Resource Conservation Technology in Pulses

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FOREWORD

Concerted research and development efforts have transformed Indian agriculture from subsistence to intensive farming, making India self-sufficient in foodgrains production. During this process, paradigm shift in cropping systems with focused attention to cereal crops has pushed pulses into marginal and poor lands. While the mission of increasing foodgrains production stands somehow achieved without major jump in pulses productivity and production in our country, these were accompanied by widespread problems of resource degradation. Though production of pulses has reached recently to 18.01 mt after a stagnant period of more than 10 years, there is a greater need to increase productivity using suitable management practices to improve livelihood and nutritional security of large number of Indian vegetarians. About 85% pulses are grown under rainfed conditions with less or no fertilizers. Traditional practice of tillage and clean cultivation leads to drastic decline in SOC and overall soil health. Under such situation, resource conservation practices become necessity to achieve sustainable and profitable pulse production subsequently aiming to improve the livelihood of farmers. It has assumed importance in view of the widespread natural resource degradation leading to increased production cost, unsustainable resource use, environmental pollution and health of ecosystems. Worldwide more than 100 million hectare area is under conservation agriculture, however, it is new to our country. In world conservation agriculture is more successful in rainfed areas, whereas in India it is mostly confined to irrigated agriculture. There is more efforts need to be done for popularization of these practices among Indian farmers.

This book on `Resource Conservation Technology in Pulses' covers wide range of issues related to resource conservation in pulse based cropping systems. This book is an outcome of sincere efforts by authors who deserve great appreciation. I trust and believe that this book will serve as an important reference book for those engaged in research and extension for improving and stabilizing pulse production in the country and will simulate further research in critical aspects of conservation agriculture.

(S. Ayyappan)

PREFACE

Indian agriculture has been successful in achieving increased foodgrains production. While the mission of increasing foodgrains production stands somehow achieved without major jump in pulses productivity and production in country, these were accompanied by widespread problems of resource degradation. Though recently production of pulses has reached to 17.09 mt (2012-13) after a stagnant period of more than 10 years, there is greater need to increase productivity using suitable management practices to improve livelihood and nutritional security of large number of Indian vegetarians. Pulses are grown on marginal and degraded land over the years under low or no inputs. Traditional or conventional agriculture bases most of its operations or practices on soil tillage; i.e., inversion tillage such as mouldboard ploughing or disk harrow, or vertical tillage such as chisel, "spiked" harrow and other tools. Soil tillage drastically alters its original structure, breaking up its natural aggregates and burying the residues of the previous crop, so that, the bare soil becomes unprotected and exposed to the action of the wind and rain. Under these circumstances water and soil erosion and sediment runoff are likely to occur. Furthermore, with tillage, soil organic matter and biodiversity content are reduced and unnecessary emissions of CO_2 into the atmosphere take place. Therefore, the conservation of natural resources becomes necessity to achieve sustainable and profitable pulse production system and subsequently aims to improve livelihoods of the farmers. Conservation practices have shown advantages over traditional practices by means of improving productivity and soil health in case of cereal crops in many parts of world.

Over the past 2–3 decades globally, resource conservation technology has emerged as a way for transition to the sustainability of intensive production systems. It has assumed importance in view of the widespread natural resource degradation leading to increased production costs, unsustainable resource use, environmental pollution and health of ecosystems. It permits management of water and soils for agricultural production without excessively disturbing the soil, while protecting it from the processes that contribute to degradation like erosion, compaction, aggregate breakdown, etc. Therefore, the conservation of natural resources becomes necessity to achieve sustainable and profitable pulse production system and subsequently aims to improve livelihoods of the farmers. The RCT has shown to improve, conserve and use natural resources in a more efficient way through integrated management of available soil, water and biological resources. It is now widely recognised as a viable concept for sustainable agriculture due to its comprehensive benefits in economic, environmental and social terms. Its ability to increase grain yields to provide better economic performance and reduce production risks and to improve energy use efficiency has been well documented. What is required is better understanding of its performance and requirements across wider geographic regions and environmental conditions to enable the diffusion of technology.

The present book is outcome of valuable contributions made by various scientists and researchers across the country. This book has comprehensive coverage of resource conservation practices in pulses and pulse based cropping systems and is expected to provide a valuable source book for scholars and researchers, as well as guide book to farming community and development agencies. Contents in the book are organised in nine parts, which include i) Pulses scenario and status of resource conservation technologies in India, ii) Pulses in conservation agriculture and crop diversification, iii) Genetic approaches for harnessing conservation agriculture, iv) Integrated input management, v) Climate change and carbon sequestration opportunities, vi) Residue management and farm mechanisation, vii) Resource conservation technologies for abiotic stress management, viii) Resource conservation technologies for biotic stress management and ix) Indigenous technical knowledge, socio-economic consideration and impact assessment. This book is expected to provide sound basis for sustainable pulse production and refine the research and policies related to pulses in the country.

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PART - I

PULSES SCENARIO AND STATUS OF RESOURCE CONSERVATION TECHNOLOGIES IN INDIA