

AGRICULTURAL PRODUCTIVITY IN EASTERN INDIA

VOLUME I



**REPORT OF THE
COMMITTEE ON AGRICULTURAL
PRODUCTIVITY IN EASTERN INDIA
RESERVE BANK OF INDIA
1984**

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FOREWORD

The Reserve Bank of India has now completed 50 years. During this period, the range of its functions has steadily extended from traditional central banking to active promotion of national objectives of accelerating growth with stability, furthering social justice and reducing inter-regional disparities. Considering the crucial role of agriculture in the growth of the economy, improvement of agricultural productivity and credit support for agriculture have been important objectives of the Bank's policy.

Experience has shown that reduction of regional disparities in the levels of development often requires adoption of different strategies for different regions. One region which has been engaging the special attention of national authorities including the Reserve Bank is Eastern India.

Eastern India comprising West Bengal, Orissa, Bihar and East U.P. is endowed with rich natural and human resources for development. At one time, the region's agricultural productivity was high, but has been falling in recent years. The growth in agricultural productivity particularly in the last two and a half decades has been modest and well below the attainable levels considering the region's large potential. In view of this, the Reserve Bank, jointly with National Bank for Agriculture and Rural Development appointed a Committee, with Dr. S. R. Sen, Chairman, International Food Policy Research Institute and member of the Commission on Centre-State Relations, as Chairman, to make a detailed study of the constraints on improving agricultural productivity in this region and suggest remedial measures, with particular reference to credit and investment, to achieve as much of the potential as possible by the end of the present decade. The Committee comprised the following members: Dr. S. K. Mukherjee, member, State Planning Board, Government of West Bengal, Dr. Pradhan Hari Shankar Prasad, Professor of Economics, A. N. Sinha Institute of Social Studies, Patna, Shri K. Ramamurthy, member, Board of Revenue, Government of Orissa, Cuttack* and Shri Harbans Singh, Agricultural Production Commissioner, Government of India.+ The Committee submitted its Report on December 31, 1984.

* Retired from Government service from June 30, 1984.

+ Retired from Government service from October 31, 1984.

The Committee in its Report has made a number of useful recommendations. The Report has pointed out that accelerated agricultural development in the region has to be spearheaded by massive provision of tubewells and pumpsets, improvement in drainage, water management techniques, research and extension, power, custom services and post-harvest arrangements for storage and marketing. It has highlighted the need for improving productivity per hectare and per cultivator, especially in the case of small and marginal farmers through science-based and industry-linked farming technology. It has urged the promotion of cultivation of HYV crops and high value crops through the adoption of labour-cum-capital intensive techniques by small and marginal farmers and provision of improved custom services through the setting up of leasing agencies. It has drawn attention to the need for reorganisation and strengthening of the credit structure, for which it has suggested a number of measures. The Report points out that the region is near the threshold of accelerated progress, but it would be necessary to give it a "big push" in terms of substantial public investment, credit support from the banking system and, more importantly, efficient management. The Committee is of the opinion that, if its recommendations are effectively implemented, it should be possible for the region to achieve an annual compound growth rate of at least 5 per cent in agricultural production during the next 10 years.

The Committee has produced a very valuable Report. I have no doubt the recommendations made by it will have a far reaching impact on the formulation and implementation of agricultural policies for the region in the coming years. We owe a special debt of gratitude to Dr. S. R. Sen and his colleagues for the high quality of work that has gone into the preparation of the Report.

I am happy that this Report is being published in the Golden Jubilee year of the Reserve Bank. It is hoped that it will be widely read and warmly welcomed by planners and policy makers and the valuable recommendations made by the Committee will become an important input in the plan of action to improve agricultural productivity of the eastern region of the country.

Reserve Bank of India
Bombay
May 27, 1985.



GOVERNOR

CONTENTS
VOLUME I
PART I
EASTERN INDIA

	Page
Foreword	v
Abbreviations	ix
1. Introduction	1
2. An Overview	19
3. Trends in Agricultural Development	30
4. General Constraints to Agricultural Growth	68
5. Strategy for Accelerating Agricultural Growth	76
6. Prospects for Accelerating Agricultural Growth	84
7. Management and Organisation	94
8. Land and Farm Policy	106
9. Irrigation, Drainage and Water Management	121
10. Input Supply	140
11. Agricultural Research, Extension and Training.	152
12. Marketing Development	172
13. Agricultural Development in Tribal Areas	184
14. Animal Husbandry and Fishery Development	199
15. Credit Policy	212
16. Investment and Credit Requirements	245
17. Conclusion	257

APPENDICES

	Page
1. RBI Memorandum dated March 10, 1983 on the Setting up of the Committee on Agricultural Productivity in Eastern India	263
2. Terms of Reference of the Working Groups	265
3. List of Persons met by the Committee	268
4. List of Persons who Submitted Notes to the Committee ...	276
5. The Andhra Pradesh Irrigation Utilisation and Area Development Act, 1984 — Relevant Extracts	279
6. The West Bengal Inland Fisheries Act, 1984 — Relevant Extracts	299
7. Report of the National Commission on Agriculture (Final Report) — Relevant Recommendations	303
8. Report of the National Committee on the Development of Backward Areas, on Drought-Prone Areas and Desert Areas — Relevant Recommendations ...	318
9. Report of the National Committee on the Development of Backward Areas on Chronically Flood Affected Areas — Relevant Recommendations	346
10. Report of the Irrigation Commission 1972 — Relevant Recommendations	352
11. Report of the Rashtriya Barh Ayog (National Commission on Floods) — Relevant Recommendations	367
12. Report of the Committee on Forestry for Alleviation of Property, 1984 — Relevant Recommendations	372
13. Report of the Group on Perishable Agricultural Commodities, May, 1981 — Relevant Recommendations	378
SUBJECT INDEX	387

ABBREVIATIONS

AEO	— Agricultural Extension Officer
AERC	— Agro-Economic Research Centre
AICRP	— All-India Coordinated Research Project
APC	— Agricultural Production Commissioner
ARDC	— Agricultural Refinance and Development Corporation
AVAW	— Associate Village Agricultural Worker
AVRDC	— Asian Vegetable Research and Development Centre, Taiwan
CAD	— Command Area Development
CADA	— Command Area Development Authority
CADP	— Comprehensive Area Development Programmes
CAZRI	— Central Arid Zone Research Institute, Jodhapur
CCB	— Central Co-operative Bank
CIFE	— Central Institute for Fisheries Education
CIFRI	— Central Inland Fisheries Research Institute
CRRI	— Central Rice Research Institute
CWC	— Central Water Commission
DPAP	— Drought-Prone Area Development
DRDA	— District Rural Development Agency
DRI	— Differential Rate of Interest
DVC	— Damodar Valley Corporation
FCI	— Food Corporation of India
FSS	— Farmers' Service Society
GIC	— General Insurance Corporation of India
GOI	— Government of India
HVC	— High Value Crops
HYV	— High Yielding Varieties
IARI	— Indian Agricultural Research Institute
ICAR	— Indian Council of Agricultural Research
ICDP	— Intensive Cattle Development Project
ICRISAT	— International Crop Research Institute for Semi-Arid Tropics
IIM	— Indian Institute of Management
IIT	— Indian Institute of Technology
IRDP	— Integrated Rural Development Programme
IRRI	— International Rice Research Institute, Philippines
IRTP	— International Rice Testing Programme
ISI	— Indian Standards Institution
LAMPS	— Large-sized Adivasi Multi Purpose Society
LDB	— Land Development Bank
M & E	— Monitoring and Evaluation
MNP	— Minimum Needs Programme
M.P.	— Madhya Pradesh
NABARD	— National Bank for Agriculture and Rural Development
NARP	— National Agricultural Research Project

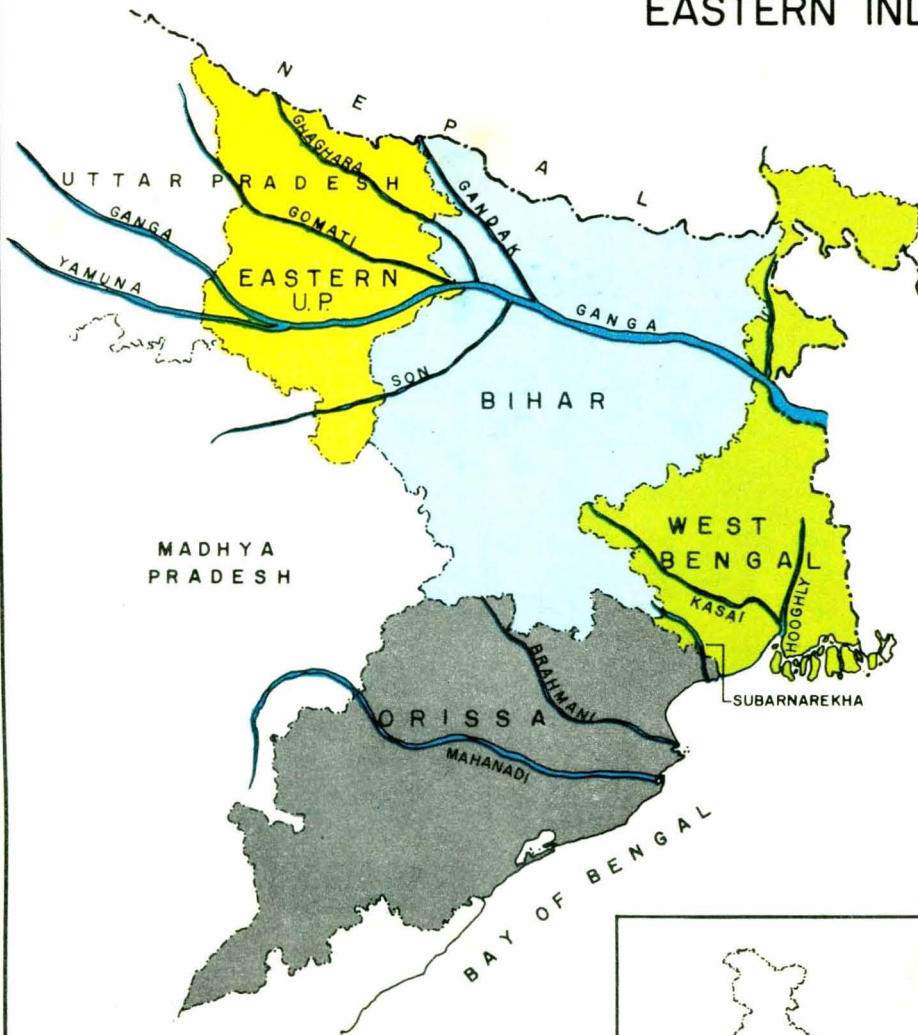
NCA	— National Commission on Agriculture
NCDC	— National Co-operative Development Corporation
NDRI	— National Dairy Research Institute, Karnal
NPK	— Nitrogenous, Phosphatic and Potassic
NREP	— National Rural Employment Programme
NSC	— National Seeds Corporation
MFP	— Minor Forest Produce
OFD	— On-farm Development
OPAMMA	— Orissa Pumpset and Agro-Machinery Association
PACS	— Primary Agricultural Credit Society
PLDB	— Primary Land Development Bank
PWD	— Public Works Department
RBI	— Reserve Bank of India
R & D	— Research and Development
RLEGP	— Rural Landless Employment Guarantee Programme
RRB	— Regional Rural Bank
SCB	— State Co-operative Bank
SMS	— Subject Matter Specialist
TDCC	— Tribal Development Co-operative Corporation
T & V	— Training and Visit
U.P.	— Uttar Pradesh
VAW	— Village Level Agricultural Extension Worker
VVV	— Vikas Volunteer Vahini

