

Agriculture **for** **Food Security** **and Rural Growth**

Edited by
Vibha Dhawan

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The Energy and Resources Institute

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ISBN 978-81-7993-152-3

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Published by

TERI Press

The Energy and Resources Institute

Darbari Seth Block

IHC Complex

Lodhi Road

New Delhi – 110 003

India

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India +91 • Delhi (0) 11

Printed by I G Printers, New Delhi

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Foreword

The current food crisis, as a result of which prices have skyrocketed across the world, only brings to mind the need for visionaries and scientists of distinction to help come up with technological and managerial solutions to meet this growing global problem. It was indeed a visionary and brilliant scientific mind that India was fortunate to have in Dr B P Pal to lay the foundation of the Green Revolution in this country. It was Dr Pal's remarkable scientific leadership of agricultural research and extension in this country that brought about a sea change in agricultural activity leading to progressive and rapid increase in output at a time when the world had concluded that India would forever be a country subject to famine and food scarcity for all time to come. It is a matter of pride and lasting satisfaction that India belied the prophecies of doom that many leaders and persons of distinction had pronounced in the 1960s and 70s.

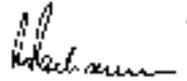
More than his professional worth, perhaps, what we need today is a missionary leader in the field of agriculture who has Dr Pal's human qualities. Never once did this remarkable person seek or accept personal aggrandizement and acclaim. He was a symbol of humility and dedication, which has been rarely seen in recent decades among several of our professionals.

While global agriculture itself is deeply afflicted by a number of serious problems, we in this country need to pay specific attention to the challenges we face in this sector. Quite apart from a growing population, rising

incomes, which lead to diversification of diets and growing demand for food grains, the country has to be acutely aware of the relative stagnation in agricultural output that we have seen during recent years.

Adding to this situation is the impact of climate change, which is already exhibiting a decline in yields of some crops. In addition, the problem is compounded by growing scarcity of water and higher prices of chemical fertilizers. The answer to these challenges lies in technological innovations, which are long overdue in respect of a number of crops grown in this country. The need for reducing malnutrition and ensuring adequate and healthy diet for India's growing population is an imperative that we cannot ignore any longer. This volume, which is dedicated to the memory and brilliant contributions of Dr B P Pal, provides concepts, ideas and an analysis based on the current situation and directions by which we can meet the current challenges.

The tribute to Dr B P Pal underlying this volume would really become genuine if we pick up the knowledge contained in these pages and translate them into policies and actions.



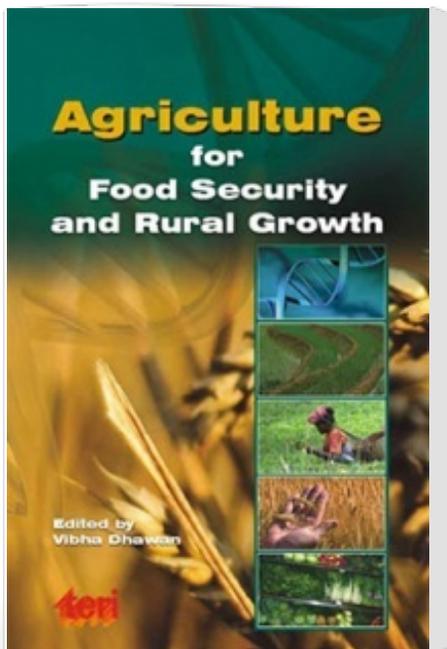
R K Pachauri
Director-General, TERI

Preface

Since the beginning of civilization human race has been a keen observant and have improved agricultural crops to suit their needs. Since time immemorial farmers are altering the genetic make up of cultivated species through selection and breeding. All these advancements have resulted in superior crop varieties and thus are very different from their wild ancestors. With the scientific advancements in the field of tissue culture, it became possible to make crosses among wildly related species/genera through application of techniques such as in vitro pollination (to overcome pre-fertilization barrier), embryo culture (to overcome post-fertilization barrier); generate pure lines through anther culture (for production of haploids); and generate sterile seedless plants through endosperm culture (for production of triploids) and clone elites through micropropagation (for mass cloning).

The discovery of double helical structure DNA by Watson and Crick opened an exciting era as it was then established that genes are basis of heredity . Some decades later, another important discovery was made that the genome of a soil bacterium, *Agrobacterium* which was known to cause crown gall disease, actually gets integrated into the genome of the infested plant and it perpetuates as a part of plant genome from one generation to the next. This property was later exploited for tagging other important genes and thus transfer ring them from one organism to another . Within a decade, the products developed through recombinant DNA

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Publisher : **TERI Press**

ISBN : 9788179931523

Author : **Vibha Dhawan**

Type the URL : <http://www.kopykitab.com/product/6071>



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