



4. B.Sc. (Ag) SECOND YEAR SECOND SEMESTER

4.1 Practical Crop Production - II [AGR 203]

1(0+1)

Practice of raising 8-10 prevailing Rabi crops of the agro-climatic zone will be done by the student. One crop will be grown by a student or group of 2-4 students depending upon the strength of students in the class, on a minimum of 100 m² areas. Following practices will be performed by the student(s) for raising the allotted crop to them separately, besides observing the practices performed by the other students in their plots for raising the crops.

Practical:

Crop planning, raising field crops in multiple cropping systems: Field preparation, seed treatment, nursery raising, sowing, nutrient management, water management, weed management and management of insect-pests and diseases of crops, harvesting, threshing, drying, winnowing, storage and marketing of produce. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of a group of students.

References:

1. Hand book of Agriculture - ICAR
2. Krishi Vijay - RVSKVV Publication, Gwalior
3. Krishi Vishwa - JNKVV, Jabalpur
4. Principles and Practices of Agronomy - P. Balasubramaniam & S.P. Palaniappan
5. Principles and Practices of Agronomy - S.S. Singh
6. Crop Management (Under irrigated and rained conditions) - S.S. Singh
7. Principles of Agronomy - T.Y. Reddy and G.H. Sankara Reddy
8. Production Economics and Farm Management - S.P. Dhondyal & G.N. Singh
9. Agricultural Finance & Management - S. Subba Reddy & P. Raghu Ram
10. Cropping System (Theory & Practice) - B.N. Chatterjee & S. Maiti



4.2 Manures, Fertilizers and Agro-Chemicals [SAC 201]

3(2+1)

Theory:

Introduction - Raw materials - Manures - Bulky and concentrated - FYM, Composts - Different methods, Mechanical compost plants, Vermicomposting, Green manures, Oil cakes, Sewage and sludge - Biogas plant slurry, Plant and animal refuges. Fertilizers - classifications, Manufacturing processes and properties of major nitrogenous (ammonium sulphate, urea, calcium ammonium nitrate, ammonium nitrate, ammonium sulphate nitrate) phosphatic (single super phosphate, enriched super phosphate, diammonium phosphate, ammonium poly phosphate), potassic and complex fertilizers their fate and reactions in the soil, Secondary and micronutrients fertilizers, Amendments. Fertilizer Control Order, Fertilizer storage; Biofertilizers and their advantage, Organic chemistry as prelude to agro chemicals, diverse types of agrochemicals, Botanical insecticides (Neem), Pyrethrum, Synthetic pyrethroids. Synthetic organic insecticides, Major classes, Properties and uses of some important insecticides under each class. Herbicides - Major classes - Properties and uses of 2,4-D, atrazine, glyphosate, butachlor benthocarb; Fungicides - Major classes - Properties and uses of carbendazim, carboxin, captan, tridemorph and copper oxychloride - Insecticides Act, Plant growth regulators.

Practical:

1. Total nitrogen and phosphorus in manures / composts - Ammoniacal and nitrate nitrogen - Water soluble P_2O_5 , potassium, calcium, sulphur and zinc contents of fertilizers COD in organic wastes - Adulteration in fertilizer.
2. Argentometric and iodometric titrations - their use in the analysis of lindane metasystox, endosulfan, Malathion, copper and sulphur fungicides - Compatibility of fertilizers with pesticides.

References:

1. The nature and properties of Soil - N.C. Brady and R.R. Weil
2. Fundamentals of soil science - ICAR Publication



3. Soil Fertility and Fertilizers – J.L. Harlin, J.D. Beaton, S.L. Tisdale, W.L. Nelson
4. Manures and fertilizers – Yawalkar
5. A Text Book of Applied Entomology – K.P. Shrivastava
6. Fundamentals of Soil – V.N. Sahai
7. Organic Farming Theory & Biofertilizer in Agriculture-N.S. Subbarao
8. Soil Fertility Management for sustainable Agriculture – Rajendra Prasad & James F. Power
9. A Text Book of Soil Science and Fertilizers Manures- Dr. Nirankari & Lal singh.

