



S. C. Panda



# Agronomy



Tom Stitt  
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# Agronomy

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## FOREWORD

Advances in basic sciences such as chemistry, physics, biology and plant breeding and genetics have helped in understanding the factors affecting growth of plants and to increase the production processes in agriculture. Fertilizers, pesticides, new varieties and hybrids of crops and methods of cultivation are largely the offspring of science. Scientific agriculture played an important role in the process of enrichment of developed countries. If development is to occur in the developing countries, agriculture must be able to produce surplus food and exportable commercial crops on cost-effective basis. Any country seeking to develop its economy has to give significant priority to agriculture, particularly scientific agriculture. Wherever scientific methods are applied, experience world over shows they got agriculture revolutionized.

Agronomy deals with the principles and practices of crop production and soil management. In its broadest sense, it includes agro-meteorology, crop ecology, crop production (including cropping systems), crop nutrition, soil fertility including manures and fertilizers, agro-forestry, water management, weed control, seed technology, cropping and farming systems, etc. One needs to have a sound knowledge of all these agronomic aspects as also related aspects from other sciences, viz., Botany, Soil Science, Statistics, etc. The science of Agronomy has made it possible to generate suitable technology for varied agro-climatic regions and integrate the results of other allied sciences, so as to deliver these appropriate innovative and tested practices to the farmers at large.

The scenario in food production is changing fast in the country with advances made in all branches of Agricultural Sciences. However, the science of Agronomy, a specialized subject dealing with all aspects of field crop production, has accelerated the pace of food production, aided by progress made in understanding the intricate relationships between crop growth and yield, and between crop and its environment of climate, soil, biotic factors and management practices.

The text-cum-reference book to meet precisely the felt need is an outcome of the author's active involvement in teaching, research and extension guidance in the field of agronomy for over thirty years. The author presented the book entitled, "**Agronomy**" in a scientific and systematic manner to understand the fundamentals clearly and easily which is the beauty of this book. I believe that this book will be very useful to the undergraduate and postgraduate students in agriculture, teachers in agricultural institutions and those who are interested in the subject. The book is divided into fifteen chapters and covers comprehensively the content of all courses in agronomy for undergraduate and post graduate students of Agricultural Universities in the country. The chapters have been arranged in such a manner as to lead the students through the entire gamut of Agronomy.

I am confident that this book will serve as a text book for agronomy and veterinary students, a reference for research scientists and teachers in the areas of crop production, integrated farming systems, dry land agriculture, cropping systems, production technology management under different situations, soil fertility management, water management, weed management, nutrient management, agro-meteorology, seed technology, and avian and animal sciences. This book will

also serve as a guide to the extension officials of the department of agriculture. I congratulate Dr. S. C. Panda for his pains taking effort in bringing out this book covering comprehensively the content of all courses in agronomy offered for U.G. and P.G. students of the agricultural universities in the country and the latest technologies for crop production associated with integrated enterprises in farming systems to meet the growing interest in sustainable agriculture. I am confident that this book will be widely accepted among the students. I extend my best wishes to Dr. Sharat Chandra Panda for the success of this book.

Bhubaneswar

**Dr. Bhagabat Panda**

# PREFACE

Agronomy is a division of agricultural science embracing preparation of soil in accordance with crop demands, enriching the soil with organic matter and plant nutrients, choice of crops and varieties to fit the climate, crop rotation and intercropping, suitable dates of sowing, moisture regulation, and drainage, weed management, harvesting and processing to an extent. It deals essentially with all aspects of soil, crop and water management to increase productivity of crops. It is, therefore, essential that the students of agriculture have a good grasp of the principles of agronomy.

India, with one of the biggest scientific manpower of the world, made a spectacular increase in its food grains production, after independence, especially after late sixties, when the country ushered into the world famous '**Green Revolution**'. The Green Revolution is manifested of the advances made in the agricultural sciences and can be summed up in three words, (1) seeds (High yielding Varieties), (2) water, and (3) fertilizers. The management of the last two factors of production, with a view to achieving the production potential of the first, i.e., High yielding varieties (seeds) is exclusively an agronomic domain. Agronomy can thus be rightly called as backbone of all agricultural sciences.

