



**जननायक चन्द्रशेखर विश्वविद्यालय, बलिया-277001 (उ.प्र.)**  
**Jananayak Chandrashekhar University, Ballia-277001 (U. P.)**



## **FACULTY OF AGRICULTURE**

### **COURSE STRUCTURE FOR**

### **M.Sc.(Agriculture)**

### **AGRONOMY**

**UNDER SEMESTER SYSTEM AS PER ICAR RECOMMENDED  
SYLLABUS**

**ACADEMIC SESSION: 2020-21**



### **M.Sc.(Agriculture)**

### **Agronomy**

## **FACULTY OF AGRICULRE**

**SEMESTER SYSTEM**  
**FACULTY OF AGRICULRE**  
**M.Sc. (Agriculture)-Agronomy**  
**SEMESTER SYSTEM**

**Course Structure for**  
**M.Sc. (Agriculture) Agronomy**  
**Under Semester System to come into force from Academic Session 2020-21**  
**Department of Agronomy**

Agronomy is not just plowing and planting, but a major component of agro-ecology which includes several activities that affect the environment and human populations. An Agronomist remains in the center of efforts to work with issues related to environmental and ecological concerns, and to increase the production of food, feed, fuels and fiber for a growing world citizenry. Agronomists today are involved with many issues including producing food, creating healthier food, managing environmental impacts, and creating energy from plants. Research activities in Agronomy focus on systems analysis and simulation modeling of environmental and management impacts on agricultural production; these are key to sustainability of the agriculture production systems. In fact, agronomy is a discipline that combines the application of sciences like Biology, Chemistry, Ecology, Earth Science, and Genetics. It is a science that directly deals with the crop production technologies with a view to improve and sustain factor productivity; decline in factor productivity is the major cause of concern to Agricultural Scientists today. The significance of agronomy in agriculture and to Society can never be undermined.

- All the courses have been designed and updated as per present and future needs.
- New courses have been introduced to keep pace with the latest developments.
- List of books and Journals have been provided to keep pace with latest developments in the area.
- Suggested Areas of research have also been added for providing directions to the area

**M.Sc. (Agriculture) Agronomy**  
**COURSE STRUCTURE**

**FIRST SEMESTER**

**M.M.: 400**

PAPER– 101 MODERN CONCEPTS IN CROP PRODUCTION	75 MARKS
PAPER– 102 PRINCIPLES AND PRACTICES OF SOIL FERTILITY AND NUTRIENT MANAGEMENT	75 MARKS
PAPER– 103 PRINCIPLES AND PRACTICES OF WEED MANAGEMENT	75 MARKS
PAPER– 104 PRINCIPLES AND PRACTICES OF WATER MANAGEMENT	75 MARKS
PRACTICAL FOR ALL	100 MARKS
<b>SECOND SEMESTER</b>	<b>M.M.: 400</b>

PAPER – 201 AGROMETEOROLOGY AND CROP WEATHER FORECASTING	75 MARKS
PAPER – 202 AGRONOMY OF MAJOR CEREALS AND PULSES	75 MARKS
PAPER – 203 AGRONOMY OF OILSEED, FIBRE AND SUGAR CROPS	75 MARKS
PAPER – 204 EXPERIMENTAL TECHNIQUES	75 MARKS
PRACTICAL FOR ALL	100 MARKS

**THIRD SEMESTER** **M.M.: 400**

PAPER – 301 AGRONOMY OF FODDER AND FORAGE CROPS	75 MARKS
PAPER – 302 AGROSTOLOGY AND AGROFORESTRY	75 MARKS
PAPER – 303 CROPPING SYSTEMS	75 MARKS
PAPER – 304 DRYLAND FARMING	75 MARKS
PRACTICAL FOR ALL	100 MARKS

**FOURTH SEMESTER** **M.M.: 400**

PAPER – 401 PRINCIPLES AND PRACTICES OF ORGANIC FARMING	75 MARKS
PAPER – 402 AGRONOMY OF MEDICINAL, AROMATIC AND UNDER UTILIZED CROPS	75 MARKS
PAPER- 403 SEMINAR	75 MARKS
PAPER – 404 THESES WORK FOR RESEARCH	100 MARKS
VIVA-VOCE OF THESIS WORK FOR RESEARCH	75 MARKS

## PROPOSED REGULATION

Semesters/Papers <b>SEMESTER I</b>	Title of the papers	Theory		Practical	
		Max. Marks	Min. Marks	Max. Marks	Mini. marks
Paper 101	(Theory Paper)	<b>75</b>	25	-	
Paper 102	(Theory Paper)	75	25	-	
Paper 103	(Theory Paper)	75	25	-	
Paper 104	(Theory Paper)	75	25	-	
	PRACTICAL FOR ALL			100	33
<b>Total aggregate of First Semester is 36%</b>		Max. Marks – 400 Min.Marks – 144			
<b>SEMESTER II</b>					
Paper 201	(Theory Paper)	75	25	-	
Paper 202	(Theory Paper)	75	25	-	-
Paper 203	(Theory Paper)	75	25	-	-
Paper 204	(Theory Paper)	75	25	-	-
	PRACTICAL FOR ALL	-	-	100	33
<b>Total aggregate of First Semester is 36%</b>		<b>Max. Marks – 400</b> <b>Min. Marks – 144</b>			
<b>SEMESTER III</b>					
Paper 301	(Theory Paper)	75	25	-	-
Paper 302	(Theory Paper)	75	25	-	-
Paper 303	(Theory Paper)	75	25	-	-
Paper 304	(Theory Paper)	75	25	-	-
	PRACTICAL FOR ALL	-	-	100	33
<b>Total aggregate of First Semester is 36%</b>		<b>Max. Marks – 400, Min. Marks – 144</b>			
<b>SEMESTER IV</b>					
Paper 401	(Theory Paper)	75	25	-	-
Paper 402	(Theory Paper)	75	25		
Paper 403	SEMINAR	-		75	25
Paper 404	THESIS WORK FOR RESEARCH			125	42
-	VIVA-VOCE OF THESIS WORK FOR RESEARCH			50	17
<b>Total aggregate of First Semester is 36%</b>		<b>Max. Marks – 400 ;Min. Marks – 144</b>			