4.3 Insect Ecology and Integrated Pest Management Including Beneficial

Insects [ENT 202] 3 (2+1)

Theory:

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. Concepts of Balance of life in nature, biotic potential and environmental resistance and causes for outbreak of pests in agro-ecosystem. Pest surveillance and pest forecasting. Categories of pests. IPM; Introduction, importance, concepts 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 derivatives, pyridine azomethines, pyrroles, etc. Nematicides, Rodenticides, Acaricides and fumigants. Recent methods of pest control, repellents, antifeedants, hormones, attractants, gamma radiation and genetic 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. Non insect pests – mites, nematology, rodents and birds. Vermiculture

Practical:

1. Visit to meteorological observatory / automatic weather reporting station;
2. Study of terrestrial and pond ecosystems of insects;
3. Studies on behaviour of insects and orientation (repellency, stimulation, deterancy);
4. Study of distribution patterns of insects, sampling techniques for the estimation of insect population and damage;
5. Pest surveillance through light traps, pheromone traps and field incidence;
6. Practicable IPM practices, Mechanical and physical methods;
7. Practicable IPM practices, Cultural and biological methods;
8. Chemical control, Insecticides and their formulations;
9. Calculation of doses/concentrations of insecticides;
10. Compatibility of pesticides and Phytotoxicity of insecticides;
11. IPM case studies;
12. Identification of common phytophagous mites and their morphological characters;
13. Identification of common plant parasitic nematodes and their morphological characters;
14. Identification of rodents and bird pests and their damage;
15. Identification of earthworms in vermiculture – visit to vermiculture unit;
16. Other beneficial insects – Pollinators, weed killers and scavengers

**References:**

1. Metcalf, R.L and Luckman W.H. (1982). Introduction to Insect Pest Management. Wiley Inter Science publishing, New York.
2. G.S.Dhaliwal and Ramesh Arora (2001). Integrated Pest Management. Concepts and Approaches. Kalyani publishers, New Delhi.
3. Larry P.Pedigo. (1991). Entomology and Pest Management. Larry P.Pedigo. (1991). Mac Millan publishing company, New York.
4. Yazdani G.S. and Agarwal M.L. (1979). Elements of Insect Ecology. Naroji publishing house, New Delhi.
5. Nair K.K., Anantyhakrishnan T.N. and B.V.David. (1976). General and Applied Entomology. Tata Mc. Graw Hill publishing co.Ltd. New Delhi.
6. A.S. Atwal (1976). Agricultural Pests of India & South East Asia
7. B. Vasantha Raj David (2003). Elements of Economic Entomology
8. K.K Nayar, T.N. Ananthakristman & B.V. David (1985). General & Applied Entomology
9. D.K. Butani & M.G. Jatwani 1984 Insects in vegetables
10. D.K. Butani (1984). Insect and Fruits
11. B.P. Khare (1993). Stored Grain Pests and their Management

4.4 Agricultural Marketing, Trade and Prices [AEC 202]**2 (1+1)****Theory:**

Agricultural Marketing: Concepts and Definition, Scope and subject matter, Market and Marketing: Meaning, Definitions, Components of a market, Classification. Market structure, Conduct, performance. Marketing structure, Market functionaries or agencies, Producer's surplus: Meaning, Types of producers surplus, marketable surplus. Marketed surplus, importance, Factors affecting Marketable surplus. Marketing channels: Meaning, Definition, Channels for different products. Market integration, Meaning, Definition, Types of Market Integration. Marketing efficiency: Meaning, Definition, Marketing costs, Margins and price spread, Factors affecting the cost of marketing, Reasons for higher marketing costs of farm commodities, Ways of reducing marketing costs. Theories of International Trade: Domestic Trade, Free trade, International Trade, GATT, WTO, Implications of AOA. Market access, Domestic support,



Export subsidies, EXIM-Policy & Ministerial conferences. Cooperative Marketing. State Trading. Ware Housing Corporation; Central and State, Objectives, Functions, Advantages. Food Corporation of India: Objectives and Functions. Quality Control, Agricultural Products, AGMARK. Price Characteristics of agricultural product process, Meaning, Need for Agricultural Price Policy. Risk in Marketing: Meaning and importance, Types of Risk in Marketing. Speculations and Hedging, Futures trading, Contract farming.