In depth knowledge of agronomy in the areas of agro-meteorology, soils and tillage, soil and water conservation, soil fertility, irrigation water management, nutrition management and weed management are essential to formulate management practices for sustainable crop production systems. The topic covered is the most relevant in view of growing interest in sustainable agriculture. This book brings out in detail the agronomy courses recommended for U.G. Programme by Deans' Committee as accepted by the ICAR. I sincerely hope that this book will serve as a text book for Agronomy students of all the Agricultural Universities, a resource of teachers and scientists in the areas of agro-meteorology, soil management, nutrient management, water management, weed management, crop production and management, dry farming, and cropping and farming systems. It will also serve as a guide to extension officials of the Department of Agriculture.

This is the age of information technology. Information is exploding on all fronts. Sometimes one is totally confounded and clueless about sieving the mass of information and choosing the one required by him/her. This is especially so for the young undergraduate students and those who are initiated into a subject. It is also very important for the teachers to process the mass of information and make it available to the students in an easily understandable manner. The information provided should not only be simple to understand but also to comprehend in an integrated manner. With the expanding horizon of knowledge in agriculture, particularly crop production, there have been several attempts in this direction keeping in view the under graduate syllabus of Agronomy for agriculture students followed in agricultural universities, as recommended by the Deans' Committee of the Indian Council of Agricultural Research. I believe that the book on '**Agronomy**' will be very useful to the undergraduate and postgraduate students of agriculture, teachers in agricultural institutions and those who are interested in the subject. Farming systems represent integration of farm enterprises as cropping systems animal husbandry, fisheries, poultry farming, etc. for optimal utilization of resources bringing prosperity to the farmers.

At present, there is no comprehensive text book on "Agronomy" from which one can have at least an overview of all these aspects including Cropping and Farming Systems and applied aspects suitable for farmers. This book will provide comprehensive information on the subject matter and fulfil the needs of students and other professionals. This is a book containing of fifteen chapters covering comprehensively the content of all courses in Agronomy for U.G. and P.G. students including the integrated farming and cropping systems. Though this book primarily written to serve as a text book/reference for the students of agriculture in under graduate and post graduate levels and technologists in developing organizations, it is hoped that this book will be valuable for similar groups in the third world countries of Asia and Africa. This book also serves as a valuable reference for the candidates preparing Agricultural Research Services and other competitive examinations. Professional Institutions in Soil Conservation, Krishi Vigyna Kendras and Rural Institutions and similar other Institutions would find this book very much helpful. The farmers may refer this book to practice integrated farming and cropping systems as the considerable emphasis is placed for obtaining maximum, profitable production per unit area per unit time.

The author acknowledges his indebtedness to authors of books from which most of the material in the text has been drawn. In several cases, it has not been possible to obtain permission for reproduction for which the author and publishers offer their sincere apologies.

The author is deeply indebted to ICAR for its assistance provided at various levels for preparing the manuscript. Special mention is made for the valuable help received from Sri K.C. Sahoo, Research Fellow of the Emeritus Scientist Project, OUAT, Bhubaneswar.

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In preparing this book, I have received helps, suggestions and encouragements from Dr. B. C. Nayak, Dean, College of Agriculture; Dr. P. K. Mahapatra, Professor and Head, Agronomy; Dr. L. M. Garnayak, Associate Professor, Agronomy and other staff members of the Department of Agronomy, College of Agriculture, OUAT, Bhubaneswar. I am grateful to all of them who communicated the encouraging comments regarding the text and constructing suggestions for the improvement of the book.

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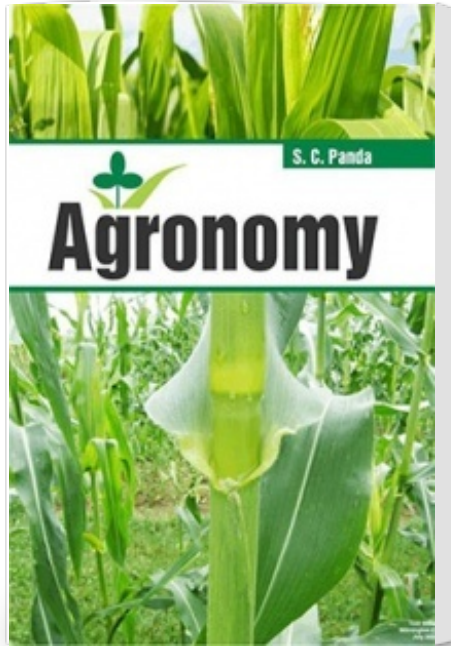
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