

# FACULTY OF AGRICULTURE

ORDINANCES

&

SYLLABUS

FOR

**M.Sc. AGRICULTURE (HONS.)**  
**Parts I & II**

Examination : 2004



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**Guru Nanak Dev University**  
**Amritsar**

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**Price : 20-00**

**MASTER OF SCIENCE IN AGRICULTURE****Duration:**

1. The duration of the course of Master of Science in Agriculture (M.Sc.Agri.) will be two years. The examination shall be held in two parts, Part-I at the end of the course of first year Part-II at the end of the course of second year.

**2. Eligibility :**

(a) A candidate who was passed B.Sc. Agriculture Examination of Guru Nanak Dev University with 55% marks in Aggregate and preferably 60% in the elective subject he wants to offer in his M.Sc.(Agriculture)

**OR**

(b) Any other examination recognised as equivalent to the above by Guru Nanak Dev University, is eligible to apply for the admission.

**Note :- Detailed Ordinances relating to examination for this class are contained in the Guru Nanak Dev University, Calendar, Vol. II read with Syndicate decisions / amendments made from time to time.**

## M.Sc. Agriculture (Hons) Parts I &amp; II

**SCHEME OF STUDIES & EXAMINATION FOR THE M.Sc.AGRIC.  
(HONS.)  
PARTS-I & II (ANNUAL SYSTEM)  
(AGRIC. ECONOMICS GROUP)**

SR. No.	COURSE CODE	SUBJECT	PERIODS		MARKS		INT. ASSES.		TOTAL		GRAND TOTAL
			Per weeks	Th. Pract.	Th. Pract.	Th. Pract.	Th. Pract.	Th. Pract.			
1.	M.Sc.A. Major-I (Ag.Econ.)	Farm Management &Production Economics	4	6	80	40	20	10	100	50	150
2.	M.Sc.A.Major-II (Ag.Econ.)	Econometrics &Research Methodology	5	-	80	-	20	-	100	-	100
3.	M.Sc.A. Major-III (Ag. Econ.)	Micro & Macro Economics	5	-	80	-	20	-	100	-	100
4.	M.Sc.A. Major-IV (Ag.Econ.)	Marketing of Farm Production and Agriculture Finance	4	-	80	-	20	-	100	-	100
5.	M.Sc.A. Major-V (Ag.Econ) in lieu of Major-III Part.	Agricultural Price Analysis	3	-	40	-	10	-	50	-	50
6.	M.Sc.A. Minor- Agron.	Plant Ecology &Soil Fertility	6	6	80	40	20	10	100	50	150
7.	M.Sc. A. Stat	Statistical Research Methods for Agricultural Economist	4	3	80	40	20	10	100	50	150
<b>Total =</b>			<b>31</b>	<b>15</b>	<b>520</b>	<b>120</b>	<b>130</b>	<b>30</b>	<b>650</b>	<b>150</b>	<b>800</b>

**M.Sc. AGRIC. (HONS) PART \_II -:**

1.	M.SC. A.Major –VI (Ag.Econ)	Agricultural Financial Management, Monetary Theory and Analysis	6	-	80	--	20	--	100	---	100
2.	M.SC.A. (Ag.Econ)	Research Work	--	4	--	100	--	--	---	100	100
<b>Total =</b>			<b>6</b>	<b>4</b>	<b>80</b>	<b>100</b>	<b>20</b>	<b>-</b>	<b>100</b>	<b>100</b>	<b>200</b>

**Total Degree Marks = 1000**

**SYLLABUS FOR M.SC.AGRI.(HONS.) PART I (ANNUAL SYSTEM)  
FOR (AGRICULTURE ECONOMICS GROUP)  
M.Sc. A. Major I Econ. Farm Management and Production Economics**

**Time : 3 Hours**

**Max.Marks (Th) : 80**

**Int. Asses : 20**

**Periods per week (Th) : 4**

**Instructions for paper setters**

1. **Question paper should be set strictly according to the syllabus.**
2. **The language of questions should be straight and simple.**
3. **Not more than one question should be based on one topic.**
4. **The question paper should cover the whole syllabus and questions should be equally distributed.**
5. **At least ten questions should be set, out of which the candidates should be required to attempt any five.**

Meaning and function of farm management, development of farm management as a science, management factors in commercial agriculture. Organising and operating the farm business for optimal resources use . Farm adjustment programmes under uncertain conditions. Farm records and accounting. Analysis of farm record, inventory , balance sheet, income accounts, expenses accounts. Efficiency measures for different factors of production and farm business.

Review and analysis of the problem of capital in agriculture, capital formation, the changing capital structure of agriculture , the Principles and technique of capital management including capital budgeting and determination of agricultural credit requirements and utilization. Meaning and scope theory of producer behavior. Relation of farm management and Production economics.

Production functions :Types of production function and their characteristics. Mechanisms of fitting a production function and the related estimations problems.

Optimum allocation of resources including that over time and under risk and uncertainty with practical application to agriculture.

**PRACTICAL MAJOR-I AGRI. ECON.**

**Time 3 Hours**

**Max Marks(Pract) : 40**

**Int. Asses. : 10**

**Periods per Week (Pract) : 6**

Preparation of farm layout, Maintenance of farm business records, summerisation and analysis of account and preparation of enterprises, labour and partial budgets. Assigning five students to each village selected for Farm Planning Exercise. Allotment of different types/sizes of farms to different students for studying the existing farm plans and resource use patterns. Preparation of alternate plans, practical control charts in respect of the assigned farms.

**M.Sc. A. Major II Econ.  
Econometrics and Research Methodology**

**Time 3 Hours**

**Max Marks(Th) : 80**

**Int. Assess. : 20**

**Periods per Week (Th) : 5**

**Instruction for paper setters**

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight and simple.
3. Not more than one question should be based on one topic .
4. The question paper should cover the whole syllabus and questions should be equally distributed.
5. At least ten questions should be set, out of which the candidates should be required to attempt any five.

**Econometrics and its role in Economic**

Methodology of Economics, types of econometrics, Single-Equation.

**Regression Models** : The Modern interpretation of regression, statistical vs. Deterministic Relationship regression vs. Correlation, Regression vs Causation.