**Consolidate Performa for allotments of all semester are as follows-**

First Semester	400	144
Second Semester	400	144

Third Semester	400	144
Fourth Semester	400	144
Grand Total	1600	576

**Note-**

1. The research work may be initiated in any of II or III semester but the thesis shall be submitted at the end of IV semester.
2. The evaluation of seminar presentation shall be done by the departmental committee which shall be constituted by the Head of Department /Principal of College.
3. Practical examination shall be conducted by external and internal examiner.
4. The thesis evaluation and viva-voce shall be made by the external and internal examiner.
5. The minimum passing marks of every paper shall be 33 % in theory and practical separately and total aggregate of the semester shall be 36 % minimum.

## **FACULTY OF AGRICULRE**

### **M.Sc. (Ag.) Agronomy**

#### **DEPARTMENT OF AGRONOMY**

#### **COURSE STRUCTURE– DETAILED**

**FIRST SEMESTER**

**MM.:400**

**PAPER – 101 MODERN CONCEPTS IN CROP PRODUCTION**

**M.M.: 75**

**UNIT I**

Crop growth analysis in relation to environment; gro-ecological zones of India. Quantitative agro-biological principles and inverse yield nitrogen law; Mitscherlich yield equation, its interpretation and applicability; Baule unit.

**UNIT II**

Effect of lodging in cereals; physiology of grain yield in cereals; optimization of plant population and planting geometry in relation to different resources, concept of ideal plant type and crop modeling for desired crop yield.

**UNIT III**

Scientific principles of crop production; crop response production functions; concept of soil plant relations; yield and environmental stress.

**UNIT IV**

Integrated farming systems, organic farming, and resource conservation technology including modern concept of tillage; dry farming; determining the nutrient needs for yield potentiality of crop plants, concept of balance nutrition and integrated nutrient management; precision agriculture.

**Suggested Readings**

Balasubramaniyan P & Palaniappan SP. 2001. *Principles and Practices of Agronomy*. Agrobios.  
Fageria NK. 1992. *Maximizing Crop Yields*. Marcel Dekker.  
Havlin JL, Beaton JD, Tisdale SL & Nelson WL. 2006. *Soil Fertility and Fertilizers*. Prentice Hall.  
Paroda R.S. 2003. *Sustaining our Food Security*. Konark Publ.  
Reddy SR. 2000. *Principles of Crop Production*. Kalyani Publ.  
Sankaran S & Mudaliar TVS. 1997. *Principles of Agronomy*. The Bangalore Printing & Publ.  
Singh SS. 2006. *Principles and Practices of Agronomy*. Kalyani.

## **PAPER – 102 SOIL FERTILITY AND NUTRIENT MANAGEMENT M.M.: 75**

### **UNIT I**

Soil fertility and productivity - factors affecting; features of good soil management; problems of supply and availability of nutrients; relation between nutrient supply and crop growth; organic farming - basic concepts and definitions.

### **UNIT II**

Criteria of essentiality of nutrients; Essential plant nutrients – their functions, nutrient deficiency symptoms; transformation and dynamics of major plant nutrients. Preparation and use of farmyard manure, compost, green manures, vermicompost,

### **UNIT III**

Biofertilizers and other organic concentrates their composition, availability and crop responses; recycling of organic wastes and residue management. Commercial fertilizers; composition, relative fertilizer value and cost; crop response to different nutrients, residual effects and fertilizer use efficiency, fertilizer mixtures and grades; agronomic, chemical and physiological methods of increasing fertilizer use efficiency; nutrient interactions.

### **UNIT IV**

Time and methods of manures and fertilizers application; foliar application and its concept; relative performance of organic and inorganic manures; economics of fertilizer use; integrated nutrient management; use of vermincompost and residue wastes in crops.

### **Suggested Readings**

Brady NC & Weil R.R 2002. *The Nature and Properties of Soils*. 13th Ed. Pearson Edu.  
Fageria NK, Baligar VC & Jones CA. 1991. *Growth and Mineral Nutrition of Field Crops*. Marcel Dekker.  
Havlin JL, Beaton JD, Tisdale SL & Nelson WL. 2006. *Soil Fertility and Fertilizers*. 7th Ed. Prentice Hall.  
Prasad R & Power JF. 1997. *Soil Fertility Management for Sustainable Agriculture*. CRC Press.  
Yawalkar KS, Agrawal JP & Bokde S. 2000. *Manures and Fertilizers*. Agri-Horti Publ.

## **PAPER –103 PRINCIPLES AND PRACTICES OF WEED MANAGEMENT M.M.: 75**

### **UNIT I**

Weed biology and ecology, crop-weed competition including allelopathy; principles and methods of weed control and classification; weed indices.

### **UNIT II**

Herbicides introduction and history of their development; classification based on chemical, physiological application and selectivity; mode and mechanism of action of herbicides.

### **UNIT III**

Herbicide structure - activity relationship; factors affecting the efficiency of herbicides; herbicide formulations, herbicide mixtures; herbicide resistance and management; weed control through bio-herbicides, myco-herbicides and allelochemicals; Degradation of herbicides in soil and plants; herbicide resistance in weeds and crops; herbicide rotation.