Errata

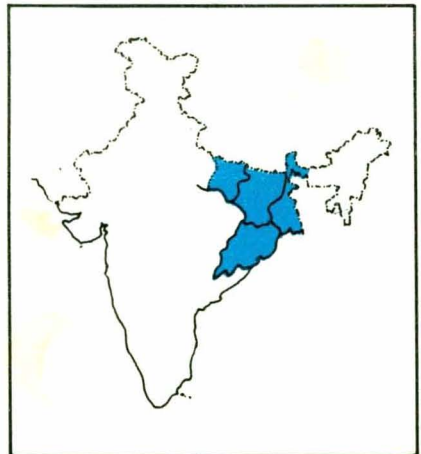
Page	Item/ Para/Table	Line/ Column	For	Read
viii	Appendices			
	Item 12	2	Property	Poverty
ix	CADP	10	Programmes	Programme
ix	CAZRI	11	Jodhapur	Jodhpur
ix	DPAP	17	Development	Programme
39	3.5.4	2	decade.	decade,
43	Table 3.11	8 Col. 1	(Lakh Tones) Potato@	Potato@ (Lakh tonnes)
44	3.5.15	12	Bihar, as may be seen below.	per cent.
59	3.11.13(ii)	3	horticulare	horticulture
112	8.6.2	3	farmers.	farms.
146	Item (b)	3	one tonne 0.1 ha	one tonne per 0.1 ha
195	13.9.1	19	utilised for	utilised from
250	6.2.10	—	6.2.10	16.2.10
250	6.2.10	18	for	in
307	27	1	showing	sowing
309	41	1	cocao	cocoa
320	10	1	undisciplinary	undisciplinary
321	14	7	filled	fitted
342	102	6	follow up	followed up
352	3	2	pariticularly	particularly
356	30	7	or	of
357	3	4	set-up	set up
358	7	3	aluvium-covered	alluvium-covered
358	7	4	explored	exploited
382	27	4	of	or

PART I
EASTERN INDIA

EASTERN INDIA



- 1 The territorial waters of India extend into the sea to a distance of twelve nautical miles measured from the appropriate base line.
- 2 Based upon Survey of India map with the permission of the Surveyor General of India.
- 3 © Government of India Copyright 1985
- 4 Responsibility for the correctness of internal details shown on the maps rests with the publisher.



CHAPTER 1

INTRODUCTION

1.1 *Background*

1.1.1 Eastern India comprising West Bengal, Orissa, Bihar and East U.P., is one of the most fertile regions in India. Historically, it was the most prosperous agricultural tract in the country. It lost its pre-eminence due to a variety of reasons such as exploitation of the peasantry under the system of *zamindari*, *talukdari* and subinfeudation, growing pressure of population on land and fragmentation of holdings, inadequate provision of bridges, culverts and siphons in railways, roads and canals which interfere with natural flow of water and add to monsoon floods, waterlogging, pests and diseases, neglect of irrigation, drainage and water management programmes and consequent difficulty in adoption of modern technology in agriculture. The Green Revolution which started in the mid-1960s in the wake of the adoption of HYV seeds, fertilizers, pesticides, etc., and transformed agriculture in Punjab and Haryana, has not made any significant impact in the eastern region.

1.1.2 The region has, however, the necessary potential for achieving a very high level of agricultural productivity. It is endowed with fertile alluvial soil in most parts, good rainfall and abundant surface and groundwater resources and plentiful supply of labour.

1.1.3 The recent sluggishness in the growth of agricultural productivity has been caused by a variety of constraints peculiar to Eastern India, including those noted above. If these constraints, which vary from area to area, are identified in detail and effective steps taken to overcome them and adequate capital provided to its resource-poor farmers, this region can become a very prosperous area and an important granary for the country, especially as it has now come close to the threshold of technological breakthrough due to the development efforts of recent years.

1.1.4 Overcoming these constraints deserves the highest priority not only for strengthening the economic base of the nation but also for tackling the very serious social and political problems which result from underemployment and unemployment and acute poverty of the teeming millions of the region who do not have ready access to alternative sources of employment and income.

1.1.5 The Government of India has been deeply concerned about the problem. The Union Ministry of Agriculture has recently initiated a special programme for stepping up production of rice, which is the most important crop of the region. The Planning Commission has given special priority for improving agricultural productivity in Eastern India.

1.1.6 In this context, the Reserve Bank of India (RBI) and the National Bank for Agriculture and Rural Development (NABARD) decided, in consultation with the Union Ministry of Agriculture and Planning Commission, to appoint a Committee on Agricultural Productivity in Eastern India to make a detailed study of the problems and prospects for development in the region (*vide* RBI Memorandum, dated March 10, 1983, Appendix 1).

1.2 *The Committee*

1.2.1 The terms of reference of the Committee are as under :

- (i) to review the trends of agricultural production and productivity in West Bengal, Orissa, Bihar and Eastern Uttar Pradesh in recent years and compare with the potential of the area;
- (ii) to identify the various constraints in achieving the potential levels of production in the States mentioned above;
- (iii) to suggest measures, with particular reference to credit and investment, necessary for achieving as much of the potential as possible by the end of the decade, viz., 1990.

1.2.2 The Committee comprised the following members :

- | | |
|--|---------------------|
| 1. Dr. S. R. Sen,
Chairman,
International Food Policy
Research Institute,
Washington D.C. | Chairman |
| 2. Dr. S.K. Mukherjee,
Member,
State Planning Board,
Government of West Bengal,
Calcutta. | Member |
| 3. Dr. Pradhan Hari Shankar Prasad,
Prof. of Economics,
A. N. Sinha Institute of Social Studies,
Patna. | Member |
| 4. Shri K. Ramamurthy,
Member,
Board of Revenue,
Government of Orissa,
Cuttack. | Member ¹ |
| 5. Shri Harbans Singh,
Agricultural Commissioner,
Government of India,
New Delhi. | Member ² |

1.2.3 Shri M. G. Gaitonde and Shri K. R. Holla,³ Directors, Department of Economic Analysis and Policy, Reserve Bank of India, were appointed Secretary and Joint Secretary respectively

¹ Shri K. Ramamurthy retired from Government service with effect from June 30, 1984. At present, he is the Chairman of the Committee on Centrally Sponsored Schemes constituted by the Planning Commission.

² Shri Harbans Singh retired from Government service with effect from October 31, 1984.

³ Shri K. R. Holla came over from NABARD to RBI on July 26, 1983.

of the Committee. Consequent on the resignation of Shri M. G. Gaitonde in May 1984, Shri K. R. Holla was appointed Secretary of the Committee with effect from May 17, 1984. Shri M. P. Nair, Deputy Director, Department of Economic Analysis and Policy, Reserve Bank of India, was appointed Joint Secretary of the Committee with effect from August 1, 1984.

1.3 *Meetings*

1.3.1 The Committee was formally inaugurated on April 9, 1983 by Hon. Rao Birendra Singh, Union Minister for Agriculture.

1.3.2 Explaining the background of the Committee, Dr. Manmohan Singh, Governor, Reserve Bank of India, stated that the Committee's main task would be to look into the problems of agricultural production and productivity in Eastern India, identify the factors standing in the way of realising the agricultural potential in this region and suggest an action programme for stepping up productivity. He drew attention to the fact that bank credit by itself would not achieve increased productivity unless supported by a strong and viable infrastructure for development.

1.3.3 In his inaugural address, the Union Minister for Agriculture pointed out that setting up of the Committee by RBI and NABARD reflected the due awareness of credit institutions of the vital role credit can play in stepping up production. He observed that despite rich natural resources, productivity in Eastern India is low due to several constraints. He emphasised the need for improving the basic infrastructure and use of modern technology in agriculture. He suggested that the Committee should take an overall view of the situation, not confining itself to credit aspect only, and that concrete proposals should be made by the Committee to remove the constraints.

1.3.4 The meeting was attended, among others, by Dr. C. H. Hanumantha Rao and Dr. A. M. Khusro, Members of Planning Commission.

1.3.5 The Committee held in all 16 meetings. The Report was adopted on December 30, 1984. A list of the meetings of the Committee and the dates on which they were held is given in Annexure 1.1.

1.4 Procedures

1.4.1 The Committee requested the State Governments to submit memoranda covering the trends in production and productivity since 1958-59 according to a prescribed format. They were also requested to give their assessment of the situation. Simultaneously, the Committee reviewed various reports and studies available on Eastern India, assembled and collected all relevant statistical, technical and other data from sources such as Directorate of Economics and Statistics, Ministry of Agriculture, Ministry of Irrigation, Indian Council of Agricultural Research (ICAR). Planning Commission, RBI and NABARD.

1.4.2 The Committee invited, through the media of leading newspapers in the four States, views of local agencies/individuals on the various aspects covered by the terms of reference. The Committee also requested the officials and non-officials whom it met during the course of its meetings and tours to submit their views and suggestions.