**Two Variable Regression Analysis** : The concept of population Regression function . The meaning of the term linear, stochastic specification of PRF. The significance of the stochastic disturbance term. The sample regression function.

**Two variable Regression Model** : The method of ordinary least squares. The assumption, standard errors of least-squares, estimates. The Gauss-Markov Theorem. The coefficient of determination  $r^2$ . A measure of Goodness of fit.

**Two Variable Regression Interval Estimation and Hypothesis Testing** : Confidence intervals for regression co-efficient and 2 Multiple Regression Analysis.

**The problem of estimation** : Three variable model, its assumption, ordinary least squares estimation of the partial Regression coefficient.

Variances and standard errors of OLS Estimation of OLS Estimates. The multiple coefficient of determination  $R^2$ ,  $R^2$  and adjusted  $R^2$

**Multiple Regression Analysis :**

**The problem of inference** : Hypothesis testing about individual partial Regression, coefficient. Testing the overall significance of the sample Regression. The analysis of variance approach to testing the overall significance to multiple Regression Testing the equality of two regression coefficient.

**Multicollinearity**: The nature of Multicollinearity estimation in the presence of multicollinearity, its consequences Detection and remedial measures.

**Heteroscedasticity** : The nature of Heteroscedasticity, OLS Estimation in the presence of heteroscedasticity, its consequences, detection and remedial measures.

**Autocorrelation** : The nature of the problem , OLS estimation in the presence of autocorrelation. Its consequences, detection and remedial measures.

**Research Methods in Economics** : Nature and objectives of economic research. Basic concepts. Alternative approaches to the study of economic problems. Formulation of hypothesis Sampling techniques, primary and secondary data, their collection, editing, tabulation, testing of hypothesis interpretation of results.

**M.Sc. A Major III Econ.  
Micro & Macro Economics**

**Time 3 Hours**

**Max Marks(Th) : 80**

**Int. Asses. : 20**

**Periods per Week (Th) : 5**

**Instructions for paper setters**

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight and simple.
3. Not more than one question should be based on one topic .
4. The question paper should cover the whole syllabus and questions should be equally distributed.
5. At least ten questions should be set, out of which the candidates should be required to attempt any five .

**Micro Economics**

Utility analysis, indifferent curve technique, consumer surplus elasticity of demand . Elasticity of supply, price determination under perfect competition and monopoly and monopolistic competition, Oligopoly.

**Macro Economics**

1. National Income : concept and measurement.
2. The classical theory of employment.
3. The Principle of effective, demand, aggregate demand and aggregate supply.
4. The consumption function.
5. Theories of the consumption function.
6. The investment function.
7. The concept of Multiplier.
8. Theories of Inflation.
9. Monetary policy.
10. Fiscal policy.

**M.Sc. A. Major IV Econ.**  
**Marketing of farm production and Agricultural finance**

**Time 3 Hours**

**Max Marks(Th) : 80**

**Int. Asses. : 20**

**Periods per Week (Th) : 4**

**Instructions for paper setters**

1. Question paper should be set strictly according to the syllabus.
2. The language of question should be straight and simple.
3. Not more than one question should be based on one topic .
4. The question paper should cover the whole syllabus and questions should be equally distributed.
5. At least ten questions should be set, out of which the candidates should be required to attempt any five .

**Marketing of Farm Production**

Task of marketing, flow of goods and services,demand and supply consideration, Function and approaches to the study of marketing. Future trading and hedging ,price spreads, market legislation, commodity marketing.

**Agricultural Finance**

The policies, regulations, objectives, functions structure, practices and procedures of agricultural financial institutions, relationship and coordination among financing and related institutions, assessment of weakness and strength of existing system. Special problems in the selection of beneficiaries, security requirements the interest rate and interest subsidy debate, repayment performance and overdues , rural saving need for special rural credit channels.

**M.Sc. A. Major V Econ. (in lieu of Major III practical)  
Agricultural Price Analysis**

**Time 3 Hours**

**Max Marks(Th) : 40**

**Int. Asses. : 10**

**Periods per Week (Th) : 3**

**Instructions for paper setters**

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- 2. The language of question should be straight and simple.**
- 3. Not more than one question should be based on one topic .**
- 4. The question paper should cover the whole syllabus and questions should be equally distributed.**
- 5. At least ten questions should be set, out of which the candidates should be required to attempt any five .**

Concepts of price in economics, inter-relationship between prices and production nature of supply and demand agricultural products, types and reasons for price movement, trend, seasonal, cyclic irregular change in general price level and their effect on agriculture, relationship of farm wholesale and retail prices, price stabilization and price support party price and term of trade.

## **M.Sc. A Minor Agron Plant Ecology and Soil Fertility**

**Time 3 Hours**

**Max Marks(Th) : 80**

**Int. Asses. : 20**

**Periods per Week (Th) : 6**

### **Instructions for paper setters**

1. **Question paper should be set strictly according to the syllabus.**
2. **The language of question should be straight and simple.**
3. **Not more than one question should be based on one topic .**
4. **The question paper should cover the whole syllabus and questions should be equally distributed.**
5. **At least ten questions should be set, out of which the candidates should be required to attempt any five .**

Crop ecology, Its scope. Ecosystem energy and food chains and energy out put relationship .Agro-ecosystem Ecological zones of India, Ley-farming , shifting cultivation. Specialized and diversified farming, Family co-oprative farming, collective farming, their merits and demerits, Cropping systems their characteristics and management. Cropping pattern, farm selection, farm size and layout.

Detailed study of cultivation and marketing of the following crops, Wheat, Rice, Maize; Cotton, Sugarcane, Groundnut, Toria, Gobhi, Sarson, Agronomy of problem soils (specially saline,alkali and acidic soils, soil conservation plant nutrients, criteria of essentiality, function deficiency symptoms. Nutrient transformation and availability. Methods of soil fertility evaluation. Fertilizer use efficiency. Time and mode of fertilizer application. Concept of integrated fertilizer use in soils. Nutrient removal by crops. Soil fertility and its maintenance. Water requirements of crops consumptive use of water. Weed control methods:- Chemical, mechanical integrated and cultural, scope and importance.

