Rainwater Management

Theory and Practice

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Rainwater Management (Theory and Practice)

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FOREWORD

The mainstay of economy of India's is agriculture, which is currently exhibiting trends of increasing un-sustainability. Further, rainfed farming will remain the main stay for the livelihood support of millions of small and marginal farmers across the country even after realizing the complete irrigation potential. It faces major challenges imposed by climate change in further expansion of irrigated area in the country. Impacts of climate change in agriculture are witnessed all over the world, but country like India is more vulnerable in view of the high population pressure on agriculture and natural resources with poor coping mechanisms. Though, much of the enormous water resources in the country remain unutilized. Thus, unplanned and unscientific planning of rainwater quite often causes disruptions of hydrologic and environmental regimes at micro and regional level are common to our experiences, such action are eventually lead to break drawn of economic fabrics and social setup. The efficient utilization of rainwater through better management is the core issue if the cropping intensity and production are to be enhanced for livelihood security of dryland farmers. The rainwater management can be implemented efficiency and economically as a viable alternative to on-farm irrigation, drinking and multiple uses, considering the fact that any land anywhere can be used to manage rainwater. This considered being an ideal solution to water scarcity regimes.

The scope of rainwater management is wide and varied. It covers diversified areas such as understanding of dryland engineering, dryland farming and its concept, weather forecasting, rainwater management for drought proofing and mitigation, risk management under drought situation, water harvesting either *in-situ* or *ex-situ* and their efficient

recycling, reduction of water losses, design of water harvesting structures and irrigation systems and the planning operation drainage of recycling system, waste water use in agricultural lands and crop planning, watershed management for better utilization of rainwater. This book deals with all these aspects. It amply serves a widely felt need for a suitable and comprehensive book on rainwater management with emphasis on water harvesting either *in-situ* or *ex-situ*, the analysis of rainfall and water balance, efficient crop planning to enhance productivity, recycling of waste water, watershed management, planning operation of recycling system.

I very much appreciate the efforts made by Drs. M.L. Jat, O.P. Gill B.S. Deora & Vivek Kumar for bringing out this book on "Rainwater Management Theory and Practice" which I hope will be useful for students, teachers and researchers, policy makers and other having interest in the areas related to rainwater management and dryland agriculture.

Prof. U.S. Sharma
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PREFACE

This book is intended as professional textbook for students of agricultural engineering, students of agriculture soil & water engineering. It will also serve as a text for students at the undergraduate and postgraduate levels in civil engineering. In addition to the students, the book will be a valuable reference to professional engineers and agricultural scientists working in the field of rainwater management, dryland farming and irrigation water management.

In addition, the book will also be a valuable reference for the candidates appearing in competitive examinations for the Agricultural Research Service and for the examinations leading to the Associate Membership of the Institution of Engineers (India). Professional training institutions in Soil Conservation and Water Management, Agricultural Polytechnics, Krishi Vigyan Kendras and Rural Institutes and similar other organizations having a programme in water management would find this book useful.

Though written primarily to serve as a text/reference for students of agricultural and engineering institutions and practicing engineers and technologists in developmental organizations in India, it is hoped that the book will be valuable to similar groups in the developing countries.

Rainwater Management, Theory and Practice covers all the areas of rainwater management, precipitation and its analysis, drought indices, weather forecasting, water harvesting, design of water harvesting structure, water losses and control, water lifting devices, irrigation scheduling, planning operation of recycling system, water recycling system related to agriculture. It is a comprehensive treatment of rainwater resources, water balance, drought, measurement of water and field layout, soil-plant-water relationships, water conveyance and control, water application methods and water recycling in salty land, drainage of agricultural lands.

The details regarding design and layout of irrigation practices in the field, including step-by-step procedures, and necessary equipment, are included wherever applicable. Solved examples have been included to emphasize the design principles and facilitate the understanding of the

subject matter in each chapters. Tables, figures and articles are numbered chapter-wise.

A list of important references is given for each chapter. A set of problems for home work is provided for answers at the end of each chapter. Examples and illustrations are provided wherever applicable, make easy the understanding of the subject. The entire book has been written using MKS of weights and measures. Conversion tables of units from one system to another are given in Appendix.

The author is deeply indebted to many societies, dignitaries and organizations for the supply of useful material for inclusion in the manuscript and the assistance at various levels for the preparation of the manuscript.

I express my sincere gratitude to Dr. S. K. Sharma, Zonal Director Research, ARS, MPUAT, Udaipur, Dr. J. K. Balyan, Assistant Professor (Agronomy), Dryland Farming Research Station, Arjia, Bhilwara and Dr. C. M. Yadav, Assistant Professor, Krishi Vigyan Kendra, Bhilwara for extending us valuable help from time to time during preparation of manuscript and also be highly acknowledge direct-indirect cooperation to our all well wishers for their.

The authors would welcome suggestions from the readers to improve the text.

- Authors

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