Practical:

1. Identification of marketing channels;
2. Study of Rythu Bazars, Regulated markets;
3. Study of unregulated markets;
4. Study of livestock markets;
5. Price spread analysis;
6. Visit to market institutions, NAFED;
7. Study of SWC, CWC and STC;
8. Analysis of information of daily prices; Marketed and marketable surplus of different commodities.

References:

1. S.S. Acharya and N.L. Agarwal (1987). Agricultural Marketing in India, Oxford & IBH, New Delhi.
2. J.R. Moore, S.S. Johl and A.M. Khusro (1973). Indian Food Grain Marketing, Printice Hall, New Delhi.
3. A.S. Kahlon & D.S. Tyagi (1983). Agricultural Price Policy in India Allied Publishers, New Delhi.
4. V.K. Bhalld and S. Shiva Ramu (1996). International Business-Environment and Management, Anmol Publications (P) Limited, New Delhi.

4.5 Protected Cultivation and Post Harvest Technology [AEG 202]

2 (1+1)

Theory:

Green house technology, Introduction, Types of Green Houses; Plant response to Green house environment, Planning and design of greenhouses,



Design criteria of greenhouse for cooling and heating purposes. Green house equipment, materials of construction for traditional and low cost green houses. Irrigation systems used in greenhouses, Typical applications, passive solar green house, hot air green house heating systems, green house drying. Cost estimation and economic analysis. Choice of crops for cultivation under greenhouses, problems / constraints of greenhouse cultivation and future strategies. Growing media, soil culture, type of soil required, drainage, flooding and leaching, soil pasteurization in peat moss and mixtures, rock wool and other inert media, nutrient film technique (NFT) / hydroponics. Threshing, threshers for different crops, parts, terminology, care and maintenance. Winnowing, manual and power operated winnowers, care and maintenance. Groundnut decorticators, hand operated and power operated decorticators, principles of working, care and maintenance. Maize shellers & castor shellers. Drying, grain drying, types of drying, types of dryers. Storage, grain storage, types of storage structures. Fruits and vegetables cleaning, machinery for cleaning of fruits and vegetables, care and maintenance. Grading, methods of grading, equipment for grading of fruits and vegetables, care and maintenance. Size reduction. equipment for size reduction care and maintenance. Evaporation, Principle, types of evaporators, quality standards - FAQ, ASTA, FPO, FDA.

Practical:

1. Study of different types of green houses based on shape, construction and cladding materials;
2. Calculation of air rate exchange in an active summer winter cooling system;
3. Calculation of rate of air exchange in an active winter cooling system;
4. Estimation of drying rate of agricultural products inside green house;
5. Testing of soil and water to study its suitability for growing crops in greenhouses;
6. The study of fertigation requirements for greenhouses crops and estimation of E.C. in the fertigation solution;



7. The study of various growing media used in raising of greenhouse crops and their preparation and pasteurization / sterilization;
8. Visit to commercial green houses; Study of threshers, their components, operation and adjustments;
9. Winnowers, their components, operation and adjustments;
10. Study of different components of groundnut decorticator;
11. Study of maize shellers;
12. Study of castor shellers;
13. Study of improved grain storage structure;
14. Study of dryers; Study of cleaners & graders.

References:

1. Green house Technology - G N Tiwari and R K Goyal
2. Green houses - K.Radha Manohar and C Igadinathane, B.S.Publications, Hyderabad
3. Principles of Agricultural Engineering - Michael & Ojha Vol. I Jain Brothers - New Delhi, 2001
4. Post Harvest Technology of cereals, pulses and oil seeds - Chakarvarthy, A. (1988). Oxford and IBH Publishing co. Ltd., Calcutta
5. Unit Operation of Agricultural Processing by K.M. Sahay & K.K. Singh, Publication Hpuse Pvt. Ltd., New Delhi.

