



# **SunRise University**

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**Scheme**

**For Two-year Course in M.Sc.  
(Agriculture) Agronomy**

**2021-2022**

**COLLEGE OF AGRICULTURE**

**SUNRISE UNIVERSITY - ALWAR**



**SUNRISE UNIVERSITY - ALWAR**

**Campus: Bagad Rajput, Ramgarh, Alwar, Rajasthan 30102**

**M.Sc(Agriculture) Agronomy**

## 1<sup>st</sup> Semester (Session - 2021-2022)

Course No	Course Title	Credit Hours		Maximum Marks				
		T	P	Theory			Practical	G. Total
				Mid Term	Internal Assessment	External Theory		
AGRON 511	AGROMETEOROLOGY AND CROP WEATHER FORECASTING	2	1	20	-	50	30	100
AGRON 512	PRINCIPLES AND PRACTICES OF WATER MANAGEMENT	2	1	20	-	50	30	100
AGRON 513	PRINCIPLES AND PRACTICES OF SOIL FERTILITY AND NUTRIENT MANAGEMENT	2	1	20	-	50	30	100
	<b>Total</b>	6	3	-	-	-	-	300

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### AGRON 511

#### Agro-meteorology and Crop Weather Forecasting 3(2+1) Objective

To impart knowledge about agro-meteorology and crop weather forecasting to meet the challenges of aberrant weather conditions.

#### Theory

Agro meteorology: aim, scope and development in relation to crop environment, composition of atmosphere, distribution of atmospheric pressure. Solar radiation: characteristics, energy balance of atmosphere system, radiation distribution in plant canopies, radiation utilization by field crops, photosynthesis and efficiency of radiation

utilization by crops, energy budget of plant canopies. Environmental temperature: soil, air, canopy temperature, temperature profile in air, soil and crop canopies, soil and air temperature effects on plant processes, regulation of air, soil temperature for protection against frost and hot winds. Environmental moisture and evaporation, measures of atmospheric moisture, temperature, relative humidity, vapour pressure and their relationship, evapotranspiration and meteorological factors determining evapotranspiration. Modification of plant environment: artificial rain making, controlling heat load, heat trapping and shedding, protection from cold, reduction in sensible and latent heat flux.

Monsoon: monsoon and their origin, characteristics of monsoon, onset and progress of monsoon, withdrawal of monsoon. Weather forecasting in India: short, medium and long range forecasting, benefits of weather service to agriculture, forecasting of destructive frost, soil moisture forecast, phenological forecast, crop yield forecast. Aero-space science and remote sensing : application in agriculture, present status of remote sensing in India. Atmospheric pollution and its effect on climate and crop production.

### **Practical**

Agro-meteorological observatory- classes, site selection, layout and installation of meteorological instruments; handling of meteorological instruments; measurement of weather parameters; working out agro-climatic indices; maintenances of record; calculation of daily, weekly and monthly means; visit to state remote sensing centre, Jodhpur/Jaipur; measurement of soil temperature in different soil conditions/depths; interpretation and use of weather data; rainfall analysis for variability; moisture availability indices for an arid and a humid district, length of growing season, fitting cropping systems; preparation of weather maps, synoptic charts and weather reports; preparation of crop weather calendars, to become familiar with agro advisory service bulletins visit to ARS, Durgapura/Bikaner.

