

REPORT OF THE
NATIONAL COMMISSION ON
AGRICULTURE
1976

PART V
RESOURCE DEVELOPMENT



GOVERNMENT OF INDIA
MINISTRY OF AGRICULTURE AND IRRIGATION
NEW DELHI

PRINTED BY THE MANAGER, GOVT. OF INDIA PRESS, RING ROAD, NEW DELHI-64
AND PUBLISHED BY THE CONTROLLER OF PUBLICATIONS, DELHI-110006, 1976.

P R E F A C E

The Report of the National Commission on Agriculture comprises 69 chapters in 15 parts. A complete list of chapters and parts is given in pages (iii), (iv) and (v). The Terms of Reference of the Commission and its composition are given in Part I—Chapter I—Introduction.

This volume, entitled 'Resource Development' is Part V of the Report and is divided into the following chapters :

15. Irrigation
16. Command Area Development
17. Land Reclamation and Development
18. Soil and Moisture Conservation
19. Electricity in Rural Development

Improvement of irrigation statistics has been discussed in Chapter 61 on Statistics in Part XIV.

**REPORT OF THE
NATIONAL COMMISSION ON AGRICULTURE**

PART I—REVIEW AND PROGRESS

1. Introduction
2. Historical Review
3. Progress of Agricultural Development
4. Some Economic Aspects

PART II—POLICY AND STRATEGY

5. Agriculture in Economic Development
6. Growth with Social Justice
7. Policy and Strategy
8. Centre-State Relations in Agricultural Development
9. Nutrition

PART III—DEMAND AND SUPPLY

10. Demand Projections
11. Supply Possibilities
12. Export Possibilities and Import Substitution

PART IV—CLIMATE AND AGRICULTURE

13. Climate and Agriculture
14. Rainfall and Cropping Patterns

PART V—RESOURCE DEVELOPMENT

15. Irrigation
16. Command Area Development
17. Land Reclamation and Development
18. Soil and Moisture Conservation
19. Electricity in Rural Development

PART VI—CROP PRODUCTION, SERICULTURE
AND APICULTURE

20. Reorientation of Cropping Systems
21. Foodgrain Crops
22. Commercial Crops
23. Horticultural Crops
24. Plantation Crops
25. Fodder Crops
26. Sericulture
27. Apiculture

PART VII—ANIMAL HUSBANDRY

28. Cattle and Buffaloes
29. Dairy Development
30. Sheep and Goats
31. Poultry
32. Other Livestock
33. Mixed Farming
34. Livestock Feeding
35. Animal Health
36. Meat Production and Animal Byproducts

PART VIII—FISHERIES

37. Inland Fisheries and Aquaculture
38. Marine Fisheries
39. Crustacean Fisheries and their Utilisation
40. Marketing of Fish and Fishery Products

PART IX—FORESTRY

41. Forest Policy
42. Production and Social Forestry
43. Minor Forest Produce
44. Forest Ecology and Wildlife Management
45. Forest Protection and Law
46. Forest Planning, Research and Education

PART X—INPUTS

47. Seeds
48. Fertilisers and Manures
49. Plant Protection Chemicals
50. Farm Power
51. Implements and Machinery

**PART XI—RESEARCH, EDUCATION AND
EXTENSION**

- 52. Research
- 53. Education
- 54. Extension

**PART XII—SUPPORTING SERVICES AND
INCENTIVES**

- 55. Credit and Incentives
- 56. Marketing, Transport and Storage
- 57. Processing and Agro-Industries

**PART XIII—RURAL EMPLOYMENT AND SPECIAL
AREA PROGRAMMES**

- 58. Rural Employment
- 59. Special Area Development Programmes

**PART XIV—PLANNING, STATISTICS AND
ADMINISTRATION**

- 60. Planning
- 61. Statistics
- 62. Administration
- 63. Farmers' Organisation
- 64. International Cooperation

PART XV—AGRARIAN REFORMS

- 65. Land Reforms Policy
- 66. Land Reforms Legislation and Implementation
- 67. Agrarian Structure and Perspective
- 68. Consolidation of Holdings
- 69. Agricultural Labour