4.6 Diseases of Field Crops and Their Management [PPT 201]**3 (2+1)****Theory:**

Economic importance, symptoms, cause, epidemiology and disease cycle and integrated management of diseases of rice, sorghum, bajra, maize, wheat, sugarcane, turmeric, tobacco, groundnut, sesamum, sunflower, cotton, redgram, bengalgram, blackgram, greengram, tea, soybean.

**Practical:**

1. Study of symptoms, etiology, host-parasite relationship and specific control measures of the following crop diseases.
2. Presentation of disease samples survey and collection of Diseases of rice, sorghum;
3. Diseases of wheat, bajra & maize;
4. Diseases of sugarcane, turmeric & tobacco;
5. Diseases of groundnut, castor & sunflower;
6. Diseases of sesamum & cotton;
7. Diseases of redgram, greengram, blackgram, bengalgram & beans;
8. Field visits at appropriate time during the semester

Note: Students should submit 50 pressed, well mounted diseased specimens in three installments during the semester.

References:

1. Plant Diseases – Singh R S (1996).Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi.
2. Diseases of Tropical and Subtropical Field, Fiber and oil plants- Cook AA (1981). Mac Millan Publishing Co. New York.
3. Diseases of Crop Plants in India- Rangaswamy G (1988). Prentice Hall of India Pvt.Ltd. New Delhi.

4.7 Production Technology of Spices, Aromatic, Medicinal and Plantation Crops [HRT 202] 3 (2+1)**Theory:**

Importance and cultivation technology of Spices – ginger, turmeric, pepper, cardamom, coriander, cumin, fenugreek; Aromatic crops – lemon grass, citronella, palmarose, vetiver, geranium, dawana; Plantation crops – coconut, arecanut, betelvine, cashew, cocoa, coffee, oilpalm; Medicinal plants – diascoria, rauwolfia, opium, ocimum, perwinkle, aloe, guggul, belladonna, nuxvomica, Solanum khasiamum , aonla,senna, plantago, stevia,coleus and Acorus.

**Practical:**

Botanical description and identification of aromatic plants; Identification of varieties in spices and plantation crops; Identification of medicinal plants; Propagation techniques in aromatic and spice crops; Selection of mother palm, and seed nuts in coconut and oil palm; Study of identification of aromatic plants; Distillation procedures for aromatic crops; Propagation methods in plantation crops; Propagation and planting methods in turmeric; Propagation and planting techniques in ginger; Harvesting procedures in aromatic plants; Processing and curing of spices (ginger, turmeric and black pepper); Training methods in betelvine; Rejuvenation practices in cashewnut; Products - byproducts of spices and plantation crops; Procedures for oleoresin extraction; Visit to local commercial plantations. Aromatic & medicinal plant nurseries and seed spices field.

References:

1. Spices and Condiments, Pruthi J.S. (1976). Agrosociences Book centre, Patna
2. Spices and Plantation Crops, Shanmugavelu K G and Madhava Rao V N (1977). Popular Book Depot., Madras
3. Coconut, Thampan P K (1980). Oxford & IBH Publishing Co., New Delhi
4. Fruits-Tropical and Sub Tropical, Bose, T K and Mitra S K (1990). Nayaprakash, Calcutta
5. Cashew, Nair M N, Bhaskara Rao E V V, Nambiar M N and Nambiar M C (1990). CPCRI, Kasargod
6. Oilpalm Production Technology, Nair M K, Nampoothiri K V K, (1996). CPCRI, Kasargod

4.8 Breeding of Field / Horticultural Crops [GPB 202]**3(2+1)****Theory:**

Breeding objectives and important concepts of breeding self pollinated, cross pollinated and vegetatively propagated crops; Hardy-Weinberg Law; Study in respect of origin, distribution of species, wild relatives and forms, Cereals, (rice, wheat, maize, millets, sorghum, bajra,ragi); Pulses (redgram, greengram, blackgram, soybean); Oilseeds (Groundnut, sesame, sunflower, safflower, castor, mustard) etc. Fibers (Cotton, kenaf, roselle, jute) etc. Vegetables