### **Suggested Readings**

- A.A. Rama Sastu (1984). Weather and Weather forecasting Publication Division, GOI.  
A.K. Sacheti, 1985. Agricultural Meteorology- Instructional-cum-Practical Manual. NCERT, New Delhi.  
Critchfield, H.J. 1995. General Climatology, Prentice Hall of India Pvt. Ltd., New Delhi  
D.S. Lal, 1998. Climatology. Sharda Pustak Bhawan.  
H.S. Mavi (1994). Introduction to Agro-meteorology. Oxford & IBH Publishing Co. New Delhi.  
K.L. Joshi, Sinha and D.P. Gupta (1985). Physical Geography, National Council of Educational Research and Training, New Delhi.  
Mavi H.S. and Tuper G.J. 2004. Agro-meteorology: Principles and Application of Climate Studies in Agriculture. Haworth Press.  
P.A. Menon (1989). Our weather. National Book Trust, New Delhi.  
P.K. Das (1992). The Monsoon. National Book Trust, New Delhi.  
R.S. Gena and S.P. Seetharaman (1991). Natural Resource Management: The Role of Remote sensing in decision making. Oxford & IBH Publishing Co. New Delhi.  
S. Venkateraman and A. Krishnan. Crops and Weather. Indian Council of Agricultural Research, New Delhi.  
S.R. Ghadekar, 1991. Meteorology, Agromet Publishers, Nagpur.  
Vashneya M.C. and Balakrishana Pillai P. 2003. Textbook of Agricultural Meteorology, ICAR.  
Vasiraju Radha Krishna Murthy (1995). Practical Manual on Agricultural Meteorology, Kalyani Publishers, Ludhiana.

## **AGRON 512 Principles and Practices of Water Management 3(2+1)**

### **Objective**

To teach the principles of water management and practices to enhance the water productivity.

### **Theory**

Water, its properties and role in plants; Water resources of India, Major irrigation projects and extent of area and crops irrigated in India; Water potential – concept, components and relationship between different components; Water movement in plant and soils; Absorption and transpiration of water in plants; Scheduling and methods of irrigation including micro irrigation system; Fertigation, Water use efficiency: Water management of crops and cropping systems; Soil, plant and meteorological factors determining water needs of crops; Water deficit stress in plants and its effect on growth. Quality of irrigation water – effect of saline water and soil salinity on plants and its management, Excess soil water and plant growth; Water management in problem soils; Drainage requirement of crops and methods of drainage, their layout and spacing.

### **Practical**

Determination of soluble salts, Ca + Mg, CO<sub>3</sub><sup>=</sup> and HCO<sub>3</sub><sup>-</sup> and Na in irrigation water; Determination of FC and PWP; Soil moisture measurement by tensiometer and pressure plate apparatus; Water flow measurement using different devices. Determining soil profile moisture deficit and irrigation requirement. Calculations on irrigation efficiencies; Computation of water requirement of crops using modified Penman formula. Determination of infiltration rates and hydraulic conductivity.

### **Suggested Readings**

A.M. Michael, 1987. Irrigation – Theory and Practice, Vikas Publishing House Pvt. Ltd., New Delhi

S.S. Parihar and B.S. Sandhu, 1978. Irrigation of field crops – Principles and Practices, ICAR, New Delhi

D. Lenka, 1999. Irrigation and Drainage. Kalyani Publishers, New Delhi.

R.D. Mishra and M. Ahmed. 1987. Manual on Irrigation Agronomy, Oxford & IBH Pub. Co. Pvt. Ltd., New Delhi

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G.H. Sankara Reddy and T. Yellamanda Reddy. 1995. Efficient use of irrigation water. Kalyani Publishers, New Delhi

K.V. Paliwal. 1972 Irrigation with saline water WTC, IARI, New Delhi.

I.C. Gupta 1990. Use of saline water in Agriculture. Oxford & IBH Pub. Co. Ltd., New Delhi

P.J. Kramer and J.S. Boyer 1995. Water relations of Plants & Soils, Academic Press, California, USA.

S.R. Reddy 2000. Principles of Crop Production, Kalyani Publication, New Delhi.

D.K. Majumar 2004. Irrigation water management – principles and practice, Prentice Hall of India, New Delhi.

S.C.Panda 2003. Principles and practices of water management. Agrobios, Jodhpur

Singh Pratap and Maliwal P.L. 2005. Technologies for Food Security and Sustainable Agriculture. Agrotech Public.

## **AGRON 513 Principles and Practices of Soil Fertility & Nutrient Management 3(2+1)**

### **Objective**

To impart knowledge of soil fertility and plant nutrients and apprise about the integrated approach of plant nutrition and sustainability of soil resources.