#### UNIT IV

Weed management in major crops and cropping systems; parasitic weeds; weed shifts in cropping systems; aquatic and perennial weed control. Integrated weed management; cost : benefit analysis of weed management.

#### **Suggested Readings**

- Aldrich RJ & Kramer RJ. 1997. *Principles in Weed Management*. Panima Publ.  
Ashton FM & Crafts AS. 1981. *Mode of Action of Herbicides*. 2nd Ed. Wiley Inter-Science.  
Gupta OP. 2007. *Weed Management – Principles and Practices*. Agrobios.  
Mandal RC. 1990. *Weed, Weedicides and Weed Control - Principles and Practices*. Agro-Botanical Publ.  
Rao VS. 2000. *Principles of Weed Science*. Oxford & IBH.  
Subramanian S, Ali AM & Kumar RJ. 1997. *All About Weed Control*. Kalyani.  
Zimdahl RL. 1999. *Fundamentals of Weed Science*. 2nd Ed. Academic Press.

### **PAPER–104 PRINCIPLES AND PRACTICES OF WATER MANAGEMENT M.M.: 75**

#### UNIT I

Water and its role in plants; water resources of India, major irrigation projects, extent of area and crops irrigated in India and different states.

#### UNIT II

Soil water movement in soil and plants; transpiration; soil-water-plant relationships; water absorption by plants; plant response to water stress, crop plant adaptation to moisture stress condition.

#### UNIT III

Soil, plant and meteorological factors determining water needs of crops; scheduling, depth and methods of irrigation; microirrigation system; fertigation; management of water in controlled environments and polyhouses.

#### UNIT IV

Water management of the crops and cropping systems; quality of irrigation water and management of saline water for irrigation; water use efficiency. Excess of soil water and plant growth; water management in problem soils; drainage requirement of crops and methods of field drainage, their layout and spacing.

#### **Suggested Readings**

- Lenka D. 1999. *Irrigation and Drainage*. Kalyani  
Michael AM. 1978. *Irrigation: Theory and Practice*. Vikas Publ.  
Paliwal KV. 1972. *Irrigation with Saline Water*. IARI Monograph, New Delhi.  
Panda SC. 2003. *Principles and Practices of Water Management*. Agrobios.  
Prihar SS & Sandhu BS. 1987. *Irrigation of Food Crops - Principles and Practices*. ICAR.  
Reddy SR. 2000. *Principles of Crop Production*. Kalyani.  
Singh Pratap & Maliwal PL. 2005. *Technologies for Food Security and Sustainable Agriculture*. Agrotech Publ.

**Practical for All**

**M.M.:100**

- Determination of soil pH, E<sub>Ce</sub>, organic C, total N, available N, P, K and S in soils
- Determination of total N, P, K and S in plants
- Interpretation of interaction effects and computation of economic and yield optima
- Identification of important weeds of different crops
- Preparation of a weed herbarium
- Weed survey in crops and cropping systems
- Crop-weed competition studies
- Preparation of spray solutions of herbicides for high and low-volume sprayers
- Use of various types of spray pumps and nozzles and calculation of swath width
- Economics of weed control
- Herbicide resistance analysis in plant and soil
- Bioassay of herbicide resistance
- Calculation of herbicidal requirement
- Water flow measurements using different devices
- Determination of irrigation requirements
- Calculation of irrigation efficiency
- Determination of infiltration rate
- Determination of saturated/unsaturated hydraulic conductivity

## **SECOND SEMESTER**

**MM.:400**

### **PAPER – 201 AGROMETEOROLOGY AND CROP WEATHER FORECASTING M.M.: 75**

#### **UNIT I**

Agro meteorology - scope and development in relation to crop environment; composition of atmosphere, distribution of atmospheric pressure and wind. Characteristics of solar radiation; energy balance of atmosphere system; radiation distribution in plant canopies, radiation utilization by field crops; photosynthesis and efficiency of radiation utilization by field crops.

#### **UNIT II**

Temperature profile in air, soil, crop canopies; soil and air temperature effects on plant processes; environmental moisture and evaporation: measures of atmospheric temperature and relative humidity vapor pressure and their relationships; evapo-transpiration and meteorological factors determining evapotranspiration.

#### **UNIT III**

Modification of plant environment: artificial rain making, heat transfer, controlling heat load, heat trapping and shading; protection from cold, heat flux, controlling soil moisture; monsoon and their origin, characteristics of monsoon; onset, progress and withdrawal of monsoon; weather hazards, drought monitoring and planning.

#### **UNIT IV**

Weather forecasting in India – short, medium and long range; aerospace science and weather forecasting; benefits of weather services to agriculture, remote sensing; application in agriculture and its present status in India; atmospheric pollution and its effect on climate and crop production.



### **Suggested Readings**

- Chang Jan Hu 1968. *Climate and Agriculture on Ecological Survey*. Aldine Publ.  
Critchfield HJ.1995. *General Climatology*. Prentice Hall of India.  
Das PK.1968. *The Monsoons*. National Book Trust Publ.  
Lal DS.1998. *Climatology*. Sharda Pustak Bhawan.  
Lenka D.1998. *Climate, Weather and Crops in India*. Kalyani.  
Mavi H.S.1994. *Introduction to Agro-meteorology*. Oxford & IBH.  
Mavi HS & Tupper GJ. 2004. *Agrometeorology: Principles and Application of Climate Studies in Agriculture*. Haworth Press.  
Menon PA.1991. *Our Weather*. National Book Trust Publ.  
Sahu DD. *Agrometeorology and Remote Sensing: Principles and Practices*. Agrobios.  
Variraju R & Krishnamurthy 1995. *Practical Manual on Agricultural Meteorology*. Kalyani.  
Varshneya MC & Balakrishana Pillai P. 2003. *Textbook of Agricultural Meteorology*. ICAR.