1.4.3 *Special Studies:* The Committee requested the Agro-Economic Research Centres (AERCs), Santiniketan and Allahabad to compile basic data required for the Committee's work, on a districtwise basis, in respect of West Bengal, Orissa, Bihar and East U.P. and undertake a sample survey of farmers in the region to assess the field-level conditions obtaining in the selected villages and to identify the main constraints faced by the farmers in improving productivity. The villages covered by the sample study by AERCs, Santiniketan and Allahabad are given in Annexure 1.2. The Committee also asked the Vice-Chancellor of Orissa University of Agriculture and Technology, Bhubaneswar, to conduct a field survey on security of tenure of various categories of land holders in Orissa. The villages selected for this study are also listed in Annexure 1.2.

1.4.4 The Committee requested the Office of the Assistant Director-General of Meteorology, Pune, to compile specially for its use weekly rainfall data over a long time span for representative stations in each district of the four States. These data are presented in Part VI of the Report.

1.5 *Working Groups*

1.5.1 The Committee set up the following Working Groups :

<i>Working Groups</i>	<i>Convenor</i>
1. Structure and Organization at Grass Roots Levels and Supporting Institutions.	Shri K. Ramamurthy.
2. Land Tenurial Status.	Shri K. Ramamurthy.
3. Levels of Productivity under different Agro-Climatic Zones.	Dr. S. K. Mukherjee.
4. Water Management (Surface and Ground-water and Drainage) and Command Area Development (including Consolidation of Holdings and Land Levelling).	Shri K. S. S. Murthy, Retired Adviser on Irrigation, Planning Commission.
5. Credit and Investment.	Shri B. R. Shetty, Retired Deputy General Manager, NABARD.

1.5.2 The terms of reference of the above Working Groups are given in Appendix 2.

1.6 *Visits to States*

1.6.1 After a preliminary study of the various problems and issues involved, the Committee visited the States as shown below :

<i>State</i>	<i>Dates of visit</i>
West Bengal	November 25 to December 3, 1983.
Orissa	December 17 to 24, 1983.
Bihar	January 17 to 24, 1984.
U.P.	April 27 to May 1, 1984.

1.6.2 The Committee had meetings with Chief Ministers, Ministers for Agriculture, Irrigation, Co-operation, Land Reforms, Planning, Finance, etc., Chief Secretaries. Government officials, bankers, chiefs of regional offices of RBI and NABARD, academicians and other knowledgeable persons. The Committee visited some districts in different agro-climatic zones and had discussions with District Collectors, local officials, bankers, representatives of voluntary organizations, progressive farmers, etc. It also visited some villages to understand the actual field conditions. A list of the places visited by the Committee during its visits to the States is given in Annexure 1.3.

1.6.3 The Chairman also met individually several administrators, credit specialists, technical experts, academicians and knowledgeable persons. The Committee received from some of them notes on various subjects. A list of important persons whom the Committee met either individually or in groups, is given in Appendix 3. A list of persons who furnished notes and other material is given in Appendix 4.

1.7 Consultations

1.7.1 *Agricultural Universities and Research Institutes:* During the course of its visits to the States, the Committee met individually and in groups, Vice-Chancellors and faculty members of the different Agricultural Universities in the region, Director and Scientists of the Institute of Agricultural Sciences, Varanasi, Scientists of the Central Rice Research Institute, Cuttack, Vice-Chancellors and their colleagues of Patna and Allahabad Universities, Professors of Calcutta and Lucknow Universities and Director/research staff of several research institutes such as Agro-Economic Research Centres, Allahabad and Santiniketan and Giri Institute of Development Studies, Lucknow.

1.8 Consultants and Staff

1.8.1 A few Consultants were associated with the work of the Committee. Dr. S. K. Ray, Professor, Institute of Economic Growth, Delhi assisted the Committee in designing the field studies, analysis of statistical data and drafting part of the Report. Shri K.S.S. Murthy, retired Adviser on Irrigation, Planning Commission and Dr. D. Tripathy, Deputy Director, Ministry of Irriga-

tion assisted the Committee in its work relating to irrigation and water management. Shri B. R. Shetty, retired Deputy General Manager, NABARD, was associated as consultant on credit.

1.8.2 The Committee had its Secretariat at Reserve Bank of India, Bombay and New Delhi. A list of staff who worked for the Committee is given in Annexure 1.4.

1.9 *Scope of the Report*

1.9.1 Constraints to development vary widely from State to State and within the State as between different zones, districts and blocks. Hence, the Committee carried out, to the extent possible, micro-level investigations of the region's problems through field visits and special studies. The Committee grouped all the districts into certain agro-climatic zones. It has not been possible to go below the district level for want of consistent data for a long period of time. The Committee made efforts to identify constraints at the zone levels and has made recommendations for accelerating agricultural development, some of which are location-specific and others general in nature.

1.9.2 The Committee is presenting its Report in six Parts. Part I comprises the main Report and gives the general findings and recommendations for improving agricultural productivity in Eastern India. It presents a brief historical review of developments in the region and attempts to identify the major constraints which are operating in Eastern India. It then indicates a strategy for accelerating agricultural development in the region. Specific policy measures and action programmes which would be needed for implementing the strategy are spelt out in some detail. Parts II to V are supplements on West Bengal, Orissa, Bihar and East U.P., highlighting main constraints and appropriate recommendations. Recommendations of some earlier Commissions and Committees, which have important significance for Eastern India and need to be implemented effectively and expeditiously are listed at Appendices 7 to 13 of Part I. All the detailed statistical statements are given in Part VI.

1.9.3 The Report deals with the problems of agricultural production and productivity. Hence the main emphasis has been on crop production and land and water management. Since in a broader sense the connotation productivity covers not only productivity per

ha, but also per capita per year, animal husbandry and fishery activities, wherever relevant, have been briefly dealt with in the Report.

1.10 *Acknowledgements*

1.10.1 At the outset, we would like to express our deep sense of gratitude to the Governor of the Reserve Bank of India, Dr. Manmohan Singh, at whose instance the Committee took up its work.

1.10.2 We received valuable assistance and co-operation from the Deputy Governors of Reserve Bank of India, Chairman and Managing Director of NABARD and several officers of the Union Ministries of Agriculture and Irrigation, Planning Commission, Indian Council of Agricultural Research, Central Rice Research Institute, Cuttack, the Institute of Agricultural Sciences, Varanasi and the Agricultural Universities of the region.

1.10.3 We are grateful to the State Governments for the valuable assistance and co-operation rendered by them. They made special arrangements for the collection and supply of information and material required by us. They also made excellent arrangements for our visits to the States. During these visits, the Chief Ministers, their Cabinet colleagues, concerned officials, bankers, local offices of RBI and NABARD, progressive farmers and other knowledgeable persons spared their valuable time to give us the benefit of their views and suggestions. We would like to express our gratitude to all of them.

1.10.4 We are also grateful to the Vice-Chancellors, professors and other scientists of the Agricultural and other Universities and Research Institutes, who gave us the benefit of their views during our visits to these institutions.

1.10.5 We gratefully acknowledge the information supplied by various institutions and individuals on the problems in different fields of agriculture and allied activities and suggestions offered by them.

1.10.6 In connection with our work, we set up a number of Working Groups. We are thankful to the convenors and members of these Working Groups for their valuable contributions.

1.10.7 We also thank the Agro-Economic Research Centres, Santiniketan and Allahabad and the officers-in-charge of studies, Shri S. Sengupta, Dr. B. N. Asthana and Shri P. C. Shukla, for the studies conducted by them, Shri S. P. Mukerji, Secretary, Ministry of Agriculture and Shri H. L. Chawla, Economic & Statistical Adviser, Directorate of Economics and Statistics, Ministry of Agriculture for sparing their services and giving other assistance. We thank the Director, Institute of Economic Growth, Delhi, for valuable assistance and for making available the services of Dr. S. K. Ray. We also thank Dr. B. Mishra, Vice-Chancellor, Orissa University of Agriculture and Technology for the study conducted on our behalf. We thank the Assistant Director-General of Meteorology, Pune for furnishing valuable statistics on rainfall.

1.10.8 We would like to acknowledge the valuable services rendered by Dr. S. K. Ray, Shri K. S. S. Murthy, Dr. D. Tripathy and Shri B. R. Shetty.

1.10.9 We thank the staff of the Committee who put in very hard work.

1.10.10 We wish to place on record our appreciation of the valuable contribution made by Shri K. R. Holla, our Secretary, in organising the work of the Committee and drafting the Report.

Annexure 1.1**Meetings held by the Committee**

<i>No.</i>	<i>Meeting</i>	<i>Date/s</i>	<i>Venue</i>
1.	1st Meeting	April 9, 1983	New Delhi
2.	2nd Meeting	May 7, 1983	New Delhi
3.	3rd Meeting	July 30, 1983	Bombay
4.	4th Meeting	September 15, 1983	New Delhi
5.	5th Meeting	November 11 and 12, 1983	New Delhi
6.	6th Meeting	May 24 and 25, 1984	New Delhi
7.	7th Meeting	July 2 to 4, 1984	New Delhi
8.	8th Meeting	July 30, 31 and August 1, 1984	New Delhi
9.	9th Meeting	August 22 to 24, 1984	New Delhi
10.	10th Meeting	September 11 to 13, 1984	New Delhi
11.	11th Meeting	September 21 and 22, 1984	New Delhi
12.	12th Meeting	October 8 and 9, 1984	New Delhi
13.	13th Meeting	October 26 to 30, 1984	New Delhi
14.	14th Meeting	November 26 to 29, 1984	New Delhi
15.	15th Meeting	December 17 to 20, 1984	New Delhi
16.	16th Meeting	December 28 to 30, 1984	New Delhi

Annexure 1.2

**List of Sample Villages taken up for Field Investigation by
Agro-Economic Research Centres, Santiniketan and Allahabad**

