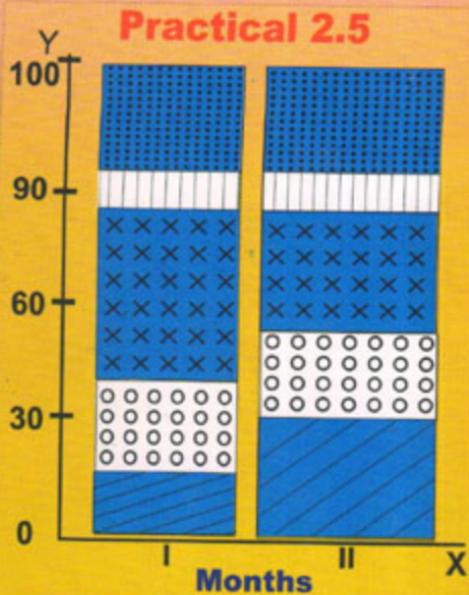


# PRACTICALS IN STATISTICS



Step Wise Procedures

Viva - Voce with Answers

Practicals Exercise

Simple Formulation

Objective Types Question

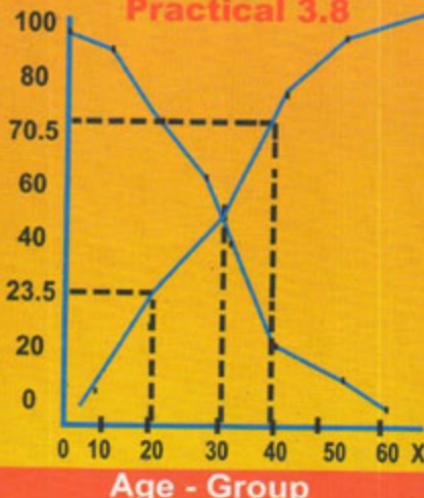
$$Y = X\beta + \epsilon$$

$$\chi^2 = \sum_{i=1}^n \left[ \frac{(O_i - E_i)^2}{E_i} \right]$$

$$R^2 = \frac{b'x'y - ny^2}{y'y - ny^2}$$

$$Z = \frac{X - \mu}{\sigma}$$

**Practical 3.8**



**H.L. Sharma**

# **PRACTICALS**

**IN**

# **STATISTICS**

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## FOREWORD

In recent years, there have been amazing changes in the theory of statistics. New theory and new practices continually have come into being. In fact, the demands for new research in this field never cease. In order to serve the needs of users, a lot of practical problems through this manual are given. In this way, it emphasizes the role of statistics and its power to condense a large amount of information into a particular value. Efforts are being made, especially in agricultural research, to know the hidden regularities of some aspects of soils, crops and other related biological phenomena. The statistics is the science which can find out the unknown facts on the basis of reliable data and true statistical methodology.

“Practicals in Statistics” written by Dr. H.I. Sharma has considered all the basic concepts, theory and formulations which have been explained through a variety of practical problems. At the end of each chapter, viva-voce questions, exercises and objective type questions have been added for the benefit of students and research workers. This manual will certainly fulfil the basic requirement of U.G. and P.G. students who are in agriculture stream. The author has a long experience of teaching and research in various fields of agriculture with reference to statistical methodology and its inference.

I thank Dr. Sharma for his efforts in bringing out this manual in the present form which will be very useful, especially to students of agriculture stream.

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**Dean, Faculty of Agriculture**  
**J.N.K.V.V., Jabalpur, M.P.**



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## FOREWORD

Statistics is an applied science which can be used in most of the fields to solve a variety of problems and draw a valid conclusions. It has a number of applications, especially in agriculture and agriculture engineering. Thus it is the science which deals with collection, analysis and interpretation of numerical data.

"Practicals in Statistics" written by Dr. H.L. Sharma has covered all the basic topics of statistical methods that have been explained through various practicals along with their stepwise procedures and in the last, objective type questions. This manual fulfils the requirements of the U.G. and P.G. students, especially for those who have been studying in agricultural university. This emphasizes the descriptive value of statistics and its power to condense a large amount of information into inference form. In particular, in agricultural research, efforts are being made to assess the hidden regularities of some aspects of agricultural engineering, plant science and another related biological phenomenon. Thus, statistics is the science which can be used to know about the unknown facts on basis of reliable data collection.

The author has a long experience of teaching and research in various fields of agriculture. I would like to congratulate and thank Dr. Sharma for his effort in bringing out this manual.



(C.K. Techchandani)

Dean, Faculty of Agricultural Engineering,  
J.N.K.V.V., Jabalpur, M.P.

## PREFACE

This practical's manual in Statistics has been prepared on the past experience of the author's working in J.N. Agricultural University, Jabalpur (M.P.). This is primarily intended to those students, scientists and teachers who always use statistical tools to analyse their experimental data. Since, this is a manual rather than a text book, the explanatory materials are brief and systematic. In each chapter, the possible varieties of practicals alongwith kinds of data and its stepwise procedure and possible viva questions/multiple choice with answers have been given. At the end of each chapter, some unsolved exercises have also been added. In this way, the students and readers of this manual may be well acquainted with the variety of problems. The beauty of this manual is that the formulae to be used in the practicals have been given in the respective practicals so that the students can easily understand. The derivations and proofs have been avoided in an effort to make the manual useful to the readers with only a general mathematical background.

