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Agriculture in Semi-Arid Environments

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With 47 Figures



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For explanation of the cover motive see legend to Fig. 3.2 (p.78)

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Preface

The semi-arid zones of the world are fragile ecosystems which are being substantially modified by the activities of mankind. Increasing human populations have resulted in greater demands on semi-arid zones for providing human sustenance and the possibility that this may enhance desertification is a grave concern. These zones are harsh habitats for humans. The famines that resulted from drought during the late 1960's and the 1970's in the African Sahel illustrated the unreliability of present agricultural systems in this zone. Large fluctuations in agricultural production have occurred in semi-arid zones of Australia, North America, and the Soviet Union due to periodic droughts, even though considerable agricultural technology has been devoted to agricultural development in these zones. The challenge to mankind is to manage these different semi-arid zones so that productivity is increased and stabilized, and environmental deterioration is decreased. Irrigation can be used to increase and stabilize agricultural production in semi-arid zones as discussed in Volume 5 of this series, *Arid Zone Irrigation*. The present volume, *Agriculture in Semi-Arid Environments*, focuses on dryland farming in semi-arid zones, and is relevant to the large areas of the world where rainfall is limiting and where water is not available for irrigation. This volume is designed to assist agricultural development in these areas and consists of reviews and analyses of available information by scientists working in Africa, Australia, and at the University of California.

Early agricultural systems are analyzed. It was thought that the ingenious systems developed in the past, which have been largely neglected by modern man, could provide guidance for the future. Some of the early systems may provide useful approaches or models for agriculture development, especially in Africa, Asia, and Central and South America. The evolution of present dryland farming systems is examined, providing a description of the present state of the systems, and an indication of possible future trends in dryland farming.

The fundamentals of climatology, soil microbiology, crop adaptation, and soil-plant-atmosphere water relations are reviewed in relation to dryland farming. This provides a basis for subsequent chapters which discuss the application of fundamental knowledge to crop management, soil management, erosion control, and pest management with emphasis on the production of staple foods by annual crops.

Although the major objective of this volume is to examine agriculture in semi-arid environments in a general manner, some chapters give emphasis to semi-arid Africa. Recent droughts and famine in the Sahelian and Sudanian zones of West

Africa provided the impetus for this specialization, and funding support was provided by the United States Agency for International Development as part of its program for assisting the hungry people of the world. The chapters on agroclimatology, and plant diseases and nematode pests in semi-arid West Africa are examples of this specialization and the international cooperation involved in writing this volume. The final chapter, which discusses interactions between cultivation and livestock production, illustrates some of the complexity of agricultural systems in Africa and the need for integrated, multi-disciplinary approaches to agricultural development in semi-arid environments.

We wish to thank the many people who contributed to the production of this book, and we hope that it will be useful to agricultural development programs. We gratefully acknowledge the agreement of Dr. K. F. Springer to publish this book as a volume of the Ecological Studies series, for it complements earlier volumes of this series that have already contributed to a better understanding of the ecology and agriculture of semi-arid zones. The editors appreciate the effort and dedication of P. J. Wilke who edited the manuscripts to provide a more consistent style.

Riverside, California
July, 1979

A. E. HALL
G. H. CANNELL
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