### **Theory**

Problems and management relating to mechanical impedance and soil submergence; Salt affected soils - problems and remedial measures; Soil acidity and remedial measures; Soil fertility and productivity concept and differences: Criteria of essentiality and forms in which nutrients are absorbed by plants; Physiological methods of increasing FUE. Nitrogen: Functions, deficiency and toxicity symptoms, forms of nitrogen, nitrogen transformation in soil, organic and mineral N balance in soil, mineralization of N compounds, losses of N from soil, nitrogenous fertilizer materials. Methods to increase N use efficiency and slow release fertilizers; Biological N fixation, symbiotic and free living N fixers; Phosphorus: Functions and deficiency symptoms, forms of P in soil, their availability and P fixation, various phosphatic fertilizers; Practices of increasing the effectiveness of applied and native phosphorus (PSB). Potassium: Functions and deficiency symptoms, forms of K in soil, fixation and release of potassium in soil; Potassic fertilizers and their application. Sulphur and micronutrients (Fe, Zn) functions, deficiency symptoms and application; Inter relationship of nutrient availability and soil pH; Important nutrient interactions and their effect on nutrient availability, cation exchange capacity and availability of plant nutrients; Integrated nutrient management.

### **Practical:**

Procedure of plant and soil sampling; Determination of soil pH, EC and organic carbon; Determination of total N and available N, P and K in soils; Determination of N, P, K and S in plant samples; Determination of Ca, Mg and Na in soil; Determination of gypsum requirement of alkali soils.

#### **Suggested Readings**

S.L. Tisdale, W.L. Nelson, J.D. Beaton and J.L. Havlin. 1997. Soil Fertility and Fertilizers. Prentice Hall of India, Pvt. Ltd., New Delhi

T.R. Reddy and G.H.S. Reddi 1992. Principles of Agronomy, Kalyani Publishers, New Delhi

L.A. Richards, 1968. Diagnosis and Improvement of Saline and Alkali Soils, Oxford and IBH Publishing Company, New Delhi

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Tamhaney, Motiramani, Bali and Donahu, 1970. Soils Their Chemistry and Fertility in Tropical Asia, Prentice Hall of India, New Delhi

R.R. Agarwal, J.S. P. Yadav and S.N. Gupta, 1982. Saline and Alkalai soils of India. ICAR Publication, New Delhi

G.Singh, J.S. Kolar and H.S. Sekhon, 2002. Recent Advances in Agronomy, Indian Society of Agornomy, IARI, New Delhi

J.S. Kanwar, 1978. Soil Fertility: Theory and Practices, ICAR Publication, New Delhi

J.L. Havlin, J.D. Beaton, S.L. Tisdale and W.L. Nelson, 2006. Soil Fertility and Fertilizers- An Introduction to Nutrient Management, Prentice Hall of India, Pvt. Ltd.,

New Delhi

N.C. Brady and R.R. Weil, 2003. Elements of the Nature and Properties of Soils. Prentice Hall, New Jersey.

R.S. Yawalkar, J.P. Agarwal and J. Bokde 1992. Manures and Fertilizers. Agri-Horticultural House, Nagpur

N.K. Fageria, V.C. Baligar and C.A. Jones 1991. Growth and Mineral Nutrition of Field Crops. Marcel Dekker, New York.

**M.Sc(Agriculture) Agronomy  
II<sup>nd</sup> Semester (Session - 2021-2022)**

Course No	Course Title	Credit Hours		Maximum Marks				
		T	P	Theory			Practical	G. Total
				Mid Term	Internal Assessment	External Theory		
AGRON 521	MODERN CONCEPTS IN CROP PRODUCTION	3	0	20	-	80	-	100
AGRON 522	PRINCIPLES AND PRACTICES OF WEED MANAGEMENT	2	1	20	-	50	30	100
AGRON 523	DRYLAND FARMING AND WATERSHED MANAGEMENT	3	0	20	-	80	-	100
AGRON 524	CROPPING SYSTEMS AND SUSTAINABLE AGRICULTURE	3	0	20	-	80	-	100
AGRON 525	AGROSTOLOGY AND AGROFORESTRY	2	1	20	-	50	30	100
	Total	13	2	-	-	-	-	500

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### **AGRON 521 Modern Concepts in Crop Production 3(3+0)**

#### **Objective**

To teach the basic concepts of soil management and crop production.

