

INTEGRATED FARMING SYSTEMS

For Sustainable Production



• A.K. Sarkar • R.S. Singh • M.S. Yadav • C.S. Singh

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FOREWORD

The post green revolution era in the Agriculture and allied sector has witnessed a decreasing growth rate of about 3.5 per cent in mid 1980s to 1990s to less than 2 per cent in mid 1990s to 2000s. Decline in size of land holdings, depleting soil quality, changing rainfall pattern over years, ground water depletion, hike in labour wages and diminishing returns have brought down the agricultural growth and the consequent widening of the gap between rural and urban incomes has become a major cause of concern. Yield gap is the other major issue determining agricultural stagnation in the country. *The gap between potential and actual yields is high in most of crops/farming system. A massive effort is needed to launch a productivity revolution in farming.* An integrated approach is necessary to remove the technological, infrastructure and social and policy constraints responsible for the productivity gap and in some cases, productivity decline.

There is an urgent need to think for more intensive and diversified system to make agriculture a lucrative business. A synergy should be established through land-based enterprises like livestock, fishery, poultry, *etc.* and new market opportunities should be captured through new enterprise including post-harvest and value additions. The diversification has to be practical in the sense that it should include demand driven factors like population growth, rising income, urbanization, dietary changes, changes in taste and preferences and export potentials as well as supply-driven factors like the development of new technologies, resource generation, available infrastructure, development of new institutions and prevailing socio-economic factors.

India has a long tradition of integrated farming that had built-in equilibrium and precise balancing of energy, water and input requirements. The crop-livestock integration that has been perfected many centuries back has a sound scientific backing. The ancient combination of livestock and crop activities had helped farmers in the past to use the manure as fertilizer for crops and the crop residues as feed for livestock. The wastes from agriculture such as straw are consumed by the cattle. Straw and other agricultural wastes are composed of cellulose which can not be digested by humans, but the cellulolytic bacteria in the rumen of the cattle can digest them. Thus the cellulose gets converted to proteins that

build up animal flesh. The build up of animal flesh helps in healthy growth of animals that provide draught power for various utilities such as ploughing, transport, *etc.* Besides human food in the form of milk, meat, *etc.* The undigested plant materials which come out as animal dung are excellent organic manures for crop and surplus as fuel.

Community village ponds and small irrigation reservoirs are also products of traditional knowledge. These community un-drainable ponds are able to harvest, hold and offer use of water for various purposes, such as livestock, crop/ horticulture, irrigation and domestic use. It is noteworthy in this regard that the un-drainable ponds also conserve water by effectively harvesting rain water and help in raising the water table. The system also helps to rear fish during the period of hold which can be harvested at any time either for food or for cash income. Due to the carbondioxide emission, livestock has been designated as a major threat to environment in terms of greenhouse gas emission. But by using cattle dung, the rich phytoplankton produced in the aquaculture ponds utilize the carbondioxide, much as the terrestrial plants serve as a carbon sink. The pond humus is also considered to be nutrient rich organic manure for agricultural/ horticultural crops. Actually, this integrated farming system focuses around a few selected, interdependent, interrelated and often inter-locking production systems. This integrated nature involves the utilization of primary and secondary produces of one system as basic input of the other systems making them mutually integrated as one whole unit. This incidentally helps to reduce the dependence on procurement of inputs from open market, making the system sustainable on long term basis. Such an integration had been helpful in attaining sustainability in agriculture and allied activities of food farming. This offers cash income and food to the farm family ensuring both livelihood and nutritional security.

(A. K. Sarkar)

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ABOUT THE BOOK

This book is a compilation of lecture notes of eminent scientists in the field of Agriculture and allied sectors on “Integrated farming system” for sustainable livelihood, food and nutritional security of rural masses. Improved agricultural technologies are of limited value if these are not adopted by farming community. Farming system on the other hand, is a judicious mix of cropping systems with associated enterprises like fruits, vegetables, flowers, dairy, poultry, piggery, duckery, goatery, fishery, lac, sericulture, *etc.* suited to given agro-climatic conditions which will help to generate additional employment and income for the small and marginal farmers under rainfed and irrigated conditions.

Conceptually it is an attempt to efficiently utilize the components of soil, water, climate, crops, farm wastes, livestock, land, labour, capital, energy and other resources with the farm family at center.

Authors feel that farming systems if adopted on a farmer and market linked mode will improve the productive potential and land resources by augmenting use efficiency of inputs through diversification, crop rotation, nutrient recycling and conservation of natural resources.