### **Practical Minor Agron**

**Time 3 Hours**

**Max Marks(Pract) : 40**

**Int. Asses. : 10**

**Periods per Week (Pract) : 6**

Identification of weed Computation of herbicide doses. Practical study of raising crops mentioned in theory, Techniques of rapid soil and plant tissue for diagnosing nutrient status of soil. Handing of metrological instruments. Farm layout plans cropping schemes, estimation of crop yield, Computation of fertilizers of different crops.

**M.SC. A. Stats**  
**Statistical Research Methods for Agricultural Economist**

**Time 3 Hours**

**Max Marks(Th) : 80**

**Int. Asses. : 20**

**Periods per Week (Th) : 4**

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2. The language of question should be straight and simple.
3. Not more than one question should be based on one topic .
4. The question paper should cover the whole syllabus and questions should be equally distributed.
5. At least ten questions should be set, out of which the candidates should be required to attempt any five .

Fitting of Binomial poisson and normal distribution.

**Sampling Technique** : Principles of sampling, simple Vs. census Sampling and non sampling errors. Simple Random sampling with and without replacement, stratified Random sampling, systematic sampling, Ratio method of sampling ( Estimation of mean and standard errors) Simple, partial and multiple correlation and linear regression up to three variables. Test of hypothesis based on . t. f. and  $X^2$  distribution concerning mean, variance, simple correlation, partial co- relation and multiple correlation. Fisher's Z transformation . Analysis variance upto two way classified data with equal number of observation.

**Index Number** : Problems and methods of constructing index numbers. Choice of weighing schemes- Laspeyre's Passche's Fisser index number, unit test time and factor reversal test of consistency concept of consumer price index and Agricultural production index numbers.

**Time Series** : Components, isolation of trend, seasonal and cyclic fluctuation and its uses .

**Growth Curves** : Concept of exponential curve, modified exponential curve, Gomperty curve, Fitting of curves of type  $y= ab^x$ ,  $Y=ax^b$ ,  $Y=ae^{bx}$  .

**Practical Stats**

**Time 3 Hours**

**Max Marks(Pract) : 40**

**Int. Asses. : 10**

**Periods per Week (Pract) : 3**

1. Experiments on fitting of distributions.
2. Estimation of mean and standard error of simple Random sampling with and without replacement, stratified Random sampling and systematic sampling.
3. Test of significance based on t, f and  $X^2$  concerning mean, variance correlation (simple, partial and multiple)
4. Analysis of variance correlation and fitting and testing of single equation linear and nonlinear models.
5. index nos. time series, growth curves.

**M.Sc. AGRICULTURE (HONS) PART-II  
(AGRICULTURE ECONOMICS GROUP)  
AGRIC. ECONOMICS MAJOR VI  
AGRICULTURAL FINANCIAL MANAGEMENT, MONETARY  
THEORY AND ANALYSIS**

**THEROY PERIODS PER WEEK =6  
TIME : 3 HOURS**

**TOTAL MARKS : 100  
THEROY : 80  
INT.ASSES. : 20**

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5. At least ten questions should be set, out of which the candidates should be required to attempt any five .

**PART-A  
AGRICULTURAL FINANCIAL MANANGEMENT**

Nature, significance and basic principles of agricultural finance, influence of time on costs and returns, and the theory of financial management. Farm financial management, acquiring farm capital, financial analysis of the farm business balance sheet; income statement and cash flow statement. Financial markets ; Financial intermediaries serving agricultural and monetary and fiscal policies. Examination of alternative systems with a view to indentify feasible modifications and improvements..

**PART B  
MONETARY THEORY AND ANALYSIS**

Study of money, credit and liquidity as related to income, employment and prices, quantity and other theories of money. Monetary equilibrium Goals of monetary policy. Stabilisation and growth. Central bank's monetary policy, the problems of planning and flexibility.

## M.Sc. Agriculture (Hons) Parts I &amp; II

**SCHEME OF STUDIES & EXAMINATION FOR THE M.SC. AGRIC.  
(HONS)  
PART –I &II (ANNUAL SYSTEM)  
(AGRONOMY GROUP)**

**CLASS : M.SC. AGRIC. (HONS.) PART-I :-**

SR. ASSES	COURSE CODE	SUBJECT No. TOTAL	PERIODS		MARKS		INT. PER WEEK		TOTAL		GRAND
			Th.	Pract.	Th.	Pract.	Th.	Pract.	Th.	Pract.	
1.	M.Sc.A. Major-I (Agron)	Crop Ecology	3	6	80	40	20	10	100	50	150
2.	M.Sc.A. Major-II (Agron)	Weed control and Crop Production	3	-	80	-	20	-	100	-	100
3.	M.Sc. A. Major-III (Agron)	Soil Fertility and Irrigation Management	3	6	80	40	20	10	100	50	150
4.	M.Sc.A Major-IV (Agron)	Soil and Water Conservation and Management of Problem Soils	3	-	80	-	20	-	100	-	100
5.	M.Sc.A minor-Soil	Fundamental of soil Chemistry Fertility and Fertilizer	6	6	80	40	20	10	100	50	150
6.	M.Sc.A. STATS	Satistical Methods for Agricultural Workers	4	3	90	40	20	10	100	50	150
<b>TOTAL =</b>			<b>22</b>	<b>21</b>	<b>400</b>	<b>160</b>	<b>120</b>	<b>40</b>	<b>600</b>	<b>200</b>	<b>800</b>

**M.SC.AGRIC (HONS) PART-II :-**

1.	M.Sc.A. MAJOR-V (Agron)	Agronomic Approaches for Higer Crop Productivity	3	3	70	15	10	5	80	20	100
2.	M.Sc. A.(Agron)	Research Work	-	4	-	100	-	-	--	100	100
<b>TOTAL =</b>			<b>3</b>	<b>7</b>	<b>70</b>	<b>115</b>	<b>10</b>	<b>5</b>	<b>80</b>	<b>120</b>	<b>200</b>

**TOTAL DEGREE MARKS = 1000**

**SYLLABUS FOR M.SC. AGRI. (PART I)  
(AGRONOMY GROUP) (ANNUAL SYSTEM)  
M.SC. A. MAJOR-I (Agron)**

**Time : 3 Hours**

**Max.Marks (Th) : 80**

**Int. Asses : 20**

**Periods per week (Th) : 3**

**Instructions for paper setters**

1. Question paper should be set strictly according to the syllabus.
2. The language of question should be straight and simple.
3. Not more than one question should be based on one topic .
4. The question paper should cover the whole syllabus and questions should be equally distributed.
5. At least ten questions should be set, out of which the candidates should be required to attempt any five .