(Tomato, bhindi, chilli, cucumbers); Flowers crops (Chrysanthemum, rose, galardia, gerbera & marigold); Fruit crops (aonla, guava, mango, custard apple, banana, papaya); Major breeding procedures for development of hybrids / varieties of various crops; Plant Genetic Resources their conservation and utilization in crop improvement; Ideotype concept in crop improvement; Breeding for resistance to biotic and abiotic stresses variability in pathogens and pests; Mechanisms of resistance in plant to pathogens and pest; Genetic basis of adaptability to unfavourable environments; Definition of biometrics, assessment of variability i.e., additive, dominance and epistasis and their differentiation; Genotype x Environment interaction and influence on yield/performance, IPR and its related issues.

Practical:

1. Emasculation and Hybridization techniques;
2. Handling of segregating generations, pedigree method;
3. Handling of segregating generations, bulk method;
4. Handling of segregating generations, back cross method;
5. Field lay out of experiments;
6. Field trials, maintenance of records and registers;
7. Estimation of Heterosis and inbreeding depression;
8. Estimation of Heritability, GCA and SCA;
9. Estimation of variability parameters;
10. Parentage of released varieties/hybrids;
11. Problems on Hardy Weinberg Law;
12. Study of quality characters;
13. Sources of donors for different characters;
14. Visit to seed production and certification plots;
15. Visit to AICRP trials and programmes;
16. Visit to grow out test plots;



17. Visit to various research stations;
18. Visit to other institutions

References:

1. Allard RW. (1981). Principles of Plant Breeding. John Wiley & Sons.
2. Chopra VL. (2001). Breeding Field Crops. Oxford & IBH.
3. Gupta SK. (2005). Practical Plant Breeding. Agribions.
4. Pohlman JM & Bothakur DN. (1972). Breeding Asian Field Crops. Oxford & IBH.
5. Roy D. (2003). Plant Breeding, Analysis and Exploitation of Variation. Narosa Publ. House.
6. Sharma JR. (2001). Principles and Practice of Plant Breeding. Tata McGraw-Hill.
7. Simmonds NW. (1990). Principles of Crop Improvement. English Language Book Society.
8. Singh BD. (2006). Plant Breeding. Kalyani.
9. Singh P. (2002). Objective Genetics and Plant Breeding. Kalyani.
10. Singh P. (2006). Essentials of Plant Breeding. Kalyani.
11. Singh S & Pawar IS. (2006). Genetic Bases and Methods of Plant Breeding CBS.

**4.9 Human Values and Professional Ethics - II (HVPE-II) [EXT221]
3 (1+2)****Module-I:- Harmony in the family and society****Understanding harmony in the family:**

Understanding values in human – human relationship meaning of Nyaya Trust (vishwas) and Respect (Samman), as the foundational values of relationship; difference between intention and competence and between respect and attention. **Understanding harmony in the society:** (society being an



expression of family): Samadhan, Samridhi, Abhay, Sah- asthiva as comprehensive human goals: **Visualizing a universal harmonious order in society: Undivided society (Akhandsamaj)** Universal Order (sarvabhaum Vyawastha) from family to world family.

Module - II: - Harmony in the Nature (Existence)

Understanding the harmony in the Nature; Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature; understanding existence as co-existence (sah-astitva) of mutually interacting units in all-pervasive space; Holistic perception of harmony at all levels of existence.

Module-III: - Implication of the holistic understanding - A look at professional Ethics

Natural acceptance of human values; definitiveness of ethical human conduct; basis for humanistic education, humanistic constitution and universal human order; competence in professional ethic; (a) ability to utilize the professional competence for augmenting universal human order, (b) ability to identify the scope and characteristic of people- friendly and eco-friendly production systems, technology and management models; Case studies of typical holistic technologies, management models and production systems; Strategy for transition from the present state to universal human order: (a) at the level of individual: as socially and ecologically responsible engineers, technologists and manager (b) at the level of society: as mutually enriching institution and organization.

