

S. C. PANDA



*Principles and
Practices of*
**Weed
Management**

PRINCIPLES AND PRACTICES OF
WEED MANAGEMENT

Principles and Practices of Weed Management

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AT THE FEET OF LORD
SHREE JAGANNATH
PURI, ORISSA

DEDICATED TO MY FATHER,
SHYAM SUNDAR PANDA
AND MOTHER,
SHNEHALATA PANDA

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FOREWORD

"Success is the ability to go from failure to failure without losing your enthusiasm"

Growth of Indian Agriculture has changed dramatically in the recent past due to crop improvement and advancement in production technology. The glory of Green Revolution, proved to be a turning point in improving the food situation from "begging bowel to self-sufficiency". In Green Revolution, Agronomists particularly Weed Scientist played the key role. Among crop pests, weeds are more harmful as compared to insects, disease organisms, nematodes and other agricultural pests.

Weeds have been part of agriculture scene since man started cultivating crop plants and weed management is an integral part of crop production with the introduction of improved cultivars. Weed Management is an approach in which weed prevention and weed control have companion roles. It implies a systems approach in which all available tools are used to reduce the propagule seed back, prevent weed emergence and minimize competition from weeds growing with desired plants. Thus, weed management has both immediate and long term objectives. This approach also implies a consideration in a broader context of their interactions with production practices.

Weeds are competitive and adaptable to all adverse environments. It has been estimated that in general weeds cause 5% loss in agricultural production in most developed countries, 10% loss in less developed countries and 25% loss in least developed countries.

In India, yield losses due to weeds are more than those from pest and diseases. Yield losses due to weeds vary with the crops. In wheat, direct yield losses have been estimated to range from 10-82%. This depends on the cultivars, weed species and density, cropping season, plant spacing, fertility and moisture status of the soil and climatic and environmental conditions. Besides reduction in yield, weeds remove large amount of plant nutrients from the soil.

Increasing awareness about conservation of environment as well as health hazards associated with agro-chemicals and consumers' preference, to safe and hazard free food are the major factors that lead to the growing

interest in alternate forms of agriculture in the world. Organic agriculture is one of the broad spectrums of production methods, being considered in support of the environment and human health. The demand for organic food is steadily increasing both in the developed and developing countries with an annual average growth rate of 20-25%. Organic agriculture is one of the latest-growing sectors of agricultural production.

Besides, the modern production technologies with high input requirement offers a tangible solution to the small and medium farmer's problem of low income and low productivity from cropping. To meet the growing demands, to solve small and medium farmer's problems and to achieve the targeted production levels with stability, ecological sustainability and equitability, a viable technology called integrated farming approach basing on soil management and organic farming suited to varied farm situations and agro-climatic conditions seem to be the answer.

An attempt has been made here to cover up theoretical as well as practical aspects of weed science which is a major and vital discipline in Agriculture. This book deals with the basic principles and technology of weed science in a systematic and comprehensive manner. It includes weed biology, description of weeds, weed ecology and competition, aquatic weeds, method of weed control, herbicide selectivity and formulation and translocation, absorption and translocation, herbicide application technology, classification and mode of action of herbicides, herbicide resistance, bio-herbicides role of biotechnology, herbicide residues, weed control in field crops, orchards, forestry, non-cropped areas and parasitic weed control.

The author presented the book entitled, "Weed Management" in a scientific and systematic manner to understand the fundamentals clearly and easily which is the beauty of this book. Potential yield can only be achieved under ideal management in an optimal physical, chemical and biological environment.

I am confident that this book will serve as a text book for agronomy, soil science, horticulture, extension education and veterinary students, a reference for research scientists and teachers in the areas of crop production, soil management, weed management organic farming, integrated farming systems, cropping systems, production technology management under different situations, soil fertility management, 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 of weed management covering 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
Date: 25.5.2014

Dr. Bhagabat Panda

Preface

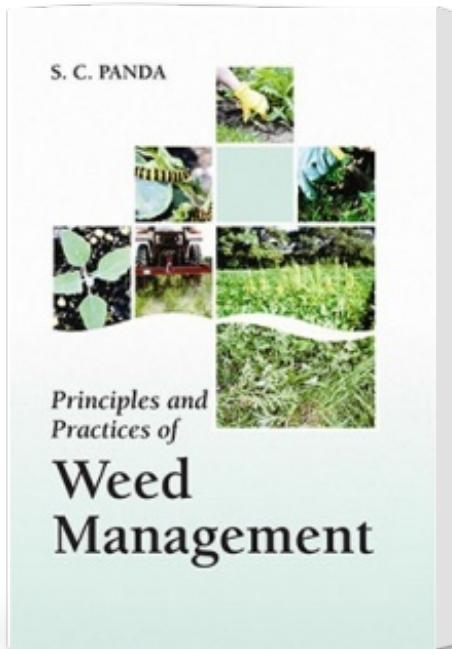
"Butterfly keeps flying from one flower to another in search of nectar without losing enthusiasm. Similarly, one should never lose enthusiasm as it is the only force, which drives people to perform at their best and allows them to achieve the worthiest of causes"

Agriculture has been a mainstay of human being since time immemorial. Agriculture in any form has been practiced in those areas where men have been living permanently. They have been restrained from plundering and/or indiscriminate hunting rather domesticated a number of facultative organisms. They have been utilizing their diligence and intelligence to integrate natural germplasms of plants and animals with natural resources like land, light, air and other biotic and abiotic factors of production to produce usable products directly or after processing by their own muscle power or any aid found in nature or developed by them for ease, cheap and swiftness.

Agricultural development is multidirectional having galloping speed and rapid spread with respect to time and space. After the introduction of modern varieties of various durations with improved plant types along with improvement of input resources, farmers started using improved cultural practices in intensive cropping systems with labour-intensive programmes to improve production potential per unit land, time and input. A large number of alternate genotypes are available to the farmers. Agronomists provided suitable environment to these genotypes to foster them and to manifest their yield potential in newer areas and seasons.

Dealing with various types of soils and climatic conditions is a prerequisite to grow crops. Understanding of relationships between crop plants and natural and manmade factors of production is a guideline to provide better environment to crop plants and to increase use-efficiency of these factors. A wide spectrum knowledge of soil, water, nutrients, weeds etc. helps to manage them efficiently in favour of crop production for years. A comprehensive idea on seeds and their handling, sowing and planting of different crop varieties under different agro-climatic conditions, cropping pattern and cropping systems helps to raise crops together or one after another considering prevailing conditions and available facilities.

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