**Crop Ecology**

Crop Ecology concept, scope, classification of climate, Ecosystem and Agro Ecosystem, components properties. Solar radiation its concept; Productivity and limits to crop-productivity. Biogeochemical cycles and their significance in crop production, plant distribution, succession; Migration, ecesis, aggregation invasion and climax Adaptation-specific-response to extreme climatic elements zones. Ecological classification of crops and Agroclimatic elements zones. Impact of environmental pollution on crops, Conservation of Agro-ecosystem.

Important characteristics of cearyl crops. Growth processes and stress tolerance. Classification according to archaeological, Morphological physiological and cytogenetical basis. Production potential of different climatic zones. Growth and development analysis of physiological process studies. Remainder index system , quality components and quality standard.

**Future Perspective of Grassland farming**

**Practical Major I**

**Max. Marks (Pract) : 40**

**Int. Asses : 10**

**Periods per Week (Pract) : 6**

Identification and collection of weeds. Crop-weeds association studies. Preparation spray, herbicides. Study of mortality and nature of mortality of weeds. Qualitative and quantitative methods of evaluation.

Handling of standard Agro-meterological instruments. Recording of weather data. Collection of weather and crop data . Heat units and water balance with meterological data, Growth rate measurement and assimilation rate; net rate of growth. Weed index, harvest index. Weed control efficiency, their calculations.

**M.SC. A. Maj-II (Agron)**  
**Weed Control & crop Production**

**Time : 3 Hours**

**Max.Marks (Th) : 80**

**Int. Asses : 20**

**Periods per week (Th) : 3**

**Instructions for paper setters**

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2. The language of question should be straight and simple.
3. Not more than one question should be based on one topic .
4. The question paper should cover the whole syllabus and questions should be equally distributed.
5. At least ten questions should be set, out of which the candidates should be required to attempt any five .

Scope of weeds control losses caused by weeds, classification of weeds. Weed management concepts and methods. Ecology and methods for preventing the introduction and spread of weeds. Principles and methods of weed control cultural chemical and biological Herbicides composition functions properties mode of their action slective and non-selective herbicides Equipment used in applying herbicides control of weeds in major field crops. Persistence and degradation in soil. Nature of crop-weed competition.

<b>Cereal: Crops</b>	:	Crops Wheat,Rice,maize
<b>Millets</b>	:	Bajra
<b>Oil seeds</b>	:	Toria, Gobhisarson, G.Nut, Sun flower
<b>Sugar Crops</b>	:	Sugarcane
<b>Foodders</b>	:	Berseem, Lucerne, Hybrid napier

Agro climatic characteristics, growing regions, Morphological and physiological description, Growth pattern-germinations seedling growth-Dry matter production, yield quality,Causes of low productivity, recent advances in Agronomy of cereal pulses and oil seed crops.

Fodder resources their utilization planning fodder production selection of suitable crops and production strategy choice of cropping system Climatic factor and fodder quality standards. Nitrogen fixation. Stage of harvesting and seed production, Factors affecting values Fodder preservation, pasture and range management.

**M.SC. A. Maj-III (Agron)**  
**Soil Fertility and Irrigation Management**

**Time : 3 Hours**

**Max.Marks (Th) : 80**

**Int. Asses : 20**

**Periods per week (Th) : 3**

**Instructions for paper setters**

1. Question paper should be set strictly according to the syllabus.
2. The language of question should be straight and simple.
3. Not more than one question should be based on one topic .
4. The question paper should cover the whole syllabus and questions should be equally distributed.
5. At least ten questions should be set, out of which the candidates should be required to attempt any five .

Soil fertility problems, essentials of plant growth, soil fertility in relation to Physical and chemical characteristics, fundamentals of fertilizer application. Plant nutrients, their availability and absorption, organic matter and soil reaction in crop production, nitrogens, phosphorus and potassium, economy of soils, lime and sulphur applications, micro and non-essential nutrients in relation to soil fertility, spray fertilization, diagnostic techniques and nutritional needs of crops, activities of soil organism affecting crop productivity; rotation to soil fertility.

Crop response to different fertilizers, influence on germination and growth; nutrient removal, preference of different crops for certain nutrients, fertilization in crop rotation carry over effects on crops; time and methods of fertilizer application for efficient use; nutrioperiodism and partial efficiency of long term effects of fertilizer use on crops. Evaluation of fertilizer use.

Principles and practices of irrigation and drainage water, its role in physiology of plants theories of water absorption, translocation and transpiration, physical condition of moisture in soil, plant response to soil moisture; availability of water to plants, effects of water deficiency on physiological processes; water in relation to temperature injury, drought tolerance of plants, crop response to excess water inter-relationship of plant response of soil moisture regimes, water efficiency in relation to soil fertility, water use efficiency; plant, soil & climate as basis for predicting water needs, effects of salinity on internal water deficit of the plant.

Methods of determining irrigation requirements, irrigation requirements of important farm crops. Cropping pattern in relation to water supplies; drainage in relation to irrigation, water logging problems and their causes. Principles of field drainage, methods of drainage.

**Practical Major III (Agron)**

**Time : 3 Hours**

**Max.Marks (Pract) : 40**

**Int. Asses : 10**

**Periods per week (Pract) : 3**

Calibration and use of neutrons, scattering moisture meter. Determination of available moisture depletion in soil profile. Determination of soil and plant water losses. Determination of available water ; calculating consumptive use, Irrigation requirements water requirement. Water use efficiency working out of optimum doses of fertilizers use of implements in soil conservation. Identification and collection of grasses and legumes. Layout of field terraces and strip cropping Canopy measurements of legumes and grasses. Working out reclamation procedures for saline and alkalis and soils from soil analysis data.