#### **Theory**

Agronomic aspects in food security; Crop growth and production in relation to climate change; Agro ecological and agroclimatic zones of India; Concept of potential yield; Modern concepts in tillage- zero, minimum and conservation tillage; Optimization of plant population and planting geometry in relation to soil fertility, solar radiation and available moisture regimes; Mitscherlich, Baule and Inverse yield : nitrogen laws; Biotic and abiotic stresses; Concept of ideal plant type; Organic farming, Physiology of grain yield in cereals; Crop growth analysis; Crop modelling in agronomic systems; Precision agriculture; Growth regulators and their role in agriculture; Designer crops; Vermi-technology; Agro biodiversity; Seed priming; ; Indigenous technological knowledge; Herbicide resistance in weeds; Allelopathy in agriculture ; Plant nutrition and disease tolerance in field crops.

#### **Suggested Readings**

Gardner, F.P.;Pearce, G.R. and Michell, R.I. Physiology of Crop Plants, Scientific Pub., Jodhpur.

S.P. Palaniappan and Shivarama,K. 1996. Cropping Systems in the Tropics - Principles and Management. New Age International Pub.

Fageria, N.K. 1992. Maximising crop yields. Marcel Dekker, New York.

Reddy,S.R. 2000. Principles of Agronomy. Kalyani Pub. New Delhi.

Sankaran, S. and Mudaliar ,T.V.S. 1997. Principles of Agronomy. The Bangalore Printing and Pub. Bangalore.

Redford, J. 1967. Growth Analysis formulae: Their use and abuse. Crop Science. 76:171-175.

Singh, G.; Kolar, J.S. and Sekhon, H.S. 2002 Recent Advances in Agronomy (Ed). ISA, Publication, New-Delhi.

Paroda, R.S. 2003. Sustaining Our Food Security. Konark Publishers Pvt. Ltd., Delhi

Balasubrammanyan P. and Palaniappan, S.P. 2001. Principles and Practices of Agronomy. Agrobios

Havlin J.L., Beaton J.D., Tisdale S.L. and Nelson W.L. 2006. Soil Fertility and Fertilizers. 7th Ed. Prentice Hall.

### **AGRON 522 Principles and Practices of Weed Management 3(2+1)**

#### **Objective**

To familiarize the students about the weeds, herbicides and methods of weed control.

#### **Theory**

Weed – biology, ecology and classification; history, development and classification of herbicides, their properties, mode of action and uses, basis of selectivity of herbicides; herbicide mixtures, adjuvants and safeners; weed control principles and management

practices in important grain crops, oilseeds, pulses, sugar, fibre crops, tuber crops and forage crops; vegetables and orchards; weed control under specific situations viz. intercropping systems, non cropped areas and drylands; noxious farm weeds and parasitic weeds and their control; fate of herbicides in soil; herbicide - pesticides and fertilizer interactions; allelopathic effect; integrated weed management; problem of aquatic weeds particularly water hyacinth, hydrilla and typha grass in Rajasthan and their possible control measures; weed control through bio herbicides and myco- herbicides; herbicide resistance in weeds and crops.

### **Practical**

Identification of common kharif, rabi and perennial weeds of crop fields, road sides, waste lands and irrigation channels; familiarization with trade names, common names, uses, cost and source of availability of herbicides; calibration of sprayer and maintenance (before and after use); study of different herbicidal formulations; calculation on herbicidal requirement for field crops and aquatic situation; application of herbicides in field crops; control of some noxious weeds by cultural and chemical means; study on weed control efficiency and calculation on weed infestation and weed index; preparation of weed herbarium, methodology for weed control research and precautions in handling or storage of herbicides.

### **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

## **AGRON 523 Dry land Farming and Watershed Management 3(3+0)**

### **Objective**

To teach the basic concepts and practices of dryland farming, soil moisture conservation and watershed management.