Practical

Exercise 1: Form small groups in the class and make them carry out a dialogue focusing on the following eight questions related to 'TRUST' 1a. Do I want myself happy 2a. Do I want make other happy? 3a. does the other want to make himself/ herself happy? 4a. does the other want to make me happy? What is the Answer? Intention (Natural acceptance): 1b. Am I able to always make myself happy? 2b. am I able to always make the other happy? Is the other able to always make himself/ herself happy? 4b. is the other able to always make me happy? What are the answers? Competence: Let each student answer



the questions for him self. Discuss the difference between intention and competence. Observe whether you evaluate yourself and others on the basis of intention or competence.

- Exercise 2:** Find out the plants and shrubs growing in and around your campus which can be useful in curing common diseases.
- Exercise 3:** Observe, on how many occasions, you are able to request your related ones (by doing the right evaluation) and on how many occasions you are disrespecting by way of under evaluation, over evaluation or otherwise evaluation. Also observe whether your feeling of respect is based on treating the other as you would treat your self or on differentiations based on body, physical facilities or beliefs.
- Exercise 4:** Write a narration in the form of a story, poem skit or essay to clarify a salient Human value to the children. Recollect and narrate an incident in your life where you were able to exhibit willful adherence to values in a difficult situation.
- Exercise 5:** List down some common units (things) of Nature which you come across in your daily life and classify them in the four order of nature. Analysis and explain the aspect of mutual fulfillment of each unit with other orders.
- Exercise 6:** Make a chart to show the whole existence as co-existence. With the help of this chart try to identify the role and scope of some of the courses or your study. Also indicate the areas which are being either over-emphasized or ignored in the present context.
- Exercise 7:** Identify any two important problems being faced by the society today and analyze the root cause of these problems. Can these be solved on the basis of natural acceptance of human values? If so, how should one proceed in this direction from the present situation?
- Exercise 8:** Suggest ways in which you can use your knowledge of science/technology for moving towards a universal human order. Propose a broad outline for humanistic constitution at the level of Nation.
- Exercise 9:** Evaluate honestly what difference in your thinking the course has made. Summarize the core message of this course grasped by you. How has this affected you in term of thought, behavior work and



realization? What practical steps are you able to visualize for transition of the society from its present state.

Exercise 10: Film/ Documentary shows: Selected items followed by through discussion.

The text Book:-

1. RR. Gaur, R. Sangal, GP Bagaria, (2009). A foundation course in human values and professional ethics, Excel Books, New Delhi.

References:

1. Ivan Illich, (1974). Energy and equity, the Trinity Press, Worcester, and Harper Collins, USA.
2. E.F. Schunacher, (1973). Small is Beautiful: A study of economics as if people mattered, blond and briggs, Britian.
3. Sussan George, (1976). How the other half dies, penguin press, reprinted (1986, 1991).
4. Donella H, Meadows, Dennis L, Jorgen Randers, William W, Behrens III, (1972). Limits to growth-club of Rome report universe books.
5. Anagraj, (1998). jeevan Vidyaekparichay, Divya path sansthan, Amarkanthak.
6. P.L. Dhar, RR. Gaur, (1990). Science & Humanism, Commonwealth Publishers.
7. A.N. Tripathi, (2003). Human Values, new Age International Publisher.
8. Subhash Palekar, (2000). How to practice natural farming, Pracheen (Vaidik), Krishi Tantra Shodh, Amarawati.
9. E.G. Seebauer and berry, Robert L. (2000). Fundamentals of Ethics for Scientist and Engineers, Oxford University press.
10. M. Govindrajran, S. Natrajan and V.S. Senthil kumar, engineering ethics (including human values), Eastern Economy Edition, Prentice Hall of India Ltd.
11. Bannerjee, B.P. (2005). Foundation of Ethics and management, Excel Books.
12. Bajpai, B.L. (2004). Indian Ethos and modern management, New Royal book co. Lucknow, Reprinted (2008).