<i>State/Region</i>	<i>District</i>	<i>Village</i>
West Bengal	Hooghly	Tinna
	Hooghly	Keshabpur
	Malda	Rakhalpukur
	Murshidabad	Gunanandapur
	Bankura	Kumardanga
	West Midnapur	Barar-kuliar
	Jalpaiguri	Sahebbari
	Jalpaiguri	Kshirerkota
	Darjeeling	Ambakey
	Darjeeling	Sarmali
Orissa	Balasore	Blurkunda
	Cuttack	Mandasahi
	Dhenkanal	Joragadia
	Mayurbhanj	Satputia
	Kalahandi	Risigaon
	Keonjhar	Danga Tangarpada
	Koraput	Sankandi
Bihar	Nalanda	Sathopur
	Nalanda	Khemanbigha
	Nalanda	Pipari
	Nalanda	Khirodharpur
	Palamau	Damodar
	Santalparganas	Fatehpur
	Saharsa	Chandaaur
	Saharsa	Dharahra
	West Champaran	Satpherwa
	West Champaran	Pokhariya
East U.P	Azamgarh	Saraimohan
	Azamgarh	Thakurgaon
	Basti	Garsapar
	Basti	Semara

**List of Sample Tehsils taken up for Field Investigation by
Orissa University of Agriculture and Technology**

<i>State</i>	<i>District</i>	<i>Tehsil</i>
Orissa	Ganjam	Aska
	Cuttack	Jagatsinghpur
	Puri	Nimapara
	Balasore	Bhadrak

Annexure 1.3

Places Visited by the Committee

<i>State/Region</i>	<i>District</i>	<i>Place</i>
West Bengal	Darjeeling	Darjeeling
	Darjeeling	Matigara
	Jalpaiguri	Mohitnagar
	Nadia	Krishnanagar
	Hooghly	Hooghly
	Purulia	Purulia
	Burdwan	Asansol
	24-Parganas	Barasaat
	24-Parganas	Sunderbans
Orissa	24-Parganas	Rangabelia
	Puri	Arna
	Puri	Dilkhana
	Sambalpur	Katapalli
Bihar	Koraput	Rayagada
	Vaisali	Vaisali
	Purnea	Phulwari
	Purnea	Bainsa
	Gaya	Gaya
	Ranchi	Ranchi
	Ranchi	Jamshedpur
	Singhbhum	Nimdih
	East Champaran	Motihari
East U.P.	West Champaran	Betia
	Gorakhpur	Chargawa
	Varanasi	Varanasi
	Mirzapur	Mirzapur
	Jaunpur	Vithar
	Faizabad	Nandigram
	Allahabad	Allahabad

Annexure 1.4**Staff of the Committee**

1. K.R. Holla, Jt. Secretary, (March 10, 1983 to
Director, May 16, 1984)
Department of Economic Secretary* (since May 17, 1984).
Analysis and Policy,
Reserve Bank of India,
Bombay.
2. M.P. Nair Jt. Secretary, (since August 1,
1984)
Deputy Director,
Department of Economic
Analysis and Policy,
Reserve Bank of India,
Bombay.
3. A.L. Verma Deputy Director,
Department of Economic
Analysis and Policy,
Reserve Bank of India,
New Delhi.
4. J.R. Majhee Deputy Director,
Department of Economic
Analysis and Policy,
Reserve Bank of India,
Bombay.
6. D.V.S. Sastri Deputy Director,
Department of Statistical
Analysis & Computer Services,
Reserve Bank of India,
Bombay.
7. S.N. Joglekar Deputy Director,
Department of Banking
Operations and Development,
Reserve Bank of India,
Bombay.

Annexure 1.4 (Contd.)

- | | |
|---------------------------|--|
| 8. R.S. Chadha** | Officer on Special Duty,
Department of Economic
Analysis and Policy,
Reserve Bank of India,
New Delhi. |
| 8. T.N. Khushu@ | —do— |
| 9. M.L. Manrai@@ | —do— |
| 10. G.R. Padmaras | Staff Officer,
Department of Economic
Analysis and Policy,
Reserve Bank of India,
Bombay. |
| 11. G.T. Kabnur | —do— |
| 12. V.C. Poojary | —do— |
| 13. Smt. S.V. Kulkarni | —do— |
| 14. S.N. Malhotra | P.S. to Chairman,
Reserve Bank of India
New Delhi. |
| 15. J.N. Seshagiri Sharma | Economic Assistant,
Department of Economic
Analysis and Policy,
Reserve Bank of India,
Bombay. |
| 16. B.R. Dixit | —do— |
| 17. P.R. Shimpi | Clerk,
Department of Economic
Analysis and Policy,
Reserve Bank of India,
Bombay. |

Annexure 1.4 (Contd.)

- | | |
|-----------------------|---|
| 18. A.A. Badnikar | Clerk,
Department of Economic
Analysis and Policy,
Reserve Bank of India,
Bombay. |
| 19. Kum. S.N. Kotian | —do— |
| 20. J.S. Chauhan | Clerk,
Department of Economic
Analysis and Policy,
Reserve Bank of India,
New Delhi. |
| 21. D.S. Khatta | —do— |
| 22. Bhopal Singh | —do— |
| 23. Naresh Kumar | —do— |
| 24. T.V. Subramaniam | Stenographer,
Department of Economic
Analysis and Policy,
Reserve Bank of India,
Bombay. |
| 25. P.T.V. Nair | —do— |
| 26. V. Krishnamoorthy | —do— |
| 27. Smt. C.F. Miranda | —do— |
| 28. V.M. Mahajan | Stenographer,
Department of Economic
Analysis and Policy,
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New Delhi. |
| 29. D.K. Gulabrani | —do— |
| 30. R.N. Gupta | —do— |
| 31. Pawan Kumar | —do— |

Annexure 1.4 (Contd.)

32. Smt. Leela Vithal Raj Typist,
 Department of Economic
 Analysis and Policy,
 Reserve Bank of India,
 Bombay.
33. Smt. A.A. Rege —do—

* Shri M. G. Gaitonde, Director, Department of Economic Analysis and Policy, Reserve Bank of India, Bombay was Secretary of the Committee from March 10, 1983 to May 16, 1984. He resigned thereafter to take up a foreign assignment.

** Ex-Economic Planner, Town and Country Planning Organization, Ministry of Works and Housing, Government of India, New Delhi.

@ Ex-Research Officer, Directorate of Economics and Statistics, Ministry of Agriculture, Government of India, New Delhi.

@@ Research Officer, Directorate of Economics and Statistics, Ministry of Agriculture, Government of India, New Delhi, on deputation.

Notes : V. D. Patil, B. P. Dagale, R. N. Koli and Smt. A. V. Sambodhi, staff of RBI, Bombay and Smt. Pramila Kapur from RBI New Delhi worked in the Committee for a short period.

CHAPTER 2

AN OVERVIEW

2.1 *Retrospect*

2.1.1 Three and a half decades of planning has transformed Indian agriculture significantly. Three distinct features of this transformation are clearly discernible from the performance of agriculture since 1950-51.

2.1.2 Firstly, the process of planning has sustained a long-run growth rate in crop production at around 3 per cent per annum. There are few countries in the world which have recorded a growth of this order over such a long period at comparable stages of their economic development.

2.1.3 Secondly, this growth in production has been obtained through intensive rather than extensive cultivation. By the end of 1950s, Indian agriculture had practically exhausted the scope for increasing production through further expansion in cultivable area. Subsequent growth has been almost entirely through increase in yield per ha of cropped area.

2.1.4 Thirdly and more importantly, since mid-1960s, Indian agriculture is undergoing dynamic changes. The HYV seed and fertilizer technology coupled with irrigation, research and extension infrastructure made it possible to launch science-based and industry-linked farming. It has accelerated the process of commercialisation of Indian agriculture and initiated modernisation of rural India.

2.1.5 However, even after nearly two and a half decades of this significant shift in production strategy, the process of intensification of agriculture through science-based and industry-linked farming has not spread uniformly in all parts of the country. Eastern India comprising West Bengal, Orissa, Bihar and East U.P.¹ is a case in point.

¹ East U.P. comprises of 15 districts, viz., Allahabad, Azamgarh, Bahraich, Ballia, Basti, Deoria, Faizabad, Ghazipur, Gonda, Gorakhpur, Jaunpur, Mirzapur, Pratapgarh, Sultanpur and Varanasi.

2.1.6 Eastern India presents a picture of the highest concentration of population and the lowest per capita foodgrains production (Annexure 2.1). Labour alone, obviously, is not enough for developing intensive agriculture. It is only when labour along with the complementary inputs of capital and skills (irrigation, drainage, yield augmenting inputs, efficient implements, research, extension, etc.) are used intensively to make up for the scarcity of land that conditions are created for sustained increase in productivity.

2.1.7 The application of fertilizers and use of HYV seeds in the Eastern Region (West Bengal, Orissa, Bihar and East U.P.) are still at a low level. Rate of fertilizer application in 1981-82 averaged around 25 kg/ha. Coverage of area under cereals with HYV seeds has also been low, less than 40 per cent. Raising the level of application of these two inputs alone can considerably improve land productivity of the region.

2.1.8 Several other factors, however, are seriously limiting the use and level of application of these inputs. The most important factor is the lack of adequate and controlled water supply. Less than 40 per cent of the net sown area in the region is at present receiving irrigation, and that too, mostly of protective nature. As against this, most of the States in the Northern Region (Punjab, Haryana and West U.P.) are receiving adequate and controlled irrigation. Nearly 80 per cent of the net sown area in Punjab is now irrigated. Greater control on the supply of water through irrigation has helped Punjab to raise agricultural productivity. The intensity of irrigation in Punjab is nearly 170 per cent as against a little over 120 per cent in the Eastern Region (Annexure 2.2).

2.1.9 In Eastern India, water for crop production is available in relatively uncontrolled manner. It is too much and too uneven during monsoon and too little in the dry season. Heavy and highly uncertain rainfall in most parts of the region causes frequent flooding and waterlogging and makes crop cultivation during the *kharif* season extremely hazardous. Lack of adequate drainage facilities and flood control arrangements restrain the farmers from applying the recommended doses of fertilizers. Even when the recommended doses are used, they yield poor results as flooding or waterlogging limit the full realization of the fertilizer response potential of the high yielding varieties of seeds.

2.1.10 Irrigation, coupled with modern inputs and technology, results in transforming agriculture of a region in a spectacular manner when farmers have adequate control over its use and application. This has been the experience of Japan, Taiwan, South Korea and some parts of India.