### **Theory**

Definition, concept, significance and dimensions of dryland farming in Indian agriculture, characteristics of dryland farming and dryland versus rainfed farming; constraints limiting crop production in dry land areas; characterisation of environment for water availability; delineation of dry farming areas on the basis of moisture deficit index and their characteristics, use of mulches, kinds, effectiveness and economics; antitranspirants- their types, mechanism and role in dry farming; water harvesting- its concepts, techniques and practices; soil and crop management techniques- tillage, seeding, fertilizer use, crop and varietal choice, cropping system, weed control and other management practices; plant ideotypes for drylands, drought management strategies; preparation of appropriate crop plans for dryland areas; mid season corrections for aberrant weather conditions. Watershed management- definition, objectives, concepts, problems, approach components, development of cropping systems for watershed areas; alternate land use systems; planning and operation of project for watershed management.



### Suggested Reading:

- Efficient Crop Management in Dry Farming Areas. 1985. ICAR (CRIDA) Publication, Hyderabad.
- J.C. Kalyan and J. Farrington, 1995. Research for Rainfed Farming, CRIDA, Hyderabad.
- Mahendra Pal, K.A. Singh and I.P.S. Ahlawat. 1985. Cropping System Research I & II. In processing of the National Symposium on Cropping Systems Published by ISA, New Delhi.
- N.R. Das, 2007. Tillage and crop production. Scientific Publishers, Jodhpur
- P. Ramaswamy, 1982. Dry farming technology in India. Agricole Publishing Academy, New Delhi.
- R.D. Asana, 1968. Growth Habit & Crops of Non-Irrigated Areas, Important Characters of Plant Types, Ind. Farming, 81:25-27.
- R.P. Singh 1995. Sustainable Development of Dryland Agriculture in India, Scientific Publishers, Jodhpur.
- R.P. Singh, Srinivas Sharma, M.V. Padmanabhan, S.K. Das and P.K. Mishra, 1990. A Field Manual on Watershed Management, ICAR (CRIDA) Publication, Hyderabad.
- S. Palaniappan. 1985. Cropping Systems in Tropics: Principles and Management, Wiley Eastern Ltd., New Delhi & TNAU, Coimbatore.
- S.C. Rao and J. Ryan 2007. Challenges and Strategies of Dryland Agriculture. Scientific Publishers., Jodhpur.
- S.C. Verma and M.P. Singh. 1984. Agronomy of New Plant Types. Tara Book Agency, Varanasi.
- S.D. Singh, Water harvesting in Desert, Manak Publication, New Delhi.
- T.Y. Reddy and C.H. Shankara Reddi. 1992. Principles of Agronomy, Kalyani Publishers, New Delhi.
- U.S. Gupta, 1975. Physiological Aspect of Dryland Farming, Oxford & IBH, New Delhi.
- U.S. Gupta. 1995. Production and Improvements of Crops for drylands, Oxford & IBH Publishing Co. Ltd, New Delhi
- V.V. Dhurva Narayan, R.P. Singh, S.P. Bhardwaj, M., Sharma, A.K. Sikka, K.P.R. Vittal and S.K. Das. 1987. Watershed Management for Drought Mitigation, ICAR Publication, New Delhi.

## **AGRON 524 Cropping Systems and Sustainable Agriculture 3(3+0)**

### **Objective**

To acquaint the students about prevailing cropping systems and sustainable agriculture in the country and practices to improve productivity.

### **Theory:**

Cropping systems- intercropping and multiple cropping, concepts, needs, indices and assessment; existing cropping systems under irrigated and rainfed situations. Cropping system indices viz., relative spread index and relative yield index. Farming system: integrated farming system, alternate farming system - meaning and scope including specific examples. Recycling and crop residue management. Natural farming - concept and components. Organic farming. Crop diversification – principles, types and needs. Sustainable agriculture - definition, scope and objectives, Natural resources, their characterization and management; Sustainable cropping and farming systems in agriculture in relation to environmental degradation; Research needs on sustainable agriculture.

### **Suggested Readings**

Guriqbal Singh, J.S. Kolar and H.S. Sekhon 2002. Recent Advances in Agronomy, Indian

Society of Agronomy, IARI, New Delhi

K. Balakrishnan Nair, U.N. Goswami and K. Kunhkrishnan 1972 (Ed.) Proceedings of the Symposium on Cropping Patterns in India. ICAR Publication, New Delhi.