### **PAPER – 202 AGRONOMY OF MAJOR CEREALS AND PULSES M.M.: 75**

#### UNIT I

*Rabi* cereals.

#### UNIT II

*Kharif* cereals.

#### UNIT III

*Rabi* pulses.

#### UNIT IV

*Kharif* pulses.

### **Suggested Readings**

- Das NR. 2007. *Introduction to Crops of India*. Scientific Publ.  
Hunsigi G & Krishna KR. 1998. *Science of Field Crop Production*. Oxford & IBH.  
Jeswani LM & Baldev B. 1997. *Advances in Pulse Production Technology*. ICAR.  
Khare D & Bhale MS. 2000. *Seed Technology*. Scientific Publ.  
Kumar Ranjeet & Singh NP. 2003. *Maize Production in India: Golden Grain in Transition*. IARI, New Delhi.  
Pal M, Deka J & Rai RK. 1996. *Fundamentals of Cereal Crop Production*. Tata McGraw Hill.  
Prasad, Rajendra. 2002. *Text Book of Field Crop Production*. ICAR.  
Singh C, Singh P & Singh R. 2003. *Modern Techniques of Raising Field Crops*. Oxford & IBH.  
Singh, SS. 1998. *Crop Management*. Kalyani.  
Yadav DS. 1992. *Pulse Crops*. Kalyani.

### **PAPER – 203 AGRONOMY OF OILSEED, FIBRE AND SUGAR CROPS M.M.: 75**

#### UNIT I

*Rabi* oilseeds – Rapeseed and mustard, linseed, etc.

#### UNIT II

*Kharif* oilseeds - Groundnut, sesame, castor, sunflower, soybean etc.

#### UNIT III

Fiber crops - Cotton, jute, sunhemp etc.

#### UNIT IV

Sugar crops – Sugar-beet and sugarcane.

### **Suggested Readings**

Das NR. 2007. *Introduction to Crops of India*. Scientific Publ. Das PC. 1997. *Oilseed Crops of India*. Kalyani.  
Lakshmikantam N. 1983. *Technology in Sugarcane Growing*. 2nd Ed. Oxford & IBH.  
Prasad, Rajendra. 2002. *Text Book of Field Crop Production*. ICAR.  
Singh C, Singh P & Singh R. 2003. *Modern Techniques of Raising Field Crops*. Oxford & IBH.  
Singh SS. 1998. *Crop Management*. Kalyani.

## **PAPER – 204**

## **EXPERIMENTAL TECHNIQUES**

**M.M.:75**

### **UNIT I**

Descriptive statistics: probability distributions, binomial, probability distributions of functions of random variables. Classification and tabulation of data. Diagrammatic and Graphical representations of research results. Sampling distributions of sample mean and sample variance from Normal population, aim, method. Normal distribution - marginal and conditional distributions.

### **UNIT II**

Distribution of quadratic forms. Regression and correlation rank correlation, Regression analysis, partial and multiple correlation and regression, linear and nonlinear relationship. Mechanical errors. Principles of experimental design, precision and accuracy, advantage of replication, experimental technique. Analysis of variance, fundamental principles of analysis of variance. Critical difference, limitations of the analysis of variance.

### **UNIT III**

Statistical analysis and advantage and disadvantage of basic design-completely randomized design, randomized block design, Latin square design. Factorial concept: simple effects, main effects and interaction, factorial experiments (without confounding), Yates method. Confounding, principles of confounding in a  $2^3$  factorial experiments. Split plot design.

### **UNIT IV**

Missing plot technique; Bartlett's techniques for missing plots, cross-overdesign or switch-over trials, Rotational experiments, progeny selection, compact family block design, uniformity trial, sire index, sampling in field experiments.

### **Suggested Readings**

- Chakrabarti MC. 1962. *Mathematics of Design and Analysis of Experiments*. Asia Publ. House.
- Cochran WG & Cox DR. 1957. *Experimental Designs*. 2nd Ed. John Wiley.
- Dean AM & Voss D. 1999. *Design and Analysis of Experiments*. Springer.
- Dey A & Mukerjee R. 1999. *Fractional Factorial Plans*. John Wiley.
- Dey A 1986. *Theory of Block Designs*. Wiley Eastern.
- Hall M Jr. 1986. *Combinatorial Theory*. John Wiley.
- John JA & Quenouille MH. 1977. *Experiments: Design and Analysis*. Charles & Griffin.
- Kempthorne, O. 1976. *Design and Analysis of Experiments*. John Wiley.
- Khuri AI & Cornell JA. 1996. *Response Surface Designs and Analysis*. 2nd Ed. Marcel Dekker.
- Montgomery DC. 2005. *Design and Analysis of Experiments*. John Wiley.
- Raghavarao D. 1971. *Construction and Combinatorial Problems in Design of Experiments*. John Wiley.