**Soil & Water Conservation and Management of Problem soils****Time : 3 Hours****Max.Marks (Th) : 80****Int. Asses : 20****Periods per week (Th) : 3****Instructions for paper setters**

- 1. Question paper should be set strictly according to the syllabus.**
- 2. The language of question should be straight and simple.**
- 3. Not more than one question should be based on one topic .**
- 4. The question paper should cover the whole syllabus and questions should be equally distributed.**
- 5. At least ten questions should be set, out of which the candidates should be required to attempt any five .**

Nature and properties of the soils, plant responses to soil reaction extent of damage to crops, salt tolerance of crop plants, selection of crop and developing cropping pattern for alkali and acidic soils use of soil amendment for management and improvement of such soils. Agronomic practices in relation to soil acidity and alkalinity.

Problems and extent of soil and water erosion,role of agronomy in soil and water conservation, development of cropping patterns for soil and water conservation, effects of different crops on soil. Soil erosion; strip cropping classification of crops on the basis of the erosion-permitting characteristics; methods of erosion control, controlling gullies,strip cropping,mixed cropping contour cultivation, terracing, cropretation for problems areas, Lay farming cover crops-grasses and legumes, pasture improvement. Shelter belts for areas of high and low rainfall, dry land farming moisture conservation soil conservation plants water shed its concept and management.

**M.Sc. A Minor Soil  
Fundamental of Soil Chemistry Fertility & Fertilizers**

**Time : 3 Hours**

**Max.Marks (Th) : 80**

**Int. Ass : 20**

**Periods per week (Th) : 6**

**Instructions for paper setters**

1. Question paper should be set strictly according to the syllabus.
2. The language of question should be straight and simple.
3. Not more than one question should be based on one topic .
4. The question paper should cover the whole syllabus and questions should be equally distributed.
5. At least ten questions should be set, out of which the candidates should be required to attempt any five .

Soil colloids-nature, properties, origin of charges and their significance. Cation and anion exchange phenomena and their importance. Introduction to the ionic absorption, desorption and fixation, Soil reaction. Acid, saline-sodic and calcareous soils distribution, characterization, genesis and amelioration. Plants reaction to soil salinity, sodicity and acidity.

Plants nutrients-criteria of essentiality, functions, deficiency symptoms content and distribution in soil. Nutrient transformation retention and availability. Nutrient interaction. Methods of soil fertility evaluation. Fertilizers and their fate in soil. Crop responses to fertilizer. Fertilizers use efficiency Time and mode of fertilizer application.

Concept of integrated fertilizer use and water management in soils. Nutrient removal by crops. Maintenance of soil fertility. Current fertilizer consumption future trend and need.

**Practical Minor Soil**

**Time : 3 Hours**

**Max.Marks (Pract) : 40**

**Int. Asses : 10**

**Periods per week (Pract) : 6**

Determination of the effect of dilution and salinity on soil pH. Active and potential acidity. Cation and anion exchange capacity and exchange able cations. Soluble salts in soils. Lime and gypsum requirements. Nutrient absorption and fixation capacities of soils. Analysis of soil for different forms of nitrogen, phosphorus, potassium and sulphur. Determination of DTPA extractable micronutrients. Plant analysis for total nitrogen, phosphorus and potassium.

## Statistical Methods for Agricultural Workers

**Time : 3 Hours**

**Max.Marks (Th) : 80**

**Int. Ass : 20**

**Periods per week (Th) : 4**

**Note : Students are allowed to use scientific calculator. Statistical tables will be Provided to them in examination.**

### Instructions for paper setters

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3. Not more than one question should be based on one topic .
4. The question paper should cover the whole syllabus and questions should be equally distributed.
5. At least ten questions should be set, out of which the candidates should be required to attempt any five . Examiner should set at least two questions from part 3 and 7 and one each from remaining parts.(1,2,4,5,6 and 8).

1. **Probability:** Definition of Probability, addition and Multiplicative laws of probability. Fitting of Binomial, Poisson and normal distribution.
2. **Correlation and Regression:** Karl-Pearson correlation coefficient, Spearman rank Correlation, Partial Correlation, multiple correlation coefficient. Linear Regression, Multiple linear regression upto two independent variables.
3. **Tests of Hypothesis:** Introduction and concept of tests of hypothesis, t-test of significance of single mean,two means, paired t-test, test of significance of correlation coefficient and partial correlation coefficient. F-test test of significance of two variance,test of significance of multiple correlation coefficient.  $X^2$  test of significance of variance, goodness of fit and independence of attributes. Parametric versus non-parametric text, binomial test, sign test, Wilcoxon test
4. **Analysis of Variance ;** Analysis of variance for one way, two-way classification with equal cell frequencies per cell, transformation of data, concept of critical difference and Duncan's multiple range test.
5. **Design of Experiment:** Principles of design, selection of experimental material, uniformity trial, determination of size and shape of plots. Experiments in farmer's field.  
  
Layout and Analysis of RBD and LSD including one missing value, combined experiments in RBD.
6. **Factorial experiments:** Concept of main affect and interaction in  $2^2$ ,  $2^3$  experiment,partial confounding and complete confounding in  $2^3$  experiment.
7. **Other Design :** Layout and analysis of split plot design, split-split plot design, strip plot design, cross over design and balanced incomplete block design.
8. **Response surfaces :** Fitting of quadratic response curve, determination of optimum level of a factor by quadratic equation, Mitscherlich equation.

### Books Recommended

1. Statistical Procedure for Agricultural Research. By: Kwanchai-a Gomes Arturo a.Gomez, John Wiley and Sons.

**M.Sc. Agriculture (Hons) Parts I & II**

2. A text book of Agricultural Statistics.By:R.Rangaswamy, New Age International Pvt. Ltd.
3. Statistics for Agricultural Sciences.By: G. Nageswar Rao,Oxford and IBH Publishing Co.
4. Statistical Analysis of Non normal data, By: J.V. Deshpande, A.P.Gore, A. Shanubhogue, New age International Publishers Ltd.
5. Statistical methods in Animal Sciences, By : V.N. Amble, Indian Society Agricultural Statistics (New Delhi)

**Practicals on Statistical Methods for Agricultural Workers****Time : 3 Hours****Max.Marks : Pract : 40****Int.Assess : 10****Periods Per Week Pract : 3****List of Practical**

1. Fitting of Binomial Distribution.
2. Fitting of Poission Distribution.
3. Fitting of Normal Distribution
4. Fitting of simple & multiple linear regression and computation partial and multiple correlation coefficient and their interpretation in Agriculture.
5. Tests of significance based on t,F and  $X^2$ .
6. Analysis of variance.
7. Analysis of RBD including missing value.
8. Analysis of LSD including missing value.
9. Analysis of  $2^2$  and  $2^3$  factorial experiment including confounding.
10. Analysis of split plot design, split-split plot design, strip plot design, cross over design and BIBD design.
11. Determination of optimum response using quardratic trends.