K.N. Singh and R.P. Singh (Eds), 1990. Agronomic Research Towards Sustainable Agriculture, Indian Society of Agronomy, New Delhi

L.L.Somani, K.L. Totawat and B.L. Baser. 1992 (Ed.) Proceedings of National Seminar on Natural Farming, NSMP Publication, Rajasthan College of Agriculture, Udaipur

Proceedings of the National Symposium on Cropping Systems 1985. Indian Society of Agronomy, New Delhi

R.M. Devlin and E.H. Watham. 1986. Plant Physiology. CBS Publishers and Distributors, New Delhi.

R.P. Singh, 1990. Sustainable Agriculture: Issues, Perspectives and Prospects in Semi Arid Tropics. Vol I & II Indian Society of Agronomy, New Delhi

R.W. Willey 1979. Intercropping: Its Importance and Research Needs, Field Crop Abstracts 332:1-10 & 73-81

S.C. Panda. 2004. Cropping Systems and Farming Systems. Agrobios (India) Jodhpur

Singh, S.S. 2006. Principles and Practices of Agronomy. Kalyani Publishers, Ludhiana.

### **AGRON 525 Agrostology and Agro-Forestry 3(2+1)**

#### **Objective**

To teach crop husbandry of different forage, fodder and agroforestry crops/trees along with their processing.

#### **Theory**

##### **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 and problems of seed germination in agro-forestry systems; irrigation and manuring in agro-forestry systems, associative influence in relation to above ground and underground interferences; lopping and coppicing in agro-forestry systems; social acceptability and economic viability, nutritive value of trees; tender operation; desirable tree characteristics.

#### **Practical**

Preparation of charts and maps of India 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. Fertilizer application in strip and silvipastoral systems. After-care of plantation. Estimation of protein content in loppings of important fodder trees. Estimation of calorie value of wood of important fuel trees. Estimation of total biomass and fuel wood. Economics of agro-forestry. Visit to important agro-forestry research stations.

**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, Punjab, 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.

**M.Sc(Agriculture) Agronomy  
III<sup>rd</sup> Semester (Session - 2022-2023)**

Course No	Course Title	Credit Hours		Maximum Marks				
		T	P	Theory			Practical	G. Total
				Mid Term	Internal Assessment	External Theory		
AGRON 531	AGRONOMY OF MAJOR CEREALS AND PULSES	2	1	20	-	50	30	100
AGRON 532	AGRONOMY OF OIL SEEDS, FIBRE AND COMMERCIAL CROPS	2	1	20	-	50	30	100

AGRON 533	AGRONOMY OF KHARIF PULSES AND FORAGE CROPS	2	1	20	-	50	30	100
AGRON 534	PRINCIPLES AND PRACTICES OF ORGANIC FARMING	2	1	20	-	50	30	100
AGRON 535	AGRONOMY OF MEDICINAL, AROMATIC AND UNDER UTILIZED CROPS	2	1	20	-	50	30	100
	Total	10	5	-	-	-	-	500

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### **AGRON 531 Agronomy of Major Cereals and Pulses 3(2+1)**

#### **Objective**

To teach the crop husbandry of major cereals and pulses.

#### **Theory**

Origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition, quality components, handling and processing of the produce for maximum production of rice, wheat, maize, barley, sorghum, pearl millet, chickpea and pigeon pea.

#### **Practical**

Phenological studies at different growth stages of crops, different methods of raising nursery including dapog in rice; estimation of crop yields on the basis of yield attributes; calculation of fertilizer requirements and their application at different stages of growth on the basis of soil test values; computation of cost of cultivation of various crops, planning and layout of field experiments, formulation of cropping scheme for various farm sizes, calculation of cropping and rotation intensities, visit of field experiments for cultural, fertilizer, weed control and water management aspects; working out indices of intercropping systems – L.E.R. aggressivity, relative crowding coefficient and monetary yield advantage, ATER; determination of physiological maturity in different crops; working out of harvest index in various crops; computation of growth analysis indices. Study of root nodules and seed treatment with bio-fertilizers in pulses, Estimation of protein in pulses.