**Practical for All****M.M.:100**

- Visit to agro-meteorological observatory and to record sun-shine hours, wind velocity, wind direction, relative humidity, soil and air temperature, evaporation, precipitation and atmospheric pressure
- Measurement of solar radiation outside and within plant canopy
- Measurement/estimation of evapo-transpiration by various methods
- Measurement/estimation of soil water balance
- Rainfall variability analysis
- Determination of heat-unit requirement for different crops
- Measurement of soil temperatures at different depths
- Study of synoptic charts and weather reports, working principle of automatic weather station
- Visit to solar observatory
- Estimation of crop yield on the basis of yield attributes
- Formulation of cropping schemes and calculation of cropping and rotational intensities
- Working out growth indices, aggressiveness, relative crowding coefficient, monetary yield advantage and ATER of prominent intercropping systems of different crops
- Estimation of protein content in pulses
- Judging of physiological maturity in different crops
- Intercultural operations in different crops
- Determination of cost of cultivation of different crops
- Working out harvest index of various crops
- Study of seed production techniques in various crops
- Visit to nearby villages for identification of constraints in crop production
- Planning and layout of field experiments
- Cutting of sugarcane setts, its treatment and methods of sowing, tying and propping of sugarcane
- Determination of cane maturity and calculation on purity percentage, recovery percentage and sucrose content in cane juice.
- Intercultural operations in different crops
- Cotton seed treatment
- Judging of physiological maturity in different crops and working out harvest index
- Working out cost of cultivation of different crops
- Estimation of crop yield on the basis of yield attributes
- Determination of oil content in oilseeds and computation of oil yield
- Estimation of quality of fibre of different fibre crops
- Study of seed production techniques in various crops
- Identification of crops based on morphological and seed characteristics
- Raising of herbarium of medicinal, aromatic and under-utilized plants
- Quality characters in medicinal and aromatic plants
- Methods of analysis of essential oil and other chemicals of importance in medicinal and aromatic plants

**SEMETER THIRD****MM.:400****PAPER – 301 AGRONOMY OF FODDER AND FORAGE CROPS M.M.: 75**

## UNIT I

Adaptation, distribution, varietal improvement, agro-techniques and quality aspects including anti-quality factors of important fodder crops like maize, *bajra*, *guar*, cowpea, oats, barley, berseem, *senji*, lucerne etc.

## UNIT II

Adaptation, distribution, varietal improvement, agro-techniques and quality aspects including anti-quality factors of important forage crops/grasseslime, napier grass, *Panicum*, *Lasiurus*, *Cenchrus* etc.

## UNIT III

Year-round fodder production and management, preservation and utilization of forage and pasture crops. Principles and methods of hay and silage making; chemical and biochemical changes, nutrient losses and factors affecting quality of hay and silage; value addition of poor quality fodder.

## UNIT IV

Economics of forage cultivation uses and seed production techniques.

### **Suggested Readings**

- Chatterjee BN. 1989. *Forage Crop Production - Principles and Practices*. Oxford & IBH.  
Das NR. 2007. *Introduction to Crops of India*. Scientific Publ.  
Narayanan TR & Dabadghao PM. 1972. *Forage Crops of India*. ICAR.  
Singh P & Srivastava AK. 1990. *Forage Production Technology*. IGRI, Jhansi.  
Singh C, Singh P & Singh R. 2003. *Modern Techniques of Raising Field Crops*. Oxford & IBH.  
Tejwani KG. 1994. *Agroforestry in India*. Oxford & IBH.

## **PAPER – 302 AGROSTOLOGY AND AGRO-FORESTRY**

**M.M.: 75**

## UNIT I

Agrostology: definition and importance; principles of grassland ecology: grassland ecology – community, climax, dominant species, succession, biotype, ecological status of grasslands in India, grass cover of India; problems and management of grasslands.

## UNIT II

Importance, classification (various criteria), scope, status and research needs of pastures; pasture establishment, their improvement and renovation-natural pastures, cultivated pastures; common pasture grasses.

## UNIT III

Agroforestry: definition and importance; agroforestry systems, agrisilviculture, silvipasture, agrisilvipasture, agrihorticulture, aquasilviculture, alley cropping and energy plantation.

## UNIT IV

Crop production technology in agro-forestry and agrostology system; silvipastoral system: meaning and importance for wasteland development; selection of species, planting methods in agro-forestry systems; irrigation and manuring in agro-forestry systems, associative influence in relation to above ground interferences; lopping and coppicing in agro-forestry systems; social acceptability and economic viability, nutritive value of trees.

### **Suggested Readings**

- Chatterjee BN & Das PK. 1989. *Forage Crop Production. Principles and Practices*. Oxford & IBH.

- Dabadghao PM & Shankaranarayan KA. 1973. *The Grass Cover in India*. ICAR.
- Dwivedi AP. 1992. *Agroforestry- Principles and Practices*. Oxford & IBH.
- Indian Society of Agronomy. 1989. *Agroforestry System in India. Research and Development*, New Delhi.
- Narayan TR & Dabadghao PM. 1972. *Forage Crop of India*. ICAR, New Delhi.
- Pathak PS & Roy MM. 1994. *Agroforestry System for Degraded Lands*. Oxford & IBH.
- Sen NL, Dadheech RC, Dashora LK & Rawat TS. 2004. *Manual of Agroforestry and Social forestry*. Agrotech Publ.
- Shah SA. 1988. *Forestry for People*. ICAR.
- Singh Panjab, Pathak PS & Roy MM. 1994. *Agroforestry System for Sustainable Use*. Oxford & IBH.
- Singh SP. 1994. *Handbook of Agroforestry*. Agrotech Publ.
- Solanki KR. 2000. *Multipurpose Tree Species: Research, Retrospect and Prospects*. Agrobios.
- Tejwani KG. 1994. *Agroforestry in India*. Oxford & IBH.

## **PAPER –303CROPPING SYSTEMS AND SUSTAINABLE AGRICULTURE M.M.: 75**

### UNIT I

Cropping systems: definition, indices and its importance; physical resources, soil and water management in cropping systems; assessment of land use.

### UNIT II

Concept of sustainability in cropping systems and farming systems, scope and objectives; production potential under monoculture cropping, multiple cropping, alley cropping, sequential and intercropping, mechanism of yield advantage in intercropping systems.

### UNIT III

Above and below ground interactions and allelopathic effects; competition relations; multi-storied cropping and yield stability in intercropping, role of non-monetary inputs and low cost technologies; research need on sustainable agriculture.

