Technological Advancement for Vibrant Agriculture

Edited by

Dr. Amitava Rakshit

Department of Soil Science and Agricultural Chemistry, Institute of Agricultural Sciences

Banaras Hindu University, India

Athens Institute for Education and Research

2014

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ATINER 2014

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First Published in Athens, Greece by the
Athens Institute for Education and Research.
ISBN: 978-618-5065-20-1

Printed and bound in Athens, Greece by ATINER
8 Valaoritou Street, Kolonaki
10671 Athens, Greece
www.atiner.gr

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Preface

This chapters consists of ten disciplines with voluminous and diverse issues in Agriculture.. It can serve as a basic tool to help confront new realities in Agricultural Sciences and mark the beginning of a new phase in Agriculture to advance in to the 21st century.

The chapter selected in different disciplines is based on the following priorities:

- Harnessing conventional and modern scientific knowledge, tools, and cutting-edge of science for development of improved crop cultivars
- Eco-friendly and sustainable crop production and protection technologies
- Refinement of seed-production technologies
- Increasing the value of production by reducing variability in yield, quality, reducing crop loss
- Developing system for productive use of nutrients, water and reducing impact of pest and disease through the use of innovative diagnostic techniques.
- Improve the understanding of interaction between native ecosystem and production system and develop best practices to conserve biodiversity and sustainable use of resource.
- Enhancing the shelf life of perishable fruits, vegetables, flowers, product diversification and value addition for better profitability.
- Understand social needs of communities and build the capabilities for practice the change for effective utilization of resources
- Sustainable agricultural production and resource conservation
- Development of technologies to support production enhancement, profitability, competitiveness and sustainability of livestock and poultry
- Creating awareness of improved agricultural technologies among the farmers
- Further these collections will provide a much needed platform to discuss the emerging issues and problems in agriculture and will come out with a well defined strategy to overcome the challenges of food, environment and livelihood security. This book is therefore an extremely valuable contribution towards agricultural sciences with its roots in science disciplines, most notably biology and chemistry.

Amitava Rakshit

About the Author

Dr Amitava Rakshit , an IIT, Kharagpur alumnus is the faculty member in the Department of Soil Science and Agricultural Chemistry at Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, UP, India. His research areas include: Nutrient use efficiency, Simulations modeling, organic farming, Integrated Nutrient Management and bioremediation. His consulting capabilities are: Composting Techniques, Soil Health Management, Input quality Control. He was involved in "Participatory Research" and "Lab to Land" Programmes of ICAR; Dept. of Agricultural Cooperation, Govt. of India; Department of Agriculture, Government of West Bengal ;NHB, New Delhi and NHM for on farm demonstrations of agro-technologies in cerals/pulses/oilseeds/Cash crops/vegetables/Fruits. Actively involved in imparting training and dissemination of technical knowledge and information to diversified end users. He has supervised approximately five research projects, many in partnership with industry. He is widely acknowledged for his skills in linking research with the broader community in regional languages. He has been working closely with undergraduate and post-graduate students in BHU presently. He has visited Norway, Finland, Denmark, France, Austria, Russia, Thailand, Egypt, Turkey number of occasions pertaining to his research work and presentation. Dr.Rakshit has previously worked at Department of Agriculture, Government of West Bengal in research extension and implementation roles. He is presently the Chief Editor of *International Journal of Agriculture Environment and Biotechnology* (NAAS: 3.9) .He was awarded with Biovision Nxt Fellow by Biovision, Lyon, France for the year 2008-09. He has been selected as review college member of British Ecological Society, London for the year 2013-14. He was awarded with Best Teacher's Award by BHU(ICAR). He is the author of four books (*Springer, ICFAI, Kalyani and IBDC*). He also published numerous articles/reviews in professional journals.