#### **Suggested Readings**

B.N. Chatterjee and K.K. Bhattacharya, 1986. Principles and Practices of Grain Legume Production, Oxford & IBH Publishing Company, New Delhi.

D.S. Yadav, 1992. Pulse Crops, Kalyani Publishers, New Delhi.

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

Hunsgi G & Krishna KR. 1998. Science of Field Crop Production. Oxford & IBH.

Jeswani and Baldev, 1990. Advances in Pulse Production Technology, ICAR Publication,

New Delhi.

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.

P.S. Rathore 2000. Techniques and Management of Field Crop Production. Agrobios (India) Jodhpur.

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 Prem and Singh Rajbir, 2003. Modern Techniques of Raising Field Crops. Oxford & IBH Publishing Co., New Delhi.

Singh, SS. 1998. Crop Management. Kalyani Publishers.

### **AGRON 532 Agronomy of Oilseeds, Fibre and Commercial Crops 3(2+1)**

#### **Objective**

To teach the crop husbandry of oilseed, fibre and commercial crops.

#### **Theory**

Origin and history, area and production, classification, improved varieties, adaptability, climate, soil, water and cultural requirements, nutrition quality component, handling and processing of the produce for maximum production of oilseeds - groundnut, rapeseed and mustard and soybean; fibre crops - cotton and jute and commercial crops-sugarcane and potato.

#### **Practical**

Phenological studies at different growth stages of crops, study of yield attributing characters of oilseeds and cotton; computation of yield on the basis of yield attributing characters; determination of protein and oil content in oilseeds, Seed treatment of cotton seed with sulphuric acid and cow dung; computation of cost of cultivation of various crops; determination of quality of cotton including ginning per cent and lint index; calculation of fertilizer requirements and their application at different growth stages in various crops on the basis of soil test values. cutting of cane setts, its treatment and method of sowing, tying and propping of sugarcane; determination of cane maturity and calculation on purity percentage, recovery percentage and sucrose content in juice; preparation of blue print for sugarcane, calculation of seed rate and fertilizer requirement for sugarcane; to work out the cost of cultivation of sugarcane; selection of potato seed, its treatment and method of sowing; calculation of seed rate and fertilizer requirement for potato; preparation of blue print for potato;

#### **Suggested Readings**

B. Sundara 1998. Sugarcane cultivation. Vikas Publishing House Pvt. Ltd.

B.C. Biswas, S. Maheshwari, C. Singh and D.S. Yadav 1984. Cotton, Published by Fertilizer Association of India, New Delhi.

Chhidda Singh, Prem Singh and Rajbir Singh, 2003. Modern Techniques of Raising Field Crops. Oxford & IBH Publishing Co., New Delhi.

Das, N.R. 2007. Introduction to crops of India. Scientific Publisher, Jodhpur.

H.C. Srivastava, S. Bhaskaran, B. Vatsyas and K.K.G. Menon, 1985. Oilseed Production: Constraints and Opportunities, Oxford & IBH Company, New Delhi.

J.S.Grewal & V.P.Jaiswal. 1990. Agronomical studies in potato under all India Coordinated Potato Improvement Project, CPRI Pub.Shimla.

J.S.Grewal, R.C.Sharma, S.S.Saini. 1991. Agro-techniques for Intensive Potato

Cultivation in India, ICAR Publication, New Delhi.

P.S. Bhatnagar and S.P. Tiwari, 1990. Technology for increasing soybean production in India, NRCS, Technical Bulletin (ICAR), National Research Centre for Soybean, Indore.

P.S. Rathore 2000. Techniques and Management of Field Crop Production, Agrobios (India) Jodhpur

P.S. Reddy, 1988. Groundnut, ICAR, New Delhi.

Rajendra Prasad, 2002. Text book of field crops production ICAR Pub.

Research and Development Strategies for Oilseed Production in India, 1979.

Proceedings of National Symposium, 7-9 Nov. 1979, ICAR Publication, New Delhi.

S.C. Verma and M.P. Singh, 1987. Agronomy of New Plant Types, Text Book Agency, Varanasi.

S.S. Singh, 1988. Crop Management under Irrigated and Rainfed Conditions, Kalyani Publishers, New Delhi.