The contents of the manual have been covered in twenty full length Chapter and four Appendices. Chapter 1 is related to the general introduction about statistics, its importance and scope, uses in agriculture and limitations. Chapters 2 and 3 give the practicals alongwith their basic theory about the frequency distributions, diagrams and graphs and measures of central location respectively while Chapter 4 provides the various practical aspects on measures of dispersion. Chapters 5 and 6 are important which consider about the probability and its mathematical expectation and basic probability distributions and their truncated forms. The discussion on practical view is given in Chapter 7 known to be 'Curve fitting'. Correlation and regression are the basic statistical techniques for analyzing the dependence and inter-dependence data which have

been considered in Chapter 8. Sampling is an important procedure of drawing the samples from the population which is given in Chapter 9. Chapters 10, 11, 12 discuss their practical aspects on index number, time series and quality control respectively. Non-parametric methods are useful when we do not make any assumptions regarding the population parameter. Under such situation, it is, then to use these methods to test certain hypotheses. The practical considerations are given in Chapter 13. Chapters 14 and 15 provide the practical aspects about tests of significance and analysis of variance. The rest of the chapters of this manual is devoted to the discussion on design of experiments which consider the basic designs, factorial experiments, confounding, split and strip plot designs, incomplete block designs.

Constructive comments and good suggestions are invited and will be gratefully acknowledged for the improvements of this manual.

I hope that the present form of the manual will be recommended by the teachers, scientists and the students working in the Indian University.

H. L. Sharma

## **ACKNOWLEDGEMENTS**

It gives me immense pleasure in expressing my deep sense of gratitude to Dr. D.P. Singh, Hon'ble Vice-chancellor, Dr. V.S. Tomar, Director of Research Services and Dean, Faculty of Agriculture, Dr. C. B. Singh, Director of Extension Services and Director of Instruction, Dr. J. S. Raghu, Dean, College of Agriculture, Dr. P. K. Bisen, Dean Student's Welfare and Dr. C.K. Techchandani Dean, College of Agricultural Engineering and Dr. N.P. Katyar, Professor & Head of Department of Mathematics and Statistics, J.N. Agricultural University, Jabalpur for the academic advice and moral support during the preparation of this manual.

I am grateful to all my seniors specially Dr. M. L. Chandak, retired Professor and Head, Dr. G.R. Makan and friends in the Department of Mathematics and Statistics, all Heads of Departments and the students, J.N. Agricultural University, Jaba pur who have encouraged me for writing such a basic brief manual.

I am very much thankful to my wife Smt. Asha, my son Avanish and my daughters, Amita and Pratibha for providing the needed atmosphere at home.

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Last but not least, the author wishes to thank the Agro Tech Publishing Academy, Udaipur for its co-operation in all the respects leading to this manual.

H. L. Sharma

## **ABOUT THE BOOK**

This *Practicals in Statistics* has been written on the past experience of the author's working in J.N. Agricultural University, Jabalpur (M.P.) where he has been since 1983. It presents the basic fundamentals of statistical methods that can be utilized for the analysis and interpretation of data which are given in the form of different practicals. It has been prepared primarily to suit the average students. Since this is a manual rather than a text book, the explanatory materials are brief and systematic. In each chapter, the possible varieties of practicals with kinds of data, its stepwise procedure as well as viva and objective types of questions (fill in the blanks, multiple choice) with answers have also been added. The beauty of this manual is that the formulae used here have been given in the respective practicals so that the students, scientists and teachers can easily understand and learn. The derivations and proofs have been avoided in an effort to make the manual useful to the readers with merely a general background of mathematics.

This manual can serve as a guide manual not only in Agricultural University but also in traditional one as far as the chapters are concerned.

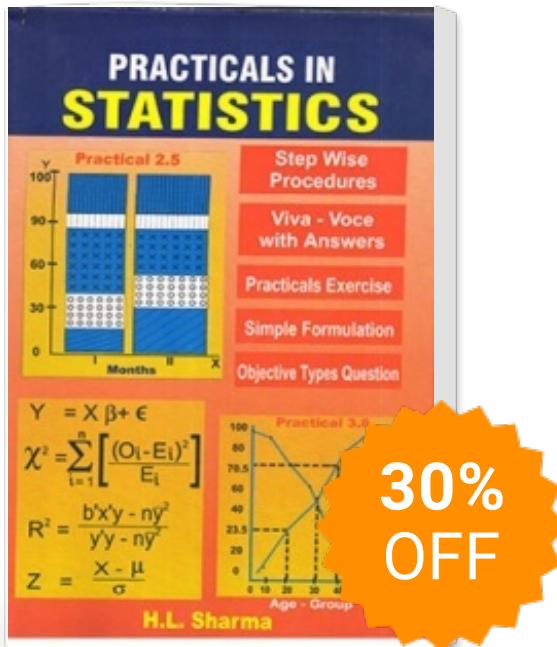
The author hopes that this manual in statistics would be more useful to the students, teachers and research workers in an Indian University.

## **ABOUT THE AUTHOR**

Dr. H.L. Sharma is Associate Professor of Statistics in the Department of Mathematics and Statistics, J.N. Agricultural University, Adhartal, Jabalpur (M.P.) where he has been involved in the activities of teaching and research since 1983. Dr. Sharma received his Ph.D. in Statistics from Banaras Hindu University, Varanasi, a well known Central University, in the year 1988. He has been one year in the University of Pennsylvania, Philadelphia (U.S.A.) during 1990–1991 as a Post Doctoral Fellow of the Rockefeller Foundation. Dr. Sharma has also been a recipient of PAA Travel Award for presentation of his paper in the International Conference of Population Association of America, Chicago (U.S.A.) from April 2–4, 1988. He has published more than forty research papers in different disciplines in the National and International Journals of repute and guided three P.G. students for their thesis work in Agricultural Statistics as a Major Advisor and a number of students in different subjects of Agriculture as a minor.

Recently, several P.G. students are to be registered for their thesis work and one, for Ph.D. in the field of Design of Experiments.

# Practicals in Statistics



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