### UNIT IV

Crop diversification for sustainability; role of organic matter in maintenance of soil fertility; crop residue management; fertilizer use efficiency and concept of fertilizer use in intensive cropping system. Plant ideotypes for drylands; plant growth regulators and their role in sustainability.

### **Suggested Readings**

- Palaniappan SP & Sivaraman K. 1996. *Cropping Systems in the Tropics; Principles and Management*. New Age.
- Panda SC. 2003. *Cropping and Farming Systems*. Agrobios.
- Reddy SR. 2000. *Principles of Crop Production*. Kalyani.
- Sankaran S & Mudaliar TVS. 1997. *Principles of Agronomy*. The Bangalore Printing & Publ. Co.
- Singh SS. 2006. *Principles and Practices of Agronomy*. Kalyani.
- Tisdale SL, Nelson WL, Beaton JD & Havlin JL. 1997. *Soil Fertility and Fertilizers*. Prentice Hall.

## **PAPER – 304 DRYLAND FARMING AND WATERSHED MANAGEMENT M.M.: 75**

### UNIT I

Definition, concept and characteristics of dry land farming; dry land versus rainfed farming; significance and dimensions of dry land farming in Indian agriculture.

### UNIT II

Soil and climatic parameters with special emphasis on rainfall characteristics; constraints limiting crop production in dry land areas; types of drought, characterization of environment for water availability; crop planning for erratic and aberrant weather conditions.

#### UNIT III

Stress physiology and resistance to drought, adaptation of crop plants to drought, drought management strategies; preparation of appropriate crop plans for dry land areas; mid contingent plan for aberrant weather conditions.

#### UNIT IV

Tillage, tillage, frequency and depth of cultivation, compaction in soil tillage; concept of conservation tillage; tillage in relation to weed control and moisture conservation; techniques and practices of soil moisture conservation; antitranspirants; soil and crop management techniques, seeding and efficient fertilizer use. Concept of watershed resource management

#### Suggested Readings

- Das NR. 2007. *Tillage and Crop Production*. Scientific Publishers.  
Dhopte AM. 2002. *Agrotechnology for Dryland Farming*. Scientific Publ.  
Dhruv Narayan VV. 2002. *Soil and Water Conservation Research in India*. ICAR.  
Gupta US. (Ed.). 1995. *Production and Improvements of Crops for Drylands*. Oxford & IBH.  
Katyal JC & Farrington J. 1995. *Research for Rainfed Farming*. CRIDA.  
Rao SC & Ryan J. 2007. *Challenges and Strategies of Dryland Agriculture*. Scientific Publishers.  
Singh P & Maliwal PL. 2005. *Technologies for Food Security and Sustainable Agriculture*. Agrotech Publishing Company.  
Singh RP. 1988. *Improved Agronomic Practices for Dryland Crops*. CRIDA.  
Singh RP. 2005. *Sustainable Development of Dryland Agriculture in India*. Scientific Publ.  
Singh SD. 1998. *Arid Land Irrigation and Ecological Management*. Scientific Publishers.  
Venkateshwarlu J. 2004. *Rainfed Agriculture in India. Research and Development Scenario*. ICAR.

#### Practical for all

**M.M.:100**

- Practical raining of farm operations in raising fodder crops;
- Canopy measurement, yield and quality estimation
- Hay and silage making and economics of their preparation
- Preparation of charts and maps showing different types of pastures and agro-forestry systems
- Identification of seeds and plants of common grasses, legumes and trees of economic importance with reference to agro-forestry
- Seed treatment for better germination of farm vegetation
- Methods of propagation/planting of grasses and trees in silvipastoral system
- Estimation of total biomass and fuel wood
- Economics of agro-forestry
- Visit to important agro-forestry research stations
- Seed treatment, seed germination and crop establishment
- Moisture stress effects and recovery behaviour of important crops
- Estimation of moisture index and aridity index
- Collection and interpretation of data for water balance equations
- Water use efficiency
- Study of field experiments relevant to dryland farming
- Visit to dryland research stations and watershed projects

**PAPER – 401 PRINCIPLES AND PRACTICES OF ORGANIC FARMING M.M.: 75****UNIT I**

Organic farming - concept and definition, its relevance to India and global agriculture and future prospects; land and water management - land use, minimum tillage; shelter zones, hedges, pasture management, agro-forestry.

**UNIT II**

Organic farming and water use efficiency; soil fertility, nutrient recycling, organic residues, organic manures, composting, soil biota and decomposition of organic residues, earthworms and vermicompost, green manures and biofertilizers.

**UNIT III**

Farming systems, crop rotations, multiple and relay cropping systems, intercropping in relation to maintenance of soil productivity.

**UNIT IV**

Control of weeds, diseases and insect pest management, biological agents and pheromones, biopesticides. Socio-economic impacts; marketing and export potential: inspection, certification, labeling and accreditation procedures; organic farming and national economy.

**Practical**

- Aerobic and anaerobic methods of making compost
- Making of vermicompost
- Identification and nursery raising of important agro-forestry trees and trees for shelter belts
- Efficient use of biofertilizers, technique of treating legume seeds with *Rhizobium* cultures, use of *Azotobacter*, *Azospirillum*, and PSB cultures in field
- Visit to an organic farm
- Quality standards, inspection, certification and labeling and accreditation procedures for farm produce from organic farms

