wood in selected villages. Economics and marketing of products raised in agro-forestry systems.

Suggested Readings:

- A. K. Patra, 2013. *Agroforestry – Principles and Practices*. New India publishing agency.
- A. P. Dwivedi, 1992. *Agroforestry – Principles and Practices*. Oxford and IBH Publishing company.
- Dadhwal et al., 2014. *Practical Manual on Agroforestry*. Jaya publishing house, Delhi.
- L.K. Jha, 2015. *Advances in Agroforestry*. APH Publishing corporation, New Delhi.
- Linford, Jenny, 2007. *A concise guide to Trees*. Parragon books service limited, Parragon.
- Negi, S.S., 2007. *Agroforestry Hand book*. International book distributor, New Delhi.
- P.S. Pathak and Ram Newaj, 2010. *Agroforestry – Potentials and Opportunities*. Agrobios, Jodhpur
- Pankaj Panwar & Sunil Puri, 2007. *Agroforestry: Systems & Practices*. New India publishing agency, New Delhi.
- Ramesh Umrani and C.K. Jain, 2010. *Agroforestry – Systems & Practices*. ABD Publishers, New Delhi.
- RamachandranNair,P.K.1993. *AnIntroductionto Agroforestry*. FirstreprintinIndia–2008. SpringerInternationalEdition
- Tejawani,K.G.1994. *AgroforestryinIndia*. Oxford&IBH,PublishingCo.Pvt.Ltd.,NewDelhi
- Luna,R.K.1989. *PlantationforestryinIndia*. InternationalBookDistributors,Dehradun.
- LedaSatish.2006. *BiodieselandJatrophaPlantations*. AGROBIOS,Jodhpur.
- Chaturvedi,A.N.andKhanna,L.S.1982. *ForestMenstruation*. Reprintedin2006. InternationalBookDistributors,Dehradun
- Negi,S.S.2006. *ForestTreeSeed*. PrashantGahlotatValleyprintersandpublishers, Dehradun.
- Chundawat and S K Gautam.1996. *A text book of Agroforestry*. Oxford and IBH Publishing company Pvt.Ltd.