**Note : Four questions will be set and students are required to attempt two questions.**

**M.Sc. AGRICULTURE (HONS) PART-II**  
(AGRONOMY GROUP)

**THEORY :- AGRONOMY MAJOR PAPER – V**  
**AGRONOMIC APPROACHES FOR HIGHER CROP PRODUCTIVITY**

**THEORY PERIODS PER WEEK =3**  
**TIME : 3 HOURS**

**TOTAL MARKS : 80**  
**THEORY : 70**  
**INT.ASSES. : 10**

**Instructions for paper setters**

1. Question paper should be set strictly according to the syllabus.
2. The language of question should be straight and simple.
3. Not more than one question should be based on one topic .
4. The question paper should cover the whole syllabus and questions should be equally distributed.
5. At least ten questions should be set, out of which the candidates should be required to attempt any five .

No- tillage concept, utility, present scenario, limitations and future research issues. Residue management in field crops and its effect on soil health, crop diversification concept, objectives, recent trends, possibilities, limitations, Agro-based industries needs and their future, Role of environmental stresses in crop production, soil and water pollution by agro-chemicals, integrated nutrient management for crops and cropping systems, natural resources, their conservation and efficient use for higher crop production, ecological optimum and efficient crop zones of India

Quality parameters in various crops and their improvement through agronomica manipulations, Ideotypes for efficient utilization of solar radiation in relation to crop productivity, growth and yield components in various crops, growth analysis ,physiological constraints in different crops, physiological and actual maturity in different crops and criteria for crop harvest, storage and marketing of various crops, WTO standers for quality crop production, mechanism of herbicide resistance and methods for prevention. Constraints in seed production in forage crops and their remedies. Allelopathic effects on soil and crop productivity.

Application of recent advances in experimental methodology. Lay out of different experimental designs for different situation.

Recent advances in agronomic research for higher crop productivity.

**PRACTICAL**

**PERIODS PER WEEK : 3**

**TOTAL MARKS : 20**  
**PRACTICAL : 15**  
**INT. ASSES. : 5**

Seed analysis for seed quality, important tests for seed germination. Emergence, Viability, Iongavity and seed vigous, visit to seed production farms.

Calibration of spray pumps and computation of herbicide doses, spray preparation and scheduling spraying of herbicides in different crops.

Clinical diagnosis and filed problems i.e. deficiency and phytotoxicity in filed crops.

Analysis of crop ecosystem components, measuring temperature and moisture effects, Recording macro and micro climatic parameters data outside and within crops and their interpretations, working out ecological optimum for different crops and delineating efficient crop zones.

Water potential, leaf diffusion resistance and canopy leaf temperature measurements.

Measuring of growth and yield indices in different crops. Judging of physiological and actual maturity of different field crops.

Actual lay out of field experiments for various situations, recording of field experimental data. Compilation and interpretation of given data . Visit to commercial, demonstration and research farms.

M.Sc. Agriculture (Hons) Parts I & II  
**SCHEME OF STUDIES & EXAMINATION FOR THE M.SC. AGRIC.  
 (HONS)  
 PARTS I & II (ANNUAL SYSTEM)  
 (HORTICULTURE GROUP)**

**CLASS : M.SC. AGRIC. (HONS.) PART-I :-**

SR. NO.	COURSE CODE	SUBJECT	PERIODS PER WEEKS		MARKS		INT. ASSES		TOTAL		GRAND TOTAL
			TH.	PRT.	TH.	PRT.	TH.	PRT.	TH.	PRT.	
1.	M.SC. A. Major-I (Hort)	Fruit Crop Improvement and Plant Regulation	3	6	80	40	20	10	100	50	150
2.	M.SC.A.Major-II (Hort)	Fruit Production	3	-	80	-	20	-	100	-	100
3.	M.SC. A. Major-III (Hort)	Systematic Pomology and Citriculture	3	6	80	40	20	10	100	50	150
4.	M.Sc.A Major-IV (Hort)	Fruit Crop Nutrition and Post Harvest Physiology	3	-	80	-	20	-	100	-	100
5.	M.SC.A minor-Soil	Fudamental of soil Chemstry Fertility and Fertilizer	6	6	80	40	20	10	100	50	150
6.	M.SC.A. STATS	Satistical Methods for Agricultural Workers	4	3	90	40	20	10	100	50	150
<b>TOTAL =</b>			<b>22</b>	<b>21</b>	<b>400</b>	<b>160</b>	<b>120</b>	<b>40</b>	<b>600</b>	<b>200</b>	<b>800</b>

**M.Sc.AGRIC (HONS) PART-II :-**

1.	M.SC.A. MAJOR-V (Hort)	Soil Water and Management and clinical Orchard Problem	3	3	70	15	10	5	80	20	100
2.	MSc. A.(Hort)	Research Work	-	4	-	100	-	-	--	100	100
<b>TOTAL =</b>			<b>3</b>	<b>7</b>	<b>70</b>	<b>115</b>	<b>10</b>	<b>5</b>	<b>80</b>	<b>120</b>	<b>200</b>

**TOTAL DEGREE MARKS = 1000**

**SYLLABUS OF M.SC. AGRIC.(HONS). PART-I  
(HORTICULTURE GROUP)  
M.Sc. A Major-I Hort.**

**Time : 3 Hours**

**Max.Marks (Th) : 80**

**Int. Asses : 20**

**Periods per week (Th) : 3**

**Instructions for paper setters**

1. Question paper should be set strictly according to the syllabus.
2. The language of question should be straight and simple.
3. Not more than one question should be based on one topic .
4. The question paper should cover the whole syllabus and questions should be equally distributed.
5. At least ten questions should be set, out of which the candidates should be required to attempt any five .

**FRUIT CROP IMPROVEMENT AND PLANT REGULATION**

**a) Improvement of Fruit Crops:-**

Breeding systems in fruit plants Methods of improvement through introduction, selection and hybridization, mutation, poly ploidy and tissue culture techniques. Breeding of citrus, mango, grape, ber. guava, papaya, pear, peach, plum and pomegranate and for their specific problems.