2.1.11 Tubewells in Haryana and Punjab are operationally more efficient as bulk of them are under the control of farmers and are also energized with electricity. The energization of tubewells in turn, has been facilitated by the availability of electric power in all villages. In fact, the tubewell boom in Haryana and Punjab is due to rapid spread of rural electrification. The situation is different in the Eastern Region. Rural electrification has not made much progress and, as a result, development of tubewells has been slow. Private tubewells are few in number and even these are underutilised due to uncertain and erratic power supply.

2.1.12 Scope for raising labour productivity is also eroding due to excessive dependence of workers on employment in agriculture. The wet rice ecosystem of the region induces this process. A number of available studies suggest that the wet rice ecosystem of monsoon regions has an extraordinary elasticity of response to additional inputs of labour and skill. Sowing, transplanting, weeding, bunding and a multitude of other activities involved in cultivating rice during the southwest monsoon period of heavy and erratic rainfall generate heavy demand for labour during critical periods of farm operations.

2.1.13 The evolution of the Eastern Region to the present small and marginal farmer dominated agrarian economy is a consequence of this agricultural involution, an extreme form of which is seen in East U.P. and Bihar where 75-80 per cent of farm operators are marginal farmers holding one ha or less.

2.1.14 The problem is further complicated by the institutional barriers which the region had inherited from the British period. Even with significant land reform programmes carried out through various legislative measures, concealed tenancy exists and semi-feudal agrarian system still operates over large areas.

2.1.15 Even with these constraints, public investment in infrastructure and supporting services could play a key role in accelerating the growth of agriculture. But the pattern of public expenditure reveals that investment on agriculture and irrigation per agricultural worker has been very low in this region. During 1969-85, expenditure on agriculture, irrigation and rural electrification per agricultural worker was the lowest in Bihar (Rs. 1645) followed by West Bengal (Rs. 1730), U.P. (Rs. 1870) and Orissa (Rs. 2000). In contrast, in Gujarat, it was around Rs. 3980, in Kerala and Punjab, it was over Rs. 4000 and in Haryana over Rs. 5000 (Annexure 2.3).

2.1.16 Notwithstanding some progress made in certain sectors benefiting from the various development programmes undertaken by the State Governments, the region continues to be one of the low agricultural efficiency regions of India. It is characterised by a slow growth rate in crop productivity and farm incomes. Due to limited employment opportunities in the industrial sector, bulk of the labour force looks for jobs in agriculture and remain underemployed. The region has the highest incidence of poverty in the country.

2.1.17 Historical record, however, provides a sharply contrasting picture of Eastern India. One and a half centuries ago, it was a very prosperous and agriculturally advanced region in the country. Its impoverisation began during the British rule, but even at the time of Independence, its agriculture maintained a lead over other regions in the country. During the triennium ending 1950-51, the Eastern Region had recorded highest foodgrains yield (Table 2.1). However, since then and especially after the introduction of the new HYV seed and fertilizer technology in the country, the region, with the exception of West Bengal, has steadily lost its relative position. The Northern Region crossed the foodgrains yield level of the Eastern Region by early 1960s and the Southern Region in 1970s. It appears ironical that programmes and policies during the planning era, which have induced an acceleration in the pace of agricultural development in other regions, could not make sufficient impact in the Eastern Region which was agriculturally so prosperous in earlier times.

Table 2.1. Trends in Foodgrains Yield

(kg/ha)

State/Region	Triennium average			
	1950-51	1960-61	1970-71	1980-81
West Bengal	916	949	1170	1290
Orissa	540	758	839	779
Bihar	513	714	820	914
East U.P.	673@	694	822	957
Eastern Region ¹	644 ⁵	765	897	970
Western Region ²	390	524	551	649
Southern Region ³	554	731	897	1149
Northern Region ⁴	608 ⁶	788	1150	1493
All India	541	671	820	975

@ For U.P. as a whole.

¹ Includes West Bengal, Orissa, Bihar and East U.P.

² Includes Maharashtra, Gujarat, Madhya Pradesh and Rajasthan.

³ Includes Andhra Pradesh, Tamil Nadu, Karnataka and Kerala.

⁴ Includes Punjab, Haryana and Uttar Pradesh (excluding East U.P.).

⁵ Includes entire U.P., as separate data for East U.P. are not available.

⁶ Excludes U.P.

2.2 The Next Step

2.2.1 The solution to the problem of low productivity in agriculture of the Eastern Region lies mainly in intensifying agriculture through advanced techniques of production and development of linkages with modern science and industry. Intensification of agriculture, when carried out through science-based and industry-linked modern farming methods raises land and labour productivity, generates spread effects and encourages activities other than crop production in rural areas.

2.2.2 We feel that in planning for economic development of the Eastern Region, much greater emphasis has to be placed on the agricultural sector than hitherto. The rationale for this strategy stems from several considerations.

2.2.3 The first is the sheer need to expand food production for the Eastern Region's growing population. Scope for land expansion has now been almost exhausted in the region. Increase in production has, therefore, to be obtained through intensive utilization of land resources.

2.2.4 The second is the urgent need to provide some relief to the acute problem of rural unemployment and under-employment in the region. As employment opportunities in the non-agricultural sector are limited, the policy makers will have to rely on the agricultural sector for employing productively a large part of the increasing work force for many years to come. This is feasible only if intensification of agriculture in the region is hastened. Even in Japan and Taiwan, in spite of their spectacular industrialisation and mechanisation of agriculture, labour input per ha in agriculture is much higher than in Eastern India.

2.2.5 Thirdly, given the present level of utilisation of irrigation potential and on the basis of current knowledge and existing technology, the present high growth generating States in India are unlikely to experience the same high growth rate in future as in the past decade or so. On the other hand, Eastern India has the necessary potential to sustain a long-run agricultural growth rate at a much higher level than at present. It has rich soil and abundant manpower and receives plenty of rainfall. It has large untapped groundwater resources, a potent factor in the shaping of India's future agricultural growth pattern.

2.2.6 The fact that Eastern India has not been able to exploit fully its agricultural potential suggests that the existing policies and programme implementation for agricultural development are not adequate for efficient utilisation of the region's agricultural resource base.

2.2.7 In designing a programme for the agricultural development of the region, it will be unwise to search for a single set of solutions. This is because physical, structural, institutional, technological, socio-economic and organizational environments which together determine the level of technology vary widely from one area to another. The Eastern Region requires special treatment, as these environments are not only entirely different from some of the relatively advanced States like Punjab or Haryana, but are also

widely different even within the region itself. In fact, within the region there are a number of farms which are as efficient as any elsewhere in the country. Yet, the fact that the average farmer in the region lags so much behind the good in raising productivity indicates that the fault lies not so much with the farmers, but with the various constraints they face. The appropriate approach would be to indentify these constraints in each agro-climatic zone of the region and formulate location specific measures to overcome them.

2.2.8 To the extent feasible, we have attempted to identify the constraints at the State and zone levels and have made recommendations for accelerating agricultural development, some of which are location specific and some general in nature. In some cases, it may be necessary to go down to the district, block and even village levels. For instance, waterlogging has to be identified and tackled from the village level upwards. But we could not go into such detail in this study.

2.2.9 We are of the opinion that if the Eastern Region has settled down to a low level of productivity, it is not so much because its farmers lack dynamism and motivation. It is because the prevailing organizational, promotional and supporting services for practising modern agriculture impose such high risk and heavy managerial responsibility upon the farm operators far beyond the capability and capital resources of the small and marginal farmers, that they become helplessly dependent upon the semi-monopolistic public and private organizations. The present system is inflexible and provides little scope for manoeuvrability to the farm operators of the region. The poor input delivery system, low level of research and technical support and inadequate marketing facilities have made them reluctant to intensify agriculture and diversify cropping pattern. The smallness and fragmented nature of their holdings, inadequate and erratic power supply and the complex bureaucratic procedures have discouraged them from utilizing the available facilities for investment in pumps and other modern farm machinery.

2.2.10 We have noted with concern that some public men of the region have misguided the farmers about the functioning of the credit institutions and encouraged defaults, especially by the bigger farmers, thereby choking the credit system itself.

2.3 *Prospect*

2.3.1 A different set of policies and action programmes is needed for inducing a self-generating process of growth in the Eastern Region. Fortunately, the present socio-economic and political situation in the country seems to provide a more favourable setting than hitherto for introducing these new programmes and policies.

2.3.2 We feel from our studies and field visits that, as a result of the development efforts of recent times, the Eastern Region has now come near the threshold of rapid growth of agricultural productivity. The encouragement and support provided for construction of private tubewells in East U.P. have convinced the farmers of the advantages of a consolidated holding. The high returns from science-based modern farming have made the farmers of Bihar restless; they are demanding more action-oriented programmes for equitable development. The 'Operation Barga' in West Bengal has instilled confidence among the tenants; they are now looking forward to highly remunerative production programmes. The training and visit system of extension in Orissa has opened up new frontiers of knowledge to the farmers; they are asking for modern inputs for utilizing their newly acquired skill and knowledge.

2.3.3 A new environment is now surfacing in the Eastern Region. The policy challenge before us is to design a set of development programmes and action plans so that this new trend can gather momentum and propel the region to a higher level of economic activity.

2.3.4 Implementation of the action programmes set out in this Report will, however, require collective and coordinated efforts and substantial public investment, credit support from the banking system and, more importantly, efficient management. This is what we have set out in Chapters 7 to 16 of this Report. We would like to emphasise that although the threshold of agricultural breakthrough in Eastern India may now seem near, it may not be crossed easily. It will need a "big push" in terms of substantial investment and imaginative managerial effort, during the next two Plan periods.

Selected Economic Indicators

Annexure 2.1

State/Region	Population density per sq. km 1981	No. of agricultural workers per 100 ha of net sown area, 1981 ¹	Per capita foodgrains output in Kg. 1980-81 ¹	Cropping intensity, 1980-81 ¹	Value of output in, Rs.		
					Per ha of net sown area	Per ha of gross sown area	Per agricultural worker
1.	2.	3.	4.	5.	6.	7.	8.
West Bengal	621	155	143	135	2354	1655	1517
Orissa	169	106	196	138	1437	1059	1361
Bihar	402	198	131	133	1863	1170	812
East U.P.	483	167	165	142	1561	1334	1249
Eastern Region	381	160	151	137	1768	1288	1144
Maharashtra	204	82	160	110	858	788	1046
Gujarat	173	70	128	111	1257	1155	1800
Madhya Pradesh	118	81	202	114	785	680	967
Rajasthan	100	46	191	114	596	527	1281
Western Region	142	71	172	112	832	744	1171
Andhra Pradesh	195	138	187	116	1367	1182	990
Tamilnadu	371	184	144	123	2625	2136	1426
Karnataka	193	86	191	108	1158	1072	1344
Kerala	654	126	51	131	4614	3524	3645
Southern Region	257	129	155	115	1794	1552	1391
Punjab	331	68	711	159	3845	2422	5610
Haryana	291	60	458	147	2627	1736	4355
U.P. (excluding East U.P.)	333	137	209	139	2178	1569	1584
Northern Region	327	108	326	145	2624	1804	2432
All-India	221	105	181	123	1468	1198	1430

* Average of five years ending 1979-80 at 1978-79 prices.