Technological Advancement for Vibrant Agriculture: An Introduction

Amitava Rakshit, Banaras Hindu University, India

Since ancient times humans have gathered plants and hunted animals for food. Later humans became dependent on agriculture to fulfill their needs for food. Agriculture is a composite term that includes all those activities which involve appropriate utilization of earth's resources for fulfillment of human needs of food, fodder, fibre and fuel, etc. But with passage of time agriculture is under intense pressure to increase production of food grains. The available fertile farm land per person in 2050 is predicted to be less than a third of that in 1950. By 2050, global population is expected to reach 9 billion and the demand for food will grow by 70%. . Therefore, managing agricultural production systems on a sustainable basis is one of the most critical challenges for the future of humanity. There was once a time when farmers used to plow the land manually and it was one long hard task stretching from dawn to dusk. Over centuries, agricultural technology has created huge changes in the way people live, and the stakes for technological progress have never been higher. The generations have witnessed traditional hybrids into genetically modified crops, improved and efficient fertilizers and resource conservation technologies.

The influx of technology in the sphere of agriculture has witnessed veritable revolutions in the arena of crop husbandry. The scientific advances have touched all the facets in the field of agriculture. It has witnessed a radical makeover from the days of hand-held apparatus to the modern day computer-controlled, GPS-monitored and self-steer programs that are virtually negating the need for human intervention from the days of hand-held apparatus to the modern day computer-controlled, GPS-monitored and self-steer programs that are virtually negating the need for human intervention. Further in the 21st century, farming has gone all high-tech and is talking about GM food, genetic engineering and agricultural biotechnology and plants, fruits and vegetables have been endowed with increased insect resistance and abundant nutritional advantages. Agricultural technology is also making inroads into the relatively new but very promising fields of nanotechnology.

Technological advancements must be used to provide farmers with tools and resources to make farming more encouraging and sustainable without deteriorating the natural resource base. Concepts of modern technologies in agricultural systems have given an important role for the improvement of agricultural productions in order to maintain food security. In a nut shell plants are biologically designed, genes are isolated, and chemicals are precisely mixed. It has been experimented and validated that modern agricultural technology can substantially improve agricultural production and sustainability. For instance, best management practices are widely applied

nowadays. It relies on targeting many of their applications, not broadcasting as was done in the past. New disease resistant hybrids, biological pest control, reduced pesticide use, cultural practices that can reduce the incidence of pests and diseases, and better placement and reduced amounts of fertilizers are all being employed. Insect-specific chemicals and biological insect controls are now being utilized, instead of broad-spectrum pesticides, which actually reduce the number of sprays needed and therefore its capitals. Organic farming by using only organic fertilizer has helped farmers to reduce costs and improve products. Crop models, GIS, and remote sensing can provide farmers with information for realizing precision agriculture, which is done by matching inputs based on actual yields of different portions on the field.

Conclusions

Even if we convert all remaining land for agriculture, we will be nowhere near meeting the future demand for food without increasing the agricultural productivity. Success can be achieved by providing farmers with education to gain necessary skills and range of solutions for higher farm profits. A major reason for low crop productivity is the deteriorating soil health over years. Sustaining soil health for higher food production require not only tilling the land but also crop rotations, better crop varieties, bringing vegetation back to degraded land and arrest soil erosion. Challenge now and for the future is and will be to produce more food from less land. Caring for mother earth will enable us to achieve the desired food production target with better conservation of natural resources of the country. Increasing population and industrialization is posing a threat to the resources such as water, energy, minerals, land and forest. Productivity of agricultural land is declining due to biotic and abiotic stresses, climate change, soil degradation etc. There is an urgent need to change the research strategies for judicious use of natural resources with proper care which can make substantial contribution towards the economic growth and development of the country.

Evolution of agricultural practices has meant that there’s greater productivity and hence prosperity in the farming circles and a variety of healthy technological options for the community as a whole. The thirty eight papers of this book published by ATINER is a mirror image of a representative part of the huge initiatives in the field of agriculture. I hope that the readers will find this collection of papers interesting as well as stimulating. Many of the experiments are analyzed and explained in this volume are ongoing, and the interpretation and suggestions offered will contribute to future course of the deliberations.