PART V
RESOURCE DEVELOPMENT
C O N T E N T S

CHAPTER 15—IRRIGATION

SECTION	PAGE
1 INTRODUCTION	1
2 WATER RESOURCES	2
Hydrological Cycle in India	2
Total Water Resources	4
Utilisable Water Resources	7
Water Resources for Irrigation	9
3 LAND RESOURCES FOR IRRIGATION	11
4 PAST DEVELOPMENT OF IRRIGATION	13
5 GROUNDWATER	16
Open Wells	18
Tubewells	20
6 DEVELOPMENT OF WATER RESOURCES	24
Certain Policies in Development	24
Water Use for Irrigation	24
Conjunctive Use of Surface Water and Groundwater	26
Irrigated Plantation	28
Investigation and Project Formulation	29
Reduction of Water Losses	31
Reduction of Evaporation Losses in Reservoirs	34
Tank Irrigation	35
Intensity of Irrigation and Channel Design	36
Operation of Irrigation System	39
7 PERSPECTIVE OF IRRIGATION DEVELOPMENT	41
8 CROPPING IN IRRIGATED AREAS	45
Water Requirement and Choice of Crops	45
Frequency, Timing and Depth of Watering	49
Irrigation in Relation to Agroclimatic Zones	50
Cropping Pattern	50
9 DRAINAGE	55
10 MODERNISATION OF EXISTING IRRIGATION SYSTEMS	58
11 ECONOMICS AND FINANCING OF IRRIGATION WORKS	61
Water Rates	64
12 IRRIGATION ADMINISTRATION	68
Organisation for Hydrology	70

	PAGE
River Basin Commissions	72
National Water Resources Council	74
Management of Irrigation	76
13 IRRIGATION RESEARCH AND TRAINING	77
14 SUMMARY OF RECOMMENDATIONS	80
APPENDIX	
15.1 Assessment of Water Resources	86
15.2 Cropped Area and Irrigated Area	90
15.3 Irrigated Area	92
15.4 Irrigated Area—Cropwise	94
15.5 Guidelines for Review of Irrigation Projects	100
15.6 Net Contribution of Multipurpose and Commercial Irrigation Schemes during 1971-72	103
15.7 Canal Water Rates in Force for Principal Crops in Various States	104
CHAPTER 16—COMMAND AREA DEVELOPMENT	
SECTION	
1 INTRODUCTION	107
2 SOIL AND SOIL SURVEYS	109
3 LAND PREPARATION FOR IRRIGATION	112
Main Steps for Land Development	112
Methods of Irrigation	113
Layout in Outlet Commands	116
Watercourses	117
Field Drains	117
Farm Roads	118
Consolidation of Holdings	118
4 PREPARATION OF COMMAND AREA DEVELOPMENT REPORT	121
5 PERSPECTIVE OF COMMAND AREA DEVELOPMENT	126
6 ORGANISATION	129
Command Area Development Authority	130
Land Development Corporation	137
Preparation of Maps	139
7 ECONOMICS AND FINANCING	141
Credit to Farmers	142
Pilot Studies in Water Management	143
Financing by Farmers' Service Societies	145
Long Term Credit	147
8 OTHER MEASURES	150
9 SUMMARY OF RECOMMENDATIONS	151
APPENDIX	
16.1 Submergence Damage of Rice According to Growth Stage in Japan	158

	PAGE	
16.2	Submergence Damage of Rice According to Growth Stage in Korea	159
16.3	Cultivable Land Before and After Land Preparation, Pochampad Project—Andhra Pradesh; Chambal Project—Madhya Pradesh; Tawa Project—Madhya Pradesh; Gandak Project—Bihar; Kosi Project—Bihar; Jayakwadi Project—Maharashtra	160
16.4	Command Area Development Authorities—Constitution of	166
16.5	Command Area Development Authorities for Ukai and Kadana Command Areas—Establishment of	172
16.6	MAPS	
	MAP I—A Illustrative Layout of Outlet Command—Large Fields—Showing Existing Field Boundaries	176-A
	MAP I—B Illustrative Layout of Outlet Command—Large Fields—Showing Contours	176-B
	MAP I—C Illustrative Layout of Outlet Command—Large Fields—Showing Layout	176-C
	MAP II—A Illustrative Layout of Outlet Command—Small Fields—Showing Existing Field Boundaries	176-D
	MAP II—B Illustrative Layout of Outlet Command—Small Fields—Showing Contours	176-E
	MAP II—C Illustrative Layout of Outlet Command—Small Fields—Showing Layout	176-F

CHAPTER 17—LAND RECLAMATION AND DEVELOPMENT

SECTION

1	INTRODUCTION	177
2	MAGNITUDE AND CAUSES OF SOIL DETERIORATION AND METHODS OF RECLAMATION	179
	Waterlogged Lands	179
	Anti-waterlogging Measures	182
	Saline and Alkali Soils	182
	Land Infested with Shrubs and Bushes	188
	Ravines	189
	Riverine Land	195
	Coastal Sandy Land	197
	Stony and Gravelly Lands	198
	Lateritic Soils	198
	High Altitude, Steep Slopes and Meadows	198
3	REVIEW OF WASTELAND RECLAMATION AND UTILISATION	199
4	PROPOSAL FOR THE FUTURE	206
	Land Infested with Shrubs and Bushes	206
	Ravines	207
	Sand Dunes	207
	Waterlogged Areas	208
	Saline and Alkali Soils	210
	Riverine Beds	210