¹ Triennium average.

State-wise Levels of Intensification in Inputs Use

Annexure 2.2

28

State/Region	Percentage of net sown area irrigated, 1978-79	Intensity of land use with irrigation, 1978-79 (Percent)	NPK in kg/ha of gross sown area, 1981-82	Percentage of cereals area under HYV, 1980-81	Percentage of villages electrified, 1982-83	No. of private energized wells per 1000 ha of net sown area, 1981-82
West Bengal	40.5	118.0	32.8	40.2	45.3	4.7
Orissa	18.8	138.2	9.9	22.3	43.4	31.9
Bihar	34.7	125.2	18.0	42.8	43.2	19.9
East U.P.	50.2	112.1	49.6	47.4	33.0	24.3
Eastern Region	36.0	122.8	26.4	37.7	41.0	13.6
Maharashtra	10.4	121.6	26.6	39.0	84.2	39.4
Gujarat	18.0	112.9	38.6	49.2	76.8	26.4
Madhya Pradesh	12.3	104.2	10.9	22.2	46.3	18.8
Rajasthan	18.7	119.2	7.9	19.8	50.2	15.1
Western Region	14.2	114.6	18.7	37.8	59.2	25.1
Andhra Pradesh	32.2	128.5	50.0	42.7	75.9	43.8
Tamilnadu	46.0	132.9	66.7	65.4	99.4	151.2
Karnataka	13.7	121.9	34.4	30.9	67.9	32.2
Kerala	10.3	155.3	32.9	39.2	100.0	46.0
Southern Region	27.1	129.7	47.3	44.2	78.5	62.3
Punjab	78.1	168.8	123.7	87.7	100.0	73.6
Haryana	52.5	155.3	45.5	66.7	100.0	65.0
U.P. (excluding East U.P.)	53.4	122.0	53.4	45.8	51.2	26.4
Northern Region	58.6	141.2	68.4	59.6	61.6	44.0
All-India	26.6	126.7	34.6	39.7	55.6	32.6

Annexure 2.3

Public Expenditure* Per Agricultural Worker

(Rupees)

State/Region	Fourth Plan (1969-74)	Fifth Plan (1974-79)	1979-80	Sixth Plan (1980-85)	Grand Total
West Bengal	193	561	160	816	1730
Orissa	183	454	196	1165	1998
Bihar	201	429	104	911	1645
U.P.	271	493	146	957	1867
Eastern Region ¹ (including U.P.)	228	480	142	946	1796
Eastern Region ² (excluding U.P.)	195	470	139	938	1742
Maharashtra	400	688	161	1459	2708
Gujarat	472	955	305	2244	3976
Madhya Pradesh	214	449	145	1032	1840
Rajasthan	344	638	175	1009	2166
Western Region ³	337	637	179	1355	2508
Andhra Pradesh	203	444	134	814	1595
Tamil Nadu	246	302	77	833	1458
Karnataka	314	610	167	1073	2164
Kerala	434	1005	325	2240	4004
Southern Region ⁴	258	479	138	981	1856
Punjab	863	1144	342	2084	4433
Haryana	916	1361	461	3149	5887
Northern Region ⁵	887	1244	397	2578	5106
All-India	361	571	167	1197	2296

* includes expenditure on

- (i) agriculture and allied services (including co-operation).
- (ii) irrigation and flood control and
- (iii) rural electrification.

Notes: ¹ Includes West Bengal, Orissa, Bihar and the entire State of U.P., due to non-availability of separate data for East U.P.

² Includes West Bengal, Orissa and Bihar.

³ Includes Maharashtra, Gujarat, Madhya Pradesh and Rajasthan.

⁴ Includes Andhra Pradesh, Tamil Nadu, Karnataka and Kerala.

⁵ Includes Punjab and Haryana.

CHAPTER 3

TRENDS IN AGRICULTURAL DEVELOPMENT

3.1.1 The performance of agriculture in Eastern India over the last two and a half decades, despite its rich natural resources, has been disappointing. This is in sharp contrast to the situation prevailing prior to 1960-61, when its productivity levels were well above other parts of the country. In this chapter, we present a brief review of the performance of agriculture in the region with particular reference to the last two and a half decades. Before we present this review, we shall first describe its resource potential and the physical factors limiting development of modern agriculture.

3.2 Physical Resources

3.2.1 Population: Eastern India is a very densely populated region. It covers a geographical area of 5.0 lakh sq. km. with a population of 192 million. Thus, it accounts for only about 15 per cent of the geographical area of the country, but 28 per cent of the total population. The region has the highest population density in the country, next only to Kerala¹. The number of agricultural workers per 100 ha of net sown area in the region in 1980-81 works out to nearly 160 as against all-India average of 105.

3.2.2 Climate and Rainfall: The climate of the region is tropical, hot and humid, except in hilly areas. The average annual rainfall ranges between 1300 mm and 1750 mm. There are, however, considerable inter-district variations in the quantum of rainfall received. There are also large variations within the season and from year to year which cause considerable instability in agricultural productivity and production. Even in the years when the total rainfall is normal, long drought spells or inadequate rainfall in crucial months of transplantation and plant growth adversely affect production.

¹ Excluding Union Territories.

3.2.3 As a result of heavy seasonal rainfall, the region is also prone to floods. Parts of the region are, however, drought-prone.

3.2.4 Climatic factors have endowed the region with a comparative advantage to develop mainly a foodgrain (particularly rice) dominated agrarian economy. Bounties of nature, however, have led to complacency in the development of infrastructural facilities like irrigation and drainage and have made agriculture unduly dependent on rainfall.

3.2.5 *Soils* : A large part of the eastern region has alluvial soils. Parts of the region are covered by red and yellow soils, laterite soils and black forest soils. Soil erosion is one of the major problems faced in hilly and laterite areas. Salinity is another problem, especially in parts of the coastal areas of West Bengal and Orissa.

3.2.6 *Agro-climatic Zones* : Even though States of Eastern India are divided into distinct agro-climatic zones based on temperature, rainfall, humidity, altitude, groundwater status and other common characteristic features, this region may be broadly classified as follows :

<i>Category</i>	<i>Groundwater status</i>
1. Alluvial Plain	White/grey
2. Plateau	Grey/dark
3. Hill/Terai	White/grey
4. Coastal Saline	Grey/dark

3.2.7 Alluvial plains include river basins of West Bengal (all districts except Darjeeling, Purulia, Bankura and coastal saline areas), deltaic regions of Orissa, North Bihar, parts of South Bihar and practically the whole of East U.P. (except Mirzapur). These are the most fertile parts of the region.

3.2.8 *Land Use Pattern*: In the eastern region, about 80 per cent of the culturable area is utilised for crop production. The scope for further expansion of net sown area for cultivation is limited, except to some extent in Bihar (Table 3.1).

Table 3.1. Land Use Pattern, 1980-81

State/Region	Percentage of net sown area to reporting area	Percentage of net sown area to culturable area*	Percentage of forests to reporting area
West Bengal	62.9	89.1	13.4
Orissa	39.5	82.1	42.7
Bihar	48.0	71.5	16.3
East U.P.	65.6	86.7	9.5
Eastern India	51.0	80.6	22.8
All India	46.1	75.8	22.1

* Total of net sown area, current fallows, other fallow lands, cultivable waste land and land under miscellaneous tree crops and groves.

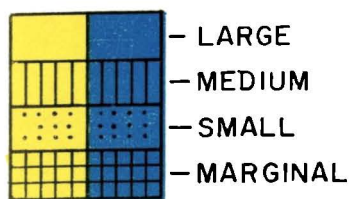
3.2.9 Agrarian Structure: The average size of operational holding is very small. The bulk of the farm operators are small and marginal farmers. The proportion of marginal farmer holdings (1 ha and less) is highest in East U.P. followed by Bihar, West Bengal and Orissa (*vide* Annexure 3.1).

3.2.10 Although the bulk of the farm operators are small and marginal farmers (around 90 per cent in East U.P., West Bengal and Bihar and 75 per cent in Orissa), they account for only about 40 per cent of the cultivated area in Orissa and Bihar and around 60 per cent in West Bengal and East U.P. Due to the preponderance of small and marginal farmers, the average size of the holding is 0.7 ha in East U.P., about 1 ha in Bihar and West Bengal and 1.6 ha in Orissa. However, for the bulk of the farm operators who are marginal farmers, the average size of the holding ranges from 0.3 to 0.4 ha in East U.P., Bihar and West Bengal and 0.5 ha in Orissa (Table 3.2). Since about half the area is cultivated by farmers with 2 ha or more and have relatively more resources and better risk-bearing and trend-setting capacity, their contribution to overall production is very important.