S.S. Srivastava, D.P. Johari and S.S. Gill. 1988. Manual of Sugarcane Production in India. ICAR Publication, New Delhi.

### **AGRON 533 Agronomy of Kharif Pulses and Forage Crops 3(2+1)**

#### **Objective**

To teach the crop husbandry of different forage crops and kharif pulses.

#### **Theory**

Origin, history, importance, distribution, adaptation, classifications, morphology, general production constraints, varietal improvement and production technology of mungbean, urdbean and mothbean, main and by products and their post harvest handling for marketing. Adaptation, distribution, varietal improvement; agrotechniques and quality aspects including anti quality factors of important fodder crops like berseem, lucerne, sorghum, oats and napier grass; 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.

#### **Practical**

Phenological studies at different growth stages of crops, study of yield attributing characters of pulses; computation of yield on the basis of yield attributing characters; study of morphology of root nodules in pulses; seed treatment of pulses and grain legumes with Rhizobium culture; interculture operations in various crops, seed treatment with fungicides for controlling soil and seed borne diseases; computation of cost of cultivation of various crops; calculation of fertilizer requirements and their application at different growth stages in various crops on the basis of soil test values, study of seed production techniques in various crops and visit to nearby fodder research farm. Method of propagation of napier grass; estimation of crude protein, crude fibre, crude fat, and NFE in forage crops; calculation of TDN, total digestible energy and metabolic energy in different forage crops.

#### **Suggested Readings**

B.N. Chatterjee and K.K. Bhattacharya, 1986. Principles and Practices of Grain Legume Production, Oxford & IBH Publishing Company, New Delhi.

B.N. Chatterjee and S. Maiti, 1982. Cropping systems (Theory and Practice), Oxford & IBH Publishing Co., New Delhi. .

B.N. Chatterjee and P.K. Das. 1989. Forage Crop Production – Principles and Practices,

Oxford & IBH Publishing Co., New Delhi.

B.N.Chatterjee and S.Maiti. 1978. Silage and hay making, ICAR, Publication, New Delhi.

Chhidda Singh, Prem Singh and Rajbir Singh, 2003. Modern Techniques of Raising Field Crops. Oxford & IBH Publishing Co., New Delhi

D.S. Yadav, 1992. Pulse Crops, Kalyani Publishers, New Delhi

Das, N.R. 2007. Introduction to crops of India. Scientific Publisher, Jodhpur.

Jeswani and Baldev, 1990. Advances in Pulse Production Technology, ICAR Pub., New Delhi.

P.S. Rathore 2000. Techniques and Management of Field Crop Production Agrobios (India) Jodhpur

Rajendra Prasad, 2002. Text book of field crops production ICAR Pub.

S.C. Verma and M.P. Singh, 1987. Agronomy of New Plant Types, Text Book Agency, Varanasi. Mungbean, 1988. Proceedings of the second International symposium, AVRDC, Bangkok, Thailand, 16-20 Nov. 1987.

S.S. Singh, 1988. Crop Management under Irrigated and Rainfed Conditions, Kalyani Publishers, New Delhi.

### **AGRON 534 Principles and Practices of Organic Farming 3(2+1)**

**Objective** -To study the principles and practices of organic farming for sustainable crop production.

#### **Theory**

##### 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

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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.

##### UNIT V

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

- Ananthkrishnan 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

### **AGRON 535 Agronomy of Medicinal, Aromatic and Under-Utilized Crops 3(2+1)**

#### **Objective**

To acquaint students about different medicinal, aromatic and underutilized field crops, their package of practices and processing.

#### **Theory**

##### **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).

#### **Practical**

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.



### 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.

## M.Sc(Agriculture) Agronomy IV<sup>th</sup> Semester (Session - 2022-2023)

Course No	Course Title	Credits	Maximum Marks				
			Theory			Practical	G. Total
			Mid Term	Internal Assessment	External Theory		
AGRON 541	SEMINAR	1	-	-	-	-	100
AGRON 542	COMPREHENSIVE	2	-	-	-	-	100
AGRON 543	RESEARCH	15	-	-	-	-	100
	<b>Total</b>	-	-	-	-	-	300

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