**Suggested Readings**

- Ananthakrishnan TN. (Ed.). 1992. *Emerging Trends in Biological Control of Phytophagous Insects*. Oxford & IBH.
- Gaur AC. 1982. *A Manual of Rural Composting*, FAO/UNDP Regional Project Document, FAO.
- Lampin N. 1990. *Organic Farming*. Press Books, Ipswich, UK.
- Palaniappan SP & Anandurai K. 1999. *Organic Farming – Theory and Practice*. Scientific Publ.
- Rao BV Venkata. 1995. *Small Farmer Focused Integrated Rural Development: Socio-economic Environment and Legal Perspective*: Publ.3, Parisaraprajna Parishtana, Bangalore.
- Reddy MV. (Ed.). 1995. *Soil Organisms and Litter Decomposition in the Tropics*. Oxford & IBH.
- Sharma A. 2002. *Hand Book of Organic Farming*. Agrobios.
- Singh SP. (Ed.) 1994. *Technology for Production of Natural Enemies*. PDBC, Bangalore.
- Subba Rao NS. 2002. *Soil Microbiology*. Oxford & IBH.
- Trivedi RN. 1993. *A Text Book of Environmental Sciences*, Anmol Publ.
- Veeresh GK, Shivashankar K & Suiglachar MA. 1997. *Organic Farming and Sustainable Agriculture*. Association for Promotion of Organic Farming, Bangalore.
- WHO. 1990. *Public Health Impact of Pesticides Used in Agriculture*. WHO.
- Woolmer PL & Swift MJ. 1994. *The Biological Management of Tropical Soil Fertility*. TSBF & Wiley.

**PAPER – 402 AGRONOMY OF MEDICINAL, AROMATIC AND UNDER-UTILIZED CROPS**

**M.M.: 75**

**UNIT I**

Importance of medicinal and aromatic plants in human health, national economy and related industries, classification of medicinal and aromatic plants according to botanical characteristics and uses.

**UNIT II**

Climate and soil requirements; cultural practices; yield and important constituents of medicinal plants (Isabgol, Rauwolfia, Poppy, *Aloe vera*, Satavar, Stevia, Safed Musli, Kalmegh, Asaphoetida, *Nux vomica*, Rosadle etc).

**UNIT III**

Climate and soil requirements; cultural practices; yield and important constituents of aromatic plants (Citronella, Palmarosa, Mentha, Basil, Lemon grass, Rose, Patchouli, Geranium etc.).

**UNIT IV**

Climate and soil requirements; cultural practices; yield of under-utilized crops (Rice bean, Lathyrus, Sesbania, Clusterbean, French bean, Fenugreek, Grain Amaranth, Coffee, Tea and Tobacco).

**Suggested Readings**

Chadha KL & Gupta R. 1995. *Advances in Horticulture*. Vol. II. *Medicinal and Aromatic Plants*. Malhotra Publ.

Das NR. 2007. *Introduction to Crops of India*. Scientific Publ.

Handa SS. 1984. *Cultivation and Utilization of Medicinal Plants*. RRL, CSIR, Jammu.

Hussain A. 1984. *Essential Oil Plants and their Cultivation*. CIMAP, Lucknow.

Hussain A. 1993. *Medicinal Plants and their Cultivation*. CIMAP, Lucknow.

ICAR 2006. *Hand Book of Agriculture*. ICAR, New Delhi.

Kumar N, Khader Md. Abdul, Rangaswami JBM & Irulappan 1997.

*Introduction to Spices, Plantation Crops, Medicinal and Aromatic Plants*. Oxford & IBH.

Prajapati ND, Purohit SS, Sharma AK & Kumar T. 2003. *A Hand Book of Medicinal Plants: A Complete Source Book*. Agrobios.

Sharma R. 2004. *Agro-Techniques of Medicinal Plants*. Daya Publ. House.

**PAPER – 403 SEMINAR**

**MAX.MARKS: 75**

**PAPER-404 THESIS WORK FOR MASTER RESEARCH**

**MAX.MARKS: 125**

Research work for thesis will be conducted related to all courses from all semester

Crop diversification under different agricultural situations, Development of farming systems for marginal, small and other farmers, Agricultural information at door step/click of mouse, Farm-specific nutrient management, Weed management in different cropping/farming systems Nutrient studies in different cropping/farming systems, Biodiversity of farming systems for conservation, Organic farming systems for different regions, Modeling for different crop situations Conservation



agriculture for yield sustainability, Role of edaphic factors on weeds proliferation and management, Implications of global warming on weed growth and herbicide behavior, Ecological implications of using thresholds for weed management, Effect of cultivation practices and herbicides on weed flora shift, GM crops and weed management strategies, Weed management under reduced moisture regime in major summer/*kharif* crops, Avoidance of herbicide resistance using IWM

**VIVA-VOCE OF THESIS WORK FOR MASTER RESEARCH**

**MAX.MARKS: 50**

**AGRONOMY: List of Journals**

- Advances in Agronomy
- Agriculture, Ecosystems and Environment
- Agricultural Systems
- Agricultural Water Management
- Agronomy Journal
- Annual Review of Plant Physiology
- Applied Ecology and Environment Research
- Australian Journal of Agricultural Research
- Australian Journal of Experimental Agriculture
- Crop Protection
- Environment and Ecology
- European Journal of Agronomy
- Fertilizer Research
- Field Crops Research
- Indian Journal of Agricultural Sciences
- Indian Journal of Agronomy
- Indian Journal of Ecology
- Indian Journal of Weed Science
- Irrigation Science
- Japanese Journal of Crop Science
- Journal of Agronomy
- Journal of Applied Ecology
- Journal of Experimental Botany
- Journal of Farming Systems Research
- Journal of Range Management
- Journal of Agricultural Science Cambridge
- Journal of Sustainable Agriculture
- Netherlands Journal of Agricultural Sciences
- Nutrient Cycling in Agroecosystems
- Pesticide Biochemistry and Physiology
- Plant and Soil
- Plant Production Science
- Soil and Tillage Research
- Swedish Journal of Agricultural Research