SIZE-WISE DISTRIBUTION OF LAND HOLDINGS

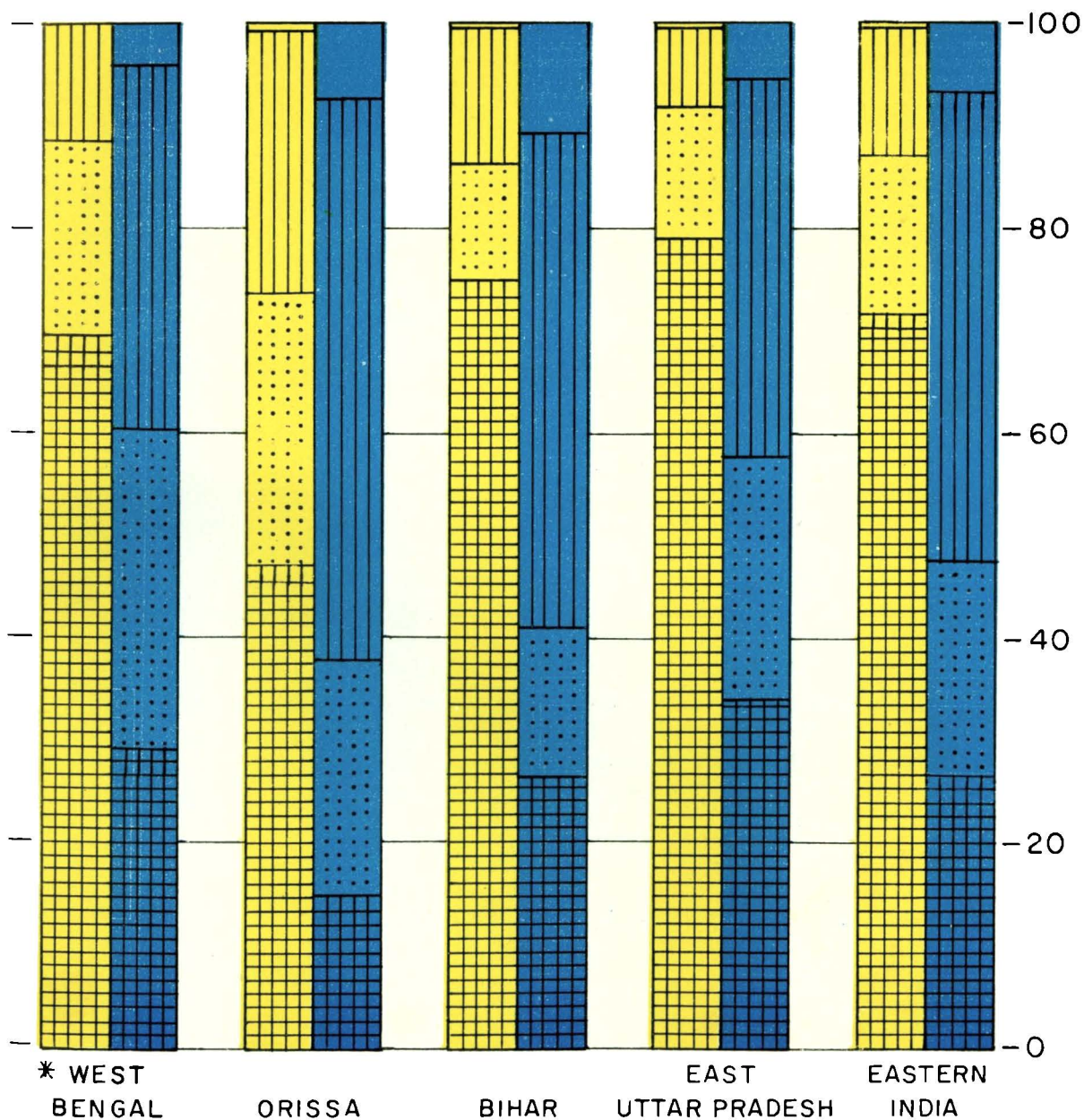
1980-81

(PER CENT)



HOLDING

AREA



* The percentage of large size holdings is negligible

Table 3.2. Average Size of Holdings, 1980-81

(In ha)					
Size group	West Bengal	Orissa	Bihar	East U.P.	Eastern India
0 to 1 ha	0.4	0.5	0.4	0.3	0.4
1 to 2 ha	1.5	1.4	1.3	1.4	1.4
2 to 10 ha	3.2	3.4	3.7	3.5	3.5
Above 10 ha	13.9@	14.0	17.1	16.5	18.0
Average	0.9	1.6	1.0	0.7	1.0

@ Excluding districts of Darjeeling and Jalpaiguri, where the average size is high due to existence of large tea plantations.

3.2.11 Not only the size of the holding is very small, but it is also very fragmented. Acute fragmentation of holdings is widespread in the whole of Eastern India. Some efforts have been made to consolidate land holdings, but the progress is very slow, particularly in West Bengal and Bihar. In Orissa, the State Government accords priority to it. In Uttar Pradesh, consolidation had taken place earlier, but a second round of consolidation has now become necessary, due to fragmentation of holdings consolidated earlier.

3.2.12 Sharecropping is widely prevalent in the region. In West Bengal, under "Operation Barga", attempts have been made to record sharecroppers but the process is still not complete. In other States, the process of recording sharecroppers has either not been taken up or is proceeding at a slow pace.

3.2.13 *Irrigation*: The region has an extensive network of rivers, canals and lakes. It has also large groundwater potential. It would be no exaggeration to say that the bulk of Eastern India is floating on water. The identified ultimate irrigation potential from all sources in the region is estimated at around 350 lakh ha accounting for around 30 per cent of the all-India potential (Table 3.3).

Table 3.3. Irrigation Potential

(Lakh ha)

State/ Region	Major and medium irrigation	Minor irrigation	Total
West Bengal	23.1	38.0	61.1
Orissa	36.0	23.0	59.0
Bihar	65.0	59.0	124.0
East U.P. ¹	50.0	59.4	109.4
Eastern India	174.1	179.4	353.5
Percentage of All-India potential	29.8	32.7	31.2

¹ Estimated, as no separate official estimates are available for East U.P. The identified potential for U.P. as a whole is 125 lakh ha under major and medium irrigation projects and 132 lakh ha under minor irrigation.

3.2.14 In 1980-81, gross irrigated area as percentage of the known potential was around 30 in Orissa, Bihar and East U.P. and 40 in West Bengal. The percentage of gross area irrigated to gross cropped area was also low, being about 20 in Orissa, 32 in West Bengal and Bihar and 42 in East U.P. (Table 3.4).

Table 3.4. Irrigated Area-Triennium Average, 1980-81

State/Region	Area irrigated (Lakh ha)	Percentage of potential utilised	Percentage of gross cropped area irrigated
West Bengal	23.9	39.1	32.0
Orissa	16.8	28.5	20.0
Bihar	35.3	28.4	32.1
East U.P.	33.7	30.8	42.0
Eastern India	109.7	31.0	31.5

3.2.15 The exploitation of groundwater resources in the region is low — around 6 per cent of the potential in Orissa, 24 per cent in West Bengal, 25 per cent in Bihar and 32 per cent in East U.P. This is in sharp contrast to Punjab and Haryana where 90 per cent and 80 per cent of the groundwater potential has been exploited.

3.2.16 *Waterlogging*: A serious problem in the region is waterlogging. About 8 lakh ha in West Bengal and 1 lakh ha in Orissa are waterlogged. It is estimated that in East U.P. about 4.5 lakh ha in Sharda Sahayak and 2.5 lakh ha in Gandak Command Area are waterlogged. According to the State Government, 15 lakh ha in 1982 and 11 lakh ha in 1983 were affected by floods and waterlogging in East U.P. About 17 lakh ha in North Bihar are affected by floods and areas remain flooded from a few weeks to 3 to 4 months depending on the physiographic situation. Part of South Bihar is also affected by waterlogging due to floods in the *kharif* season.

3.2.17 Heavy rains, combined with denudation of forests in catchment areas of rivers, give rise to heavy floods during monsoon. The natural flow of water has been blocked in many places as a result of improper alignment of railways, roads, canals and embankments and inadequate provision of bridges, culverts and siphons. Encroachment on drainage channels has aggravated the problem. Very little attention has been paid to construct the needed network of field drains, intermediate and bigger drainage channels. Hundreds of crores of rupees worth of property and crops are lost every year as a result of floods and waterlogging. An invidious but no less serious loss is the damage to crops and hazard to the health of human beings and cattle caused by filaria, diarrhoea and other debilitating diseases resulting from waterlogging. In addition, floods have damaged the soil in some areas by depositing sand.

3.3. *Agriculture in Pre-Independence Period*

3.3.1 As noted earlier, the British had saddled agriculture in Eastern India with serious institutional problems. In particular, the Permanent Settlement System gave the zamindars unprecedented position and authority. Unlike in ryotwari areas in other parts of the country, in zamindari areas, the ownership and control of lands steadily fell into the hands of a small number of landlords

and intermediaries, breaking down in the process the co-operative village structure existing earlier. The principal interest of this controlling group in agriculture was to extract maximum rent from tenants, either in cash or in kind. Many members of this group were absentee landlords who diverted capital from rural to urban areas. Other tenants of land, under intermediary and landlord control, sublet their land in smaller plots to working cultivators. Thus smaller holdings increased in number. Under this arrangement, economic motivation to develop farm land for increased production or for improving the economic conditions of cultivators was lacking. At the same time, working cultivators after paying high rent, had no surplus to invest in farm improvement. Thus, the agricultural land resource of Eastern India, along with its operators, was gradually impoverished because economic motivation leaned more towards exploitation than towards investment and improvement.

3.4 Agriculture in Post-Independence Period

3.4.1 After Independence, zamindari abolition programmes were undertaken, which initially enthused the tillers of Eastern India, but failed to create an environment conducive to agricultural growth to any significant extent. Wide persistence of absentee landlordism and disguised tenurial arrangements continued to dampen the enthusiasm of the tillers for productive cultivation.

3.4.2 Crop cultivation continued under poor water management conditions. Lack of adequate irrigation and drainage facilities, poor research and extension programmes and inadequate power, transport and marketing arrangements presented an environment in which farmers found little scope and incentive for intensifying production through improved methods.

3.4.3 In the absence of a strong progressive farm lobby, action programmes became inflexible and gave little recognition to the felt needs and aspirations of the tillers.

3.4.4 It was, however, after the introduction of the new strategy for agricultural development in the country in the mid-1960s that lack of modern infrastructure facilities in Eastern India came into sharp focus. The critical elements in the new strategy were high yielding varieties of seeds and fertilizers which require adequate

and controlled water supply for successful results. A deliberate policy of combining high yielding varieties of seeds with a package of complementary inputs was introduced in selected water assured areas of the country. In the phased introduction of the new strategy, Eastern India received lower priority and lost the benefit which accrued to the initial adopters.

3.4.5 Further, unlike wheat, the new varieties of rice, the pre-dominant crop of Eastern India, gave less spectacular results. High rainfall, often causing flood situation and making water management difficult, low fertilizer response under such conditions, cloud-cover and high humidity encouraging pests and diseases posed formidable problems for the cultivation of high yielding rice varieties in Eastern India.

