

Contents

List of Figures	xi
List of Tables	xv
Foreword, <i>Walter Orr Roberts</i>	xvii
Acknowledgments	xix

1. General Trends of Changes in the Biosphere 1

2. Food and Drought Problems 15

The Present Spread of Deserts and Arid Regions 21

The Soil Cover of Arid Regions 55

Soil formation in autonomous landscapes
(without participation of groundwater) 56

Soil-forming processes in the hydromorphic
landscapes of arid regions 73

Human Activity and Drought 85

Land Cultivation and Increased Frequency
of Dust Storms 101

Dry Farming and the Protection of Soil
Against Erosion (Degradation) 110

The improvement of soil structure and
hydrophysical properties 114

Bare fallow and moisture accumulation 117

Field cultivation without turning the soil 120

Erosion control	122
Forest plantings to protect against erosion	130
The Problem of Shifting Sands and Their Stabilization	132
Improved Management of Arid Pastures	138
3. Irrigation and Increased Biological Productivity	151
Irrigation of Soils in Arid Areas	154
Types of Irrigated Areas	162
Climate, evaporation, and irrigation	162
The role of soil and groundwater salinity	164
Geomorphological conditions and irrigation	165
Effect of Irrigation Water on Soils and Landscapes	167
Changes in the hydrophysical dynamics of soils	169
Changes in the chemical and biochemical dynamics of soils	172
Secondary Salinization of Soil	179
Soda-Salinization	188
Quality of Irrigation Water	193
Indices of Soil Salinity and Methods of Reclamation	203
Saline and nonsaline soils	203
Seasonal salinization of soil and how to combat it	204
Critical depth of mineralized groundwater and drainage	205
Removal (leaching) of salts from soils	207
Rice for soil desalinization	214
Difficulties and efficiency of drainage	215
Control of the Water-Salt Balance in Irrigation	226
Data Required for Studying and Forecasting the Water-Salt Balance	240
Required initial materials	240

Flow sheet	241
Determination of initial reserves of different salts in designated blocks (in soil-geomorphological reclamation units)	241
Evaluation of the role of the irrigation network	242
Evaluation of the effect of vegetational irrigation on the fields	243
Evaluation of natural groundwater outflow at different levels	244
Determination of the expenditure of groundwater by evaporation and transpiration	246
Determination of the rate and time of rise of groundwater (without artificial drainage)	247
Determination of the possible mineralization of groundwater and soil salinization	247
Appendix	251
Bibliography	255