Guru Kashi University
Talwandi Sabo
Doctor of Philosophy

Research Methodology (582101)

Credit: 4   **L T P**
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Objective

To teach methodology of planning, layout, data recording, analysis, interpretation and report writing of agronomic experiments

Theory

UNIT I

Historical aspects, principles and practices of field experimentation

UNIT II

Identification of research problem and preparation of research project proposal. Presentation of data and report writing.

UNIT III

Planning of experiments, recording of data - before layout of experiment, during crop growth and after harvest experimental designs (CRD (Complete Randomised Design), RBD (Randomised Block Design), LSD (Latin Square Design), and Split plot Design, Strip Plot Design etc.). Selection of experimental design, layout of experiment, number of treatments / replications, plot size, border effect etc. Techniques for increasing the precision for an experiment.

UNIT IV

Interpretation of data from weed control, irrigation, fertilizer and cropping system experiments. Interactions in factorial experiments.

UNIT V

Contrast analysis, pooled analysis and data transformation. Evaluation of direct, residual and cumulative effects of treatments.

UNIT VI

Correlation and regression analysis, and their application. Energetics and economic analysis.

UNIT VII

Analysis of data of typical agronomic experiments. Nutrient and water balance sheets. Statistical softwares and their application.

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Suggested Readings

- Clewer, A.G. and Scarisbrick, D.H. 2001. *Practical Statistics and Experimental Design for Plant and Crop Science*. John Wiley and Sons Ltd. West Sussex, England
- Cochran, W.G. and Cox, G.M. 1992. *Experimental Designs*. John Wiley and Sons, Inc. Toranto, New York, USA.
- Darmaraju Raghavarao. 1983. *Statistical Techniques in Agricultural and Biological Research*. Oxford and IBH Publishing Co. New Delhi.

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Computer Applications in Research (180102)

Credit: 2   **L   T   P**
                                                                 1   0   2

Common for all branches except Hindi, Punjabi, English, History and Religious Study.

Unit 1

Generating Charts/Graphs in Microsoft Excel, Power Point Presentation, Web search, Use of Internet and www. Using search like Google etc.

Unit 2:

SPSS concepts and its use for Statistical Analysis.

Unit 3:

MatLab and its use for Statistical Analysis.

Unit 4:

Introduction to the use of LaTeX, Mendeley, Anti-Plagiarism Softwares .

References:-

1) Office 2007 in Simple Steps, Kogent Solutions, (Wiley Publishers).
2) MS-Office 2007 Training Guide, S. Jain (BPB Publications).
3) Bansal , R. K. and others 'MATLAB and its applications in Engg. Second Edition , Pearson Education, Delhi.
4) Sabine handan & Brian S. Everitt, " A Handbook of Statistical Analysis using SPSS'', Chapman & Hall / CRC Publication, USA.

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Modern Concepts in Agronomy (582102)

Credit: 4   **L T P**

                                                                                 4 0 0

Objective

To acquaint the students about the recent developments in agronomy and resource management.

Theory

UNIT I

Environmental concerns related to intensive use of agricultural inputs. Sustainable agriculture - need, scope, practices and economic evaluation, holistic approach of farming systems.Agro-physiological basis of variation in yield, role of agro-biodiversity in sustainable food production, GM crops, crop diversification for improved food and nutritional security.

UNIT II

Conservation agriculture, modern approaches for improving resource-use efficiency, crop residue management in multiple cropping systems. Principles and practices of conservation tillage and watershed management, carbon sequestration.

UNIT III

Precision farming - current status and opportunities for adoption in India. GIS, GPS and remote sensing for crop management, global warming.

UNIT IV

Contract farming - concept, scope, partnerships, types, characteristics, management and administration, problems and advantages for farmers/ sponsors, WTO issues in agriculture.

UNIT V

Crop modeling, systems classification; flow charts, modeling techniques and methods of integration - state, rates and driving variables, feedbacks and relational diagrams information technology, elementary models for crop growth based on basic methods of classical growth analysis.

Suggested Readings:

- Sankaran, S. and Mudaliar, T.V.S. 1997. *Principles of Agronomy*. The Bangalore Printing & Publ. Co.

- Palaniappan, S.P. and Sivaraman, K. 1996. *Cropping Systems in the Tropics: Principles and Management*. New Age Publ.

Crop Production and Simulation Modelling

Objective

To familiarize the students about systems approach and to simulate yields and growth of crops under varied soil and weather conditions with different management practices, and their optimization.

Theory

UNIT I

Systems classification; flow charts, modeling techniques and methods of integration - state, rates and driving variables, feedbacks and relational diagrams.

UNIT II

Elementary models for crop growth based on basic methods of classical growth analysis.

UNIT III

Crop modeling methods for crop-weather interaction, climate change and variability components, DSSAT, APSIM, INFOCROP and Century models

UNIT IV

Potential production: leaf and canopy CO assimilation, respiration, dry matter accumulation, crop phenology and dry matter distribution and development in different crops. Estimation of generic coefficients.

Suggested Readings

- Gordan, G. 1992. *System Simulation*. 2nd Ed. Prentice Hall.
- Kropff, M.J. and Vann Laar, H.H. (Ed.). 1993. *Modelling Crop Weed Interactions*. ISBN.
- Mathews, R.B., Kropff, M.J., Bachelet, D. and Vaan Laar, H.H. (Eds.). 1993. *Modelling the Impact of Climate Change on Rice Production in Asia*. CABI.
- Penning de Vries, F.W.T. and Van Laar, H.H. (Eds.). 1982. *Simulation of Plant Growth and Crop Production*. Wageningen Centre for Agricultural Publications and Documentation, Netherlands.
- Ritchie, J.T. and Hanks, J. 1991. *Modelling Plant and Soil Systems*. American Society of Agronomy, Madison.

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Farming Systems

Objective

To appraise about cropping and farming systems, types of integrated farming systems under different agro-ecosystems, farming systems research and optimization methodologies.

Theory

UNIT I

Cropping systems – definition, indices, production potential, resource management in cropping systems, production potential under monoculture, multiple cropping, alley cropping, intercropping, mutli-storeyed cropping. Yield advantages in intercropping systems.

UNIT II

Farming systems - definition and importance; classification of farming systems, characteristics, objectives and principles. Concept of sustainability in farming systems; efficient farming systems; natural resources - identification and management.

UNIT III

Production potential of different components of farming systems. Cropping systems as an important component of farming systems, remunerative cropping systems, crop diversification.

UNIT IV

Integrated farming systems for different agro-ecosystems, interactions and resource recycling among different enterprises.

UNIT V

Farming system research methodologies: on-farm research, on-station research and system modeling. Preparation of different farming system models; evaluation of different farming systems. case studies on different farming systems.

UNIT VI

Multi-criteria decision making and optimization methodologies for designing integrated farming systems.

Suggested Readings

- Behera, U.K., Das, T.K. and Sharma A.R. 2009. *Manual on Multicriteria Decision Making and Optimization Methodology for Sustainable Farming*. Division of Agronomy, IARI, New Delhi.
- Malcolm, Hall. 2001. *Farming Systems and Poverty: Improving Farmers Livelihood in Changing World*. FAO and World Bank, Rome and Washington, D.C.
- Panda, S.C. 2004. *Cropping Systems and Farming Systems*. Agribios.

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8) Sabine handan & Brian S. Everitt, " A Handbook of Statistical Analysis using SPSS'', Chapman & Hall / CRC Publication, USA.