- Tropical Agriculture
- Weed Research

**6. Cadre-wise teaching staff required.**

<b>Professor</b>	<b>01</b>
<b>Associate Professor</b>	<b>01</b>
<b>Assistant Professor</b>	<b>04</b>
<b>Total</b>	<b>06</b>

**Administrative Staff requirement**

<b>Laboratory Assistant</b>	<b>01</b>
<b>Field Assistant</b>	<b>02</b>
<b>Attendant/Messenger</b>	<b>03</b>
<b>Total</b>	<b>06</b>

**Manpower Requirement of Dean's Office**

**Sl. No. Name of the Post No. of Posts**

1. Dean 01

**A. Establishment**

1. P.A./P.S. to Dean 01
2. Asstt. Administrative Officer 01
3. Asstt. Academic Officer 01
4. Assistant Accounts Officer 01
5. Assistants (one for each AAO) 03
6. Steno/Computer Operators 01
7. Driver 01
8. Farm Manager (Asstt. Prof.) 01\*
9. Store Keeper 01

**B. Central Instrumentation Laboratory**

1. Instrumentation Asstt. Engineer 01
2. Instrumentation Technician/Lab Asstt. 01

**C. Library Staff**

1. Asstt. Librarian(Asstt. Prof. cadre) 01
2. Library Asstt./Clerk 01
3. Shelf Asstt. 01

**D. Students Welfare**

1. Physical Education (Asstt. Prof.) 01
2. Attendant 01

**E. Hostel Staff**

1. Warden 01+01
2. Care taker/Asstt. 01+01

**F. Estate Branch**

1. Junior Engineer 01
2. Security Asstt. 01

**Land Required**

**(A) Land Utilization Pattern (hectares) Plain Hill/Coastal Region**

1. Main Building/Hostels/Residential Quarters (Including roads) 6.8 3.2
2. Playground & other amenities 3.2, 2.0
3. Farm Area, including godown/ stores 20.0, 10.8

**Note:** If land is not in one stretch, it should be at least within a radius of 5 kms

**(B) Land allocations (hectares)- 6.0 hectare**

**Infrastructure facilities (Floor space required)****A. Central Facilities****S. No. Details No. of Rooms Dimensions (ft)**

1. Dean Office 1 20x24
2. P.A. Room 1 10x12
3. Committee Room with video conferencing facility 1 20x30
4. Assistant Administrative Officer including staff 1 20x12
5. Assistant Accounts Officer including staff 1 20x12
6. Assistant Academic Officer including staff 1 20x12
7. Exam Cell (300 capacity) 1 20x12
8. Evaluation Room 1 20x36
9. Faculty Room (Ladies) 1 10x12
10. Faculty Room (Gents) 1 20x12
11. Placement Cell 1 20x12
12. Smart Lecture Halls 5 40x30 (60 capacity)
13. Exam Hall Cum Auditorium 1 100x50
14. Library/Book Bank 1 30x72
15. Common Utility Room 1 20x36
16. Central Laboratory 1 50x36
17. Hostels including Mess, Gym/Indoor, Reading Room, Warden Room, Store etc. 1 (boys) 150, 1 (girls) 150
18. Canteen 1 20x12 (kitchen with store) 20x36 Seating
19. Wash room (with toilet & urinary facilities) 10 20x12 (keeping ladies requirements)
20. Parking space As per requirement
21. Farm stores, threshing yards including implements and tractor sheds One core complex
22. Vehicles Car 1, Jeep/Car staff 2, Bus 1, Pickup van 1, Motor Bikes 2, Minibus (30 capacity) 1  
Tractors 2
23. Drinking water and irrigation facilities As per requirements
24. Vehicles shed 1 10x80

**B. Divisions/Departments/Sections – Requirements****No. Details No. of Rooms Dimensions(ft)**

1. Office of Head 11 24x12 with wash room facility
2. Faculty Rooms 1+1 12 12x10 + 18x12 and 24x10 depending on the strength
3. Clerical/technical staff 12 12x10 to 24x10 depending on the strength
5. Laboratories 12 30x 60 Larger deptt. will have two
6. Field/Lab Stores 5
7. Green house/poly house/Nursery facilities-0.02 ha

**Requirements of Lab/field equipments**

1. Crop Cafeteria . ½ acre land, small implements like spade, hoe, khurpi, darati etc.
2. Museum for identification of seeds, fertilizer, weeds, commonly used agro-chemical and medicinal and aromatic plants etc.- Storage bottle Herbarium posting material
3. Field of sowing method, fertilizer application, irrigation and soil productivity and yield estimation  
Small equipment/ implement
4. Irrigation water measurement, bulk density etc.

**Equipment Number**

- i. Hot air oven 02
- ii Moisture box 30
- iii Moisture meter 05
- iv Tube Auger 10
- v Bucket auger 10
- vi Weighing Balance 01
- vii Seed Germinator 02
- viii Conductivity Meter 01

- ix pH Meter 02
- x Water Bath 01
- xi Shaker 01
- xii Chlorophyl Meter 01
- xiii Drip and Sprinkler System 03
- xiv Sprayer 03
- xv Spring Balance 50 Kg 05
- xvi Spring Balance 10 Kg 05
- xvii Top Pan Balance 1 kg capacity 05
- xviii Top Pan Balance 2 kg capacity 05
- xix Meter Scale 10
- xx Tape 05
- xxi Brix meter 02

### **Central Library and Information System**

#### **No. Items          Nos.**

1. Internet Server 01
2. Intranet Server 01
3. Computers for Reading Hall 20
4. Heavy Duty Photocopiers 02
5. Computerized Issue and Catalogue Systems 02
6. Wi-Fi facility in college/library/hostels As per requirement
7. CCTV monitoring system for library 01
8. RFID and Access Control System (Optional) 01
9. Broadband Internet Connectivity with minimum speed of 1Gbps