**b) Plant Regulations:-**

Plant regulator, their isolation and bio-assays. Mechanism of action. Role of plant regulators in fruit crops seed and bud, in dormancy, rooting of cuttings, flower initiation, fruit set and fruit development, partenocarphy, thinning of flowers and fruits, per-harvest fruit drop & induced abscission.

**Practical Major-I (Hort.)**

**Time : 3 Hours**

**Max.Marks (Pract) : 40**

**Int. Asses : 10**

**Periods per week (Pract) : 6**

- a) Studies on bearing habit of fruit crops. Fruit bud development, receptivity stigma anthesis, dehiscence, test for pollen viability and germinability, pollen storage, hybridization techniques important fruit crops.
- b) Preparation of culture media and embryo culture.
- c) Mutagenesis in fruit crops.
- d) Preparation of growth regulator solutions, methods of applications, their use in fruit setting, fruit thinning, fruit drop, fruit maturity, fruit quality parameters seed germination of seeds and rooting of cutting and layering.
- e) Description and identification of important species and varieties of fruit crops. Commercial methods of propagation in fruit crops, training, pruning and irrigation systems.
- f) Visits to fruit research stations.

**M.Sc.A.Major II (Hort.)  
FRUIT PRODUCTION****Time : 3 Hours****Max.Marks (Th) : 80****Int. Asses : 20****Periods per week (Th) : 3****Instructions for paper setters**

1. Question paper should be set strictly according to the syllabus.
2. The language of question should be straight and simple.
3. Not more than one question should be based on one topic .
4. The question paper should cover the whole syllabus and questions should be equally distributed.
5. At least ten questions should be set, out of which the candidates should be required to attempt any five .

Brief historical accounts of fruit industry in India. Development in the present century status and scope, challenges to be faced in tropical, subtropical and temperate fruits.

**a) Tropical and Sub-tropical fruits:-**

Commercial importance, climatic and soil requirements, varieties, propagation and root stocks training and pruning, soil and water management, fertilization, Intercrops and weeding, harvesting and handling of fruits and main problems in the cultivation of mango, papaya, sapota, pineapple, cashewnut, banana, guava, ber, loquat, grape, and pomegranate.

**b) Temperate Fruits:-**

Commercial importance, Climatic and Soil requirements, varieties, propagation and root stocks, training and pruning, soil and water management, fertilization, intercrops and weeding, harvesting and handling of fruits and main problems in the cultivation of pear, peach, plum, apple, apricot, cherry, almond walnut and strawberry.

**M.Sc. A.Major-III (Hort.)****SYSTEMATIC POMOLOGY AND CITRICULTURE****Time : 3 Hours****Max.Marks (Th) : 80****Int. Asses : 20****Periods per week (Th) : 3****Instructions for paper setters**

1. Question paper should be set strictly according to the syllabus.
2. The language of question should be straight and simple.
3. Not more than one question should be based on one topic .
4. The question paper should cover the whole syllabus and questions should be equally distributed.
5. At least ten questions should be set, out of which the candidates should be required to attempt any five .

**a) Systematic Pomology:-**

Systematic pomology, significance, principles, codes of nomenclature for cultivated fruit plants. Origin speciation, distribution and classification of temperate, tropical and subtropical fruit plant species and varieties with special reference to fruits grown under Punjab conditions.

**b) Citriculture :-**

Origin, distribution and commercial importance. Important cultivated species and varieties, propagation and root stocks. Production of virus free plants, climatic and soil requirements, training and pruning, inter cropping and weed control. Fertilization, physiological and pathological disorders and their control. Harvesting, handling, grading and storage of fruits.

**Practical Major-III (Hort.)****SYSTEMATIC POMOLOGY AND CITRICULTURE****Time : 3 Hours****Max.Marks (Pract) : 40****Int. Asses : 10****Periods per week (Pract) : 6**

- A) Preparation and use of keys for the identification of fruit species and varieties. Identification of important fruit species of fruit crops
- B) Judging the maturity of the fruits. Harvesting methods, pre and post-harvest application of growth substances fungicides, nutrient and waxes, Grading, packaging and storage of fruits.
- C) Nutrition and post harvest disorders in fruit crops and their control.
- D) Collection of leaf and soil samples. Preparation of leaf samples for chemical analysis.
- E) Nutrient deficiency symptoms in fruit crops.

**M.Sc. A Major-IV (Hort)**  
**FRUIT CROP NUTRITION AND POST HARVEST PHYSIOLOGY**

**Time : 3 Hours**

**Max.Marks (Th) : 80**

**Int. Asses : 20**

**Periods per week (Th) : 3**

**Instructions for paper setters**

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**A) Nutrition of Fruit crop:-**

Essential elements, natural sources and commercial materials. Theories of mineral uptake. Role of essential elements in fruit plants. Nutrient status of Punjab soils. Nutritional problems of saline, sodic and water logged soils. Inter-relationship of elements in fruit plants. Methods for assessing fertilizer needs. Fertilizer scheduling.

**B) Post-Harvest Physiology:-**

Importance and scope. Maturity and ripensing processes and factors affecting. Quality evaluation. Factors responsible for deterioration of fruits. Role of growth substances, waxes, fungicides and irradiation in post-harvest life. Pre-cooling fumigation, packing and transportation. Controlled atmosphere and hypobaric storage. Storage disorders.

**Paper V**  
**M.Sc. A Minor soil**  
**Fundamental of Soil Chemistry fertility and fertilizers**

**Time : 3 Hours**

**Max.Marks (Th) : 80**

**Int. Asses : 20**

**Periods per week (Th) : 6**

**Instructions for paper setters**

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2. The language of question should be straight and simple.
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**Soil colloids-** nature properties, origin of charges their significance. Cation and anion exchange phenomena and their importance. Introduction to ionic adsorption, desorption and fixation, soil reaction. Acid, saline-sodic and calcareous soils, distribution, characterization, genesis and amelioration. Plant reaction to soil salinity, sodicity and acidity. Plants nutrients criteria of essentiality, functions, deficiency symptoms content and distribution in soil. Nutrient transformation retention and availability. Nutrient interaction. Methods of soil fertility evaluation. Fertilizer and their fate in soil. Crop responses to fertilizers. Fertilizer use efficiency. Time and mode of fertilizer application. Concept of integrated fertilizer use and water management in soils. Nutrient removal by crops. Maintenance of soil fertility. Current fertilizer consumption future trend and need.