(x)

	PAGE
<i>Chos and Khads</i>	210
Coastal Sandy Lands	211
Stony and Gravelly Lands	211
Lateritic Soils	211
High Altitude, Steep Slopes and Meadows	212
Land Affected by Shifting Cultivation	212
5 SUMMARY OF RECOMMENDATIONS	217
APPENDIX	
17.1 Extent of Waterlogged Area as Estimated by Various Agencies	224
17.2 Distribution of Saline, Saline-Alkali and Alkali Lands in Different States	225
17.3 Perspective Plan for Ravine Reclamation—Estimates of Targets and Costs	227
17.4 Financial Implication of Land Reclamation	229
CHAPTER 18—SOIL AND MOISTURE CONSERVATION	
SECTION	
1 INTRODUCTION	230
2 PROBLEM AND ITS MAGNITUDE	231
Land Use Pattern	231
Wastelands and Ravines	233
Cultivated Lands	233
Wind Erosion	234
Specific Problem of Catchment Areas	235
Basic Consideration of Land Use	236
Reservoir Surveys	237
Encroachment on Live Storage	238
3 BENEFITS OF CONSERVATION MEASURES	239
Protection Benefits	240
Production Benefits	242
4 PAST EFFORTS AND PRESENT STATUS	243
Pre-Independence Period	243
Post-Independence Period	245
Soil Conservation Programmes	245
Present Status	247
State Replies to Questionnaire	247
Collection of Silt Data of Rivers and Streams	248
5 APPROACH FOR THE FUTURE AND PROGRAMMES	250
Soil and Land Use Survey	250
Identification of Sediment Sources	252
Raingauge Data	253
Conservation Programmes for the Plains	254
Rainfed Agriculture	255

	PAGE
Bombay Dryfarming System	256
Farm Ponds	257
Other Water Conservation Measures	258
Agronomic Practices in Rainfed Areas	258
Treatment of Private Degenerated Lands	259
Conservation Measures in Sloping Lands	260
Afforestation	260
Grass Production	261
Conservation for Productivity Increase	262
People's Participation	262
Inter-State Projects	263
Documentation of Silt and other Data	263
Watershed Management—an Integrated Approach	264
6 ORGANISATION AND FINANCING	266
Inter-Directorate Committee on Soil Conservation Works	267
Financing Soil Conservation Works	268
Recovery of Cost of Soil Conservation Works	268
Soil Conservation Act and Legislation	269
7 RESEARCH AND TRAINING	270
Soil Conservation Boards	270
State Responsibilities	271
Follow up Work	273
Researches on Watershed Management	273
Land Resource Regions	273
Conservation Hydrology	274
Conservation Agronomy	275
Erosion Control Structures	275
Conservation Forestry	276
Gully Erosion	276
Universal Soil Loss Equation	277
Training	277
Training Centres	277
Role of Agricultural Universities	278
Publication of Manuals	278
Priorities in Training and Research	279
8 SUMMARY OF RECOMMENDATIONS	279
 APPENDIX	
18.1 Classification of Area—1970-71	287
18.2 Statewise Classification of Area (1970-71) together with Area Under Minor Forests	288
18.3 Sediment Data of Selected Reservoirs	290

	PAGE
18.4 Progress of Soil Conservation Works in Different States and Other Related Aspects (Summary of Replies to Questionnaire)	294
18.5 Sediment Data of Main Rivers and their Tributaries and the Corrected Values	312
18.6 Statewise Projects with Catchment Area and Gross Capacity	316
 CHAPTER 19—ELECTRICITY IN RURAL DEVELOPMENT	
SECTION	
1 INTRODUCTION	323
2 DEVELOPMENT OF RURAL ELECTRIFICATION	324
3 PROGRAMME AND POLICIES	326
4 ECONOMICS OF RURAL ELECTRIFICATION	328
5 FINANCING OF RURAL ELECTRIFICATION SCHEMES	330
6 DIFFICULTIES OF RURAL CONSUMERS	333
7 OTHER MATTERS	335
8 SUMMARY OF RECOMMENDATIONS	336
 APPENDIX	
19.1 Statewise Investment on Rural Electrification by Plans	340
19.2 Statewise Number of Villages Electrified	341
19.3 Statewise Number of Pumpsets/Tubewells Energised	343