

Modernization of Agriculture in Developing Countries

Resources, Potentials and Problems

Second Edition

ISAAC ARNON

*Hebrew University of Jerusalem; Agricultural Research Service
and Settlement Study Centre, Israel*

A Wiley-Interscience Publication

JOHN WILEY & SONS

Chichester · New York · Brisbane · Toronto · Singapore

Contents

Series Preface	xiii
Preface	xv
List of Figures	xvii
List of Tables	xxi
Chapter I THE NECESSITY TO TRANSFORM TRADITIONAL AGRICULTURE	1
The Characteristics of Subsistence Agriculture	1
The Role of Agriculture in Developing Economies	4
Conditions for 'Take-off'	16
Summary	19
References	20
Chapter II NATURAL RESOURCES—LAND AND WATER	23
The Need for Knowledge of the Basic Natural Resources	23
Land Resources	25
Water Resources	35
Summary and Conclusion	45
References	47
Chapter III LAND-USE IN SUBSISTENCE AGRICULTURE AND POTENTIALS FOR DEVELOPMENT	50
Land-use in Dry Regions	50
Rain-fed Agriculture in Semi-arid Regions	63
Irrigation Agriculture	67
Potentials and Problems of Irrigation Farming	73
Successful Irrigation Projects	78
Land-use in the Tropics	88
Shifting Cultivation	89
Permanent Cultivation	99
Land-use in High-altitude Regions of the Tropics	119

Summary	121
References	124
Chapter IV THE DETERIORATION OF NATURAL RE- SOURCES	130
Soil Erosion	131
Overgrazing	135
Desertification	136
Burning and Its Effects	138
Population Pressure and Shifting Cultivation	139
Forest Resources and Deforestation	140
Depletion of Wildlife and Genetic Resources	143
Water Quality	144
Large-scale Surface-water Storage	144
Adverse Effects of Irrigation	147
Excessive Exploitation of Ground-water Resources	150
Effects of Chemicals Used in Agriculture	151
Urban Intrusion	160
Public Control of Natural Resources	161
Summary	161
References	162
Chapter V HUMAN RESOURCES	167
The Problem	167
Labour Productivity in Agriculture	171
Agricultural Policies and Employment	177
The Provision of Employment Opportunities	179
Summary	203
References	204
Chapter VI GENERATION OF NEW TECHNOLOGY	208
Role of Agricultural Research in Developing Countries	208
Developing a National Research Capacity	217
Training Staff for Research Work	226
International Research Centres	233
Summary	235
References	236
Chapter VII EFFECTIVE TRANSFER OF NEW TECH- NOLOGY	239
The Gap between Available Knowledge and Prevailing Practices	239
Education and Training of the Farmer	241
Extension Education	245
The Conventional Extension Service	248
Reasons for Failure of Extension Efforts	252

Alternative Solutions	259
Vocational Training	278
Availability of an Appropriate Technology	280
The Interface between Research, Extension and the Farmer	283
Adoption of New Practices	292
Education of Those Serving the Farmers	305
Summary	313
References	315
Chapter VIII THE GREEN REVOLUTION	322
High-yielding Varieties (HYVs)	322
Problems Arising from the Adoption of HYVs	332
Seed Technology	347
Fertilizers	349
Control of Diseases and Pests	362
Weed Control	369
Improved Husbandry	373
Diversification	377
Summary	384
References	387
Chapter IX HUMAN LABOUR, ANIMAL TRACTION AND MECHANIZATION	394
Distribution of Agricultural Power	394
Human Power and Equipment	394
Animal Traction	399
Mechanization	404
Energy Requirements of Agricultural Production	423
Implications of the 'Energy Crisis' for Modernizing Agriculture	435
Alternative Sources of Energy	442
Fuel from Wood, Biomass and Organic Wastes	445
Summary	452
References	454
Chapter X PROVISION OF ESSENTIAL CONDITIONS FOR MODERNIZATION	460
Socio-cultural and Behavioural Factors	460
Infrastructure	471
Economic Factors	480
The Institutional Framework	497
Agrarian Reform	506
Size of Farms	509
Summary	533
References	534

Chapter XI	DEVELOPMENT PLANNING AND STRATEGY .	542
	Planning the Transition from Traditional to Modern Agriculture	542
	Strategies of Implementation	548
	Priorities in the Adoption of Technological Innovations	567
	Stages of Development	571
	Strategy and the Dual Economy	573
	Summary	580
	References	582
Author Index		585
Subject Index		594