**PRACTICAL MINOR SOIL**

**Time : 3 Hours**

**Max.Marks (Pract) : 40**

**Int. Asses : 10**

**Periods per week (Pract) : 6**

Determination of the effect of dilution and salinity on soil pH. Active and potential acidity. Cation and anion exchange capacity and exchangeable cation. Soluble salts in soils. Lime and gypsum requirements. Nutrient adsorption and fixation capacities of soils. Analysis of soil for different forms of nitrogen, phosphorus, potassium and sulphur. Determination of DTPA extractable micronutrients. Plant analysis for total nitrogen phosphorus and potassium.

**Paper VI**  
**M.Sc. A. Stat**  
**Statistical Methods for Agricultural Workers**

**Time : 3 Hours**

**Max.Marks (Th) : 80**

**Int. Asses : 20**

**Periods per week (Th) : 4**

**Note:- Students are allowed to use scientific calculator statistical tables will be provided to them in examination.**

**Instructions for paper setters**

1. **Question paper should be set strictly according to the syllabus.**
2. **The language of question should be straight and simple.**
3. **Not more than one question should be based on one topic .**
4. **The question paper should cover the whole syllabus and questions should be equally distributed.**
5. **At least ten questions should be set, out of which the candidates should be required to attempt any five . Examiner should set at least two questions from part 3 and 7 and one each from remaining parts (1,2,4,5,6 and 8)**

1. **Probability** : Definition of Probability, Addition and Multiplicative laws of probability. Fitting of Binomial, Poisson and Normal distribution.
2. **Correlation and Regression:** kari-Pearson Correlation coefficient, Spearman Rank Correlation, Partial Correlation, multiple correlation coefficient. Linear Regression, multiple linear regression upto two independence variables.
3. **Tests of Hypothesis** : Introduction and concept of tests of hypothesis, t-test of significance of single mean, two means paired t-test, test of significance of correlation coefficient and partial correlation coefficient. F-test, test of significance of two variances, test of significance of multiple correlation coefficient.  $\chi^2$  test of significance of variance, goodness of fit and independence of attributes. Parametric versus non-parametric text, binomial test, sign test, wilcoxon test.
4. **Analysis of variance:** Analysis of variance for one way, two-way classification with equal cell frequencies per cell, transformation of data, concept of critical difference and Duncan's multiple range test.
5. **Design of Experiment:** Principles of design, selection of experimental material, uniformity trial, determination of size and shape of plots. Experiments in farmer's field.  
Layout and analysis of RBD and LSD including one missing value, combined experiments in RBD.
6. **Factorial Experiments:** Concepts of main affect and interaction in  $2^2.2^3$  experiment, partial confounding and complete confounding in  $2^3$  experiment.
7. **Other Design** : Layout and analysis of split plot design, split-split plot design, strip plot design, cross over design and balanced incomplete block design.
8. **Response Surfaces:** Fitting of quadratic response curve, determination of optimum level of a factor by quadratic equation Mitscherlich equation.

**Books Recommended**

1. Statistical Procedure for Agricultural Research By: Kwanchai A Gomes Arturo A.Gomez, John Wiley and Sons.
2. A text book of Agricultural Statistics. By: R.Rangaswamy, **New Age International Pvt.Ltd.**
3. Statistics for Agricultural Sciences. By : G. Nageswar Rao, **Oxford and IBH Publishing Co.**
4. Statistical Analysis of Non-normal data, By : J.V. Deshpande. A.P Gore, a. Shanubhogue, New Age International Publishers Ltd.
5. Statistical methods in Animal Sciences, By : V.N Amble, Indian Society of Agricultural Statistics (New Delhi).

**List of practical  
Practicals on Statistical Methods for Agricultural Workers**

**Time : 3 Hours****Max.Marks (Pract) : 40****Int. Asses : 10****Periods per week (Pract) : 3****List of Practicals :**

1. Fitting of Binomial Distribution.
2. Fitting of Poission Distribution.
3. Fitting of Normal Distribution.
4. Fitting of simple & multiple linear regression and computation partial and multiple correlation coefficient and their interpretation in Agriculture.
5. Tests of significance based on t, F and  $X^2$ .
6. Analysis of variance.
7. Analysis of RBD including missing value.
8. Analysis of LSD including missing value.
9. Analysis of  $2^2$  and  $2^3$  factorial experiment including confounding .
- 10 Analysis of split plot design, Split-Split plot design, strip plot design, cross over design and BIBD design.
11. Determination of optimum response using quadratic trends.

**Note : Four questions will be set, and students are required to attempt two questions.**

**M.SC. Agriculture (Hons) Part –II  
(Horticulture Group)**

**THEORY :- HORTICULTURE MAJOR PAPER – V  
SOIL AND WATER MANAGEMENT AND CLINICAL  
ORCHARD PROBLEMS**

**THEORY PERIOD PER WEEK : 3  
TIME : 3 HOURS**

**TOTAL MARKS : 80  
THEORY : 70  
INT. ASSES. : 10**

**Instructions for paper setters**

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4. The question paper should cover the whole syllabus and questions should be equally distributed.
5. At least ten questions should be set, out of which the candidates should be required to attempt any five .

Orchard soil management practices in India and abroad. Intercrops and cover crops, their functions and significance in orchard economy. Factors influencing to composition of cover crops. Weeds and their control in the orchard, Moisture conservation. Water requirements of fruit plants. Response of fruit plants to soil moisture regimes. Principles, methods and scheduling of irrigation. Economics of irrigation methods.

Clinical orchard problems regarding insect, pests, diseases and disorders and their suitable control measures.

**PRACTICAL**

**PERIOD PER WEEK : 3**

**TOTAL MARKS : 20  
PRACTICAL : 15  
INT. ASSES. : 05**

Determination of irrigation needs, weed control through mulching and weedicides. Intercropping in orchard. Laying out of different methods of irrigation.

Clinical diagnosis of orchard problems and their solution. Collection of diseased, insect pest attacked and disordered specimens.