In this book an effort has been made to present the detailed information about the Integrated farming system-concept, principles, components, model development and their usefulness to the farm household. We hope that the book would prove to be useful to the students, researchers, planners, farmers and other stakeholders. All the chapters in the book have been meticulously comprehended, compiled and presented with a fine skill by the experts of respective fields. We welcome suggestion for further improvement of this publication.



(M.S. Yadav)



(A.K. Sarkar)

ABOUT THE EDITORS

Dr. Ashim Kumar Sarkar is the Dean, Faculty of Agriculture, Birsa Agricultural University, Ranchi. He obtained his Ph.D. Degree from the Division of Soil Science and Agricultural Chemistry, I.A.R.I., New Delhi in the year 1980. He has 35 years of working experience in the Agricultural Universities of Bihar and Jharkhand. He has Post doctoral research experience at BARC, Mumbai. He has been the project leader on Acid soil Management in the country. He has also worked as Nodal officer of National Agricultural Technology Project and as Director, State Agricultural Management and Extension Training Institute (SAMETI) for several years. He is the project leader of ICAR Niche Area of Excellence on soil, water and plant nutrient management for rainfed crops at B.A.U., Ranchi. He has written several books, book chapters and more than 100 research papers in National and International Journals. He has received several awards for his academic and research pursuits.



Dr. Madan Singh Yadav is the Chairman, Department of Agronomy, Faculty of Agriculture, Birsa Agricultural University, Ranchi. Dr. Yadav has graduated from University of Udaipur, Rajasthan. He obtained his Post graduation and Ph.D. Degree from the Department of Agronomy, G.B. Pant University of Agriculture and Technology, Pant Nagar, Uttarakhand in the year 1982. He has 27 years of working experience in the Agricultural Universities of Bihar and Jharkhand. He has vast research experience and has published many research papers in referred journals. He has a long working experience in the farmer's fields on transfer of technology. Dr. Yadav worked in National Agricultural Technology Project on evaluation of rice cultivars for different agro-ecological situations.



Dr. Rama Shanker Singh graduated from TCA, Dholi (Pusa) in 1968. He obtained his M.Sc. and Ph.D. Degree in Agronomy from B.H.U. Varanasi and B.A.U., Ranchi respectively. He served for about 35 years at different capacities



in Birsa Agricultural University. Dr. Singh has been associated with IFAD project. He has worked as Chief Scientist Dryland (ORP). Dr. Singh has been Associate Director Research from 1995-2000. He also served as Director Seed and Farm from 2000-2005 in the Birsa Agricultural University, Jharkhand. He served as Chairman, Department of Agronomy for about 2 years. He has 30 research papers in various reputed journals.

Dr. C.S. Singh received his B.Sc. (Ag.) Hons Degree in 1996 and M.Sc. (Ag.) in Agronomy in 1998 from Institute of Agricultural Sciences, Banaras Hindu University. He has been awarded the B.H.U. Medal during M.Sc. (Ag.) for getting highest marks in the Department of Agronomy. He joined the Department of Agronomy, Institute of Agricultural Sciences, Banaras Hindu University in 1999 for his Doctoral degree. He worked as Senior Research Fellow (SRF) in the ICAR research project “Development of sustainable farming system model for irrigated agro-ecosystem of eastern U. P.” He commenced his professional carrier in 2005 as Junior Scientist-cum-Assistant Professor in the Department of Agronomy, Birsa Agricultural University, Ranchi. Since past five years he is actively engaged in teaching programmes at undergraduate and postgraduate level and extension activities. He is associated with Maize agronomy and Integrated Farming System research at the University. He has published about 15 research papers in various national and international journals.



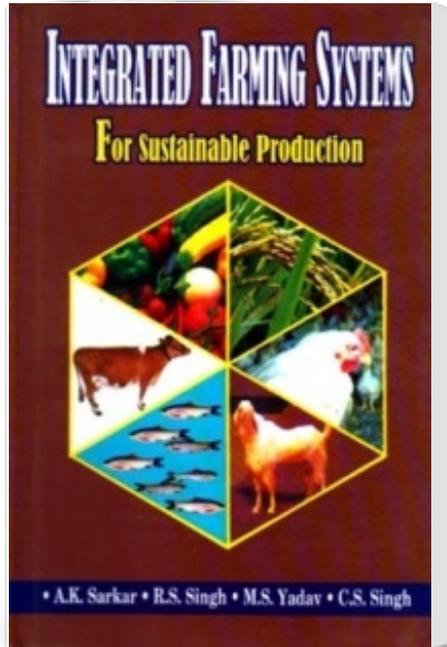
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