3.4.6 Moreover, the various resources in kind and cash needed to adopt the new technology of rice production were beyond the reach of small farmers in Eastern India. The governmental machinery and the banking system could not cope with the task of providing adequate inputs needed by the bulk of the farmers to adopt the new technology. Hence, among the resource-poor farmers, the traditional method of cultivation continued to dominate the scene. On the other hand, the large land holders in Eastern India who were in a position to adopt the new technology were apparently not interested in doing so because they could get good enough income from the traditional technology by using cheap labour. As a result, the new technology of crop production spread tardily in the eastern region.

3.4.7 The failure of the eastern region to adapt itself to the advanced techniques of science-based and industry-linked farming, coupled with insufficient development of infrastructure, has reduced it to a relatively low agricultural efficiency region of India. This is evident from the trends in production and productivity since 1960, presented in the following paragraphs.

3.5 *Production Trends since 1960*

3.5.1 *Cropping Intensity*: As the scope for bringing more area under cultivation was practically exhausted, some efforts were made to intensify land use through double and multiple cropping (Annexure 3.2). Between triennia ending 1960-61 and 1980-81, cropping intensity moved up in all States, except Bihar (Table 3.5).

Table 3.5. Cropping Intensity

(In per cent)

State/Region	Triennium ending		
	1960-61	1970-71	1980-81
West Bengal	117	126	135
Orissa	108	118	138
Bihar	138	131	133
East U.P.	131	132	142
Eastern India	125	127	137

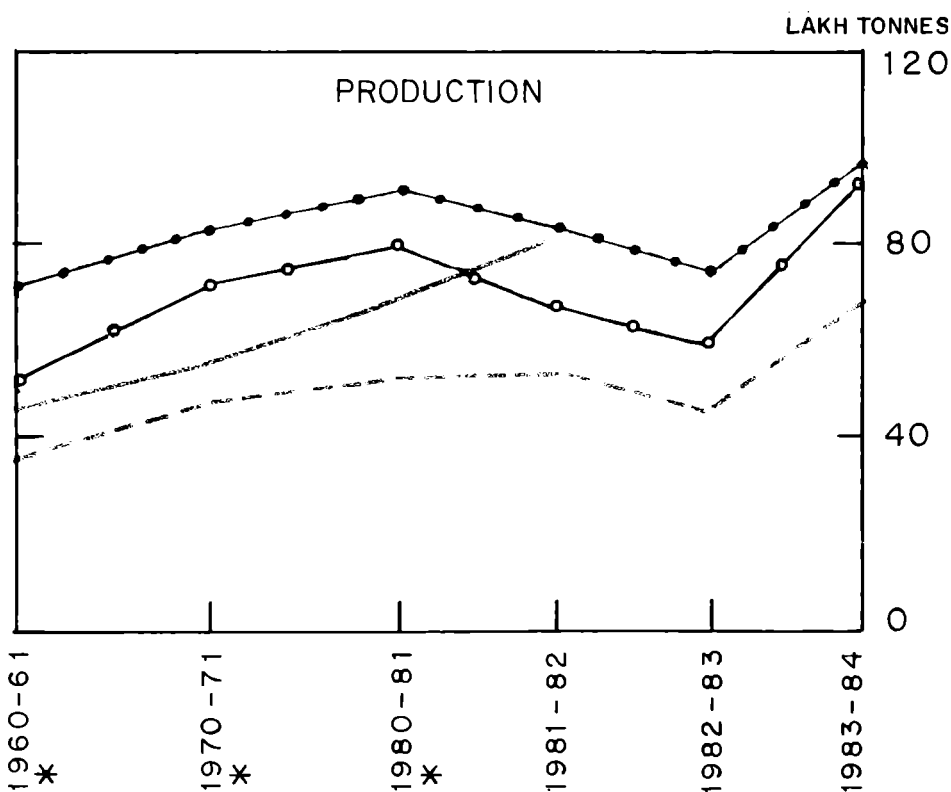
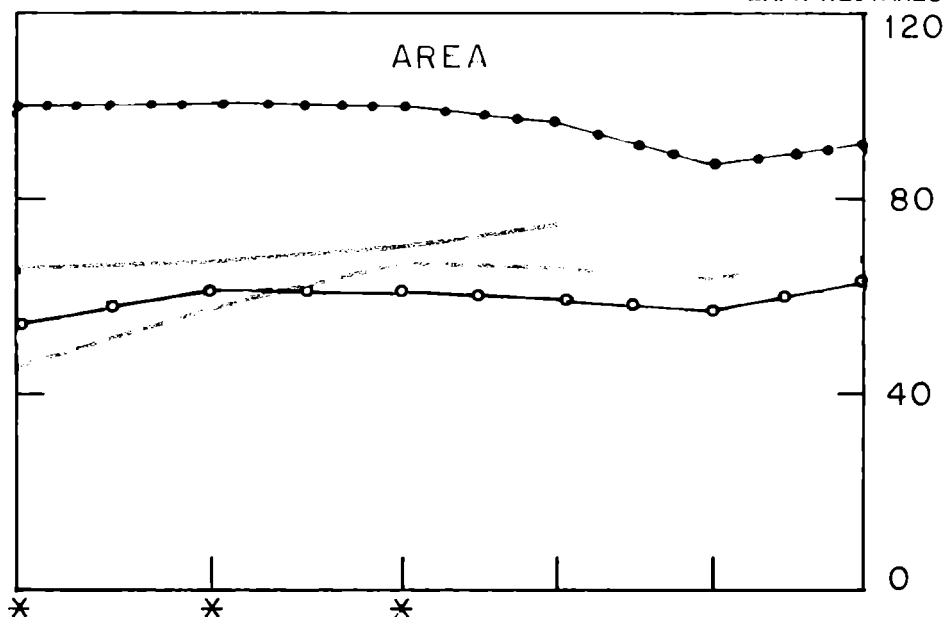
3.5.2 *Foodgrains*: In Eastern India, a substantial part of the cropped area is utilised for the cultivation of foodgrains. According to the latest land-use statistics for 1980-81, foodgrains account for 90 per cent of gross cropped area in Bihar and East U.P., and about 80 per cent in West Bengal and Orissa. Rice is the most important cereal crop, covering about 70 per cent of cropped area in West Bengal and 50 per cent in Orissa. Its share in Bihar and East U.P. is lower at around 45 per cent and 35 per cent respectively.

3.5.3 The production of foodgrains in West Bengal, Orissa and Bihar increased during 1961-71 at an annual compound growth rate of 3.3 per cent, 3.1 per cent and 1.5 per cent respectively. The growth rate, however, decelerated during 1971-81 to 1.0 per cent in West Bengal, 0.9 per cent in Orissa and 1.1 per cent in Bihar. On the other hand, East U.P. maintained its growth rate during the two reference periods at around 2 per cent per annum. For the 20-year period 1961-81, the annual growth rates were around 2 per cent in West Bengal, Orissa and East U.P. and 1.2 per cent in Bihar. During this period, the annual growth in foodgrains production in Punjab and Haryana was over 5 per cent.

3.5.4 The annual growth rate in productivity during the 20-year period was negligible in Orissa, 1.6 per cent in East U.P. and West Bengal and 1.2 per cent in Bihar. The growth in productivity was particularly poor during 1971-81. During this period,

AREA AND PRODUCTION UNDER FOODGRAINS

WEST BENGAL
 BIHAR
 ORISSA
 EAST UTTAR PRADESH
 LAKH HECTARES



* Triennium ending

whereas the growth rate in West Bengal, Bihar and East U.P. declined over the previous decade. Orissa witnessed a negative growth rate (Annexure 3.3).

3.5.5 The share of Eastern India in the country's foodgrains production came down from 26 per cent during triennium ending 1960-61 to 21 per cent during 1981-82. Foodgrains production received a setback in 1982-83, due to drought conditions. The year 1983-84, however, experienced a bumper harvest (Table 3.6).

Table 3.6. Production of Foodgrains

(Lakh tonnes)

State/Region	Triennium ending			During		
	1960-61	1970-71	1980-81	1981-82	1982-83	1983-84
West Bengal	51	70	78	65	59	92
Orissa	35	48	52	54	46	68
Bihar	70	81	90	82	73	96
East U.P.	46	55	69	81	NA	NA
Eastern India	202	254	289	282		
Percentage of all-India total	25.7	25.2	23.4	21.2		

3.5.6 *Rice*: The annual growth rate in production and yield of rice in the region during 1961-81 was modest. The growth rate in production was around 2 per cent in East U.P. and West Bengal, about 1 per cent in Orissa and 0.7 per cent in Bihar. The growth rate in productivity was even lower, 1.3 per cent in East U.P. and West Bengal, 0.6 per cent in Orissa and 0.4 per cent in Bihar (Annexure 3.3).

3.5.7 Yield of *kharif* rice, which accounts for the bulk of the region's rice production, has shown only a modest increase during 1971-81. Yield of summer rice, most of which is covered by HYV, showed a significant improvement in 1961-71, but showed a declining tendency during 1971-81 (Table 3.7).

Table 3.7. Yield of Rice

(Kg/ha)

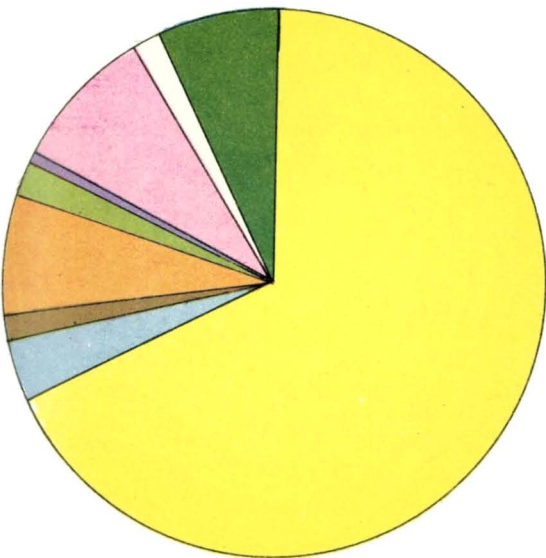
		Autumn (1)	Winter (2)	Summer (3)	Total (4)
<i>West Bengal</i>					
<i>Triennium</i>					
ending	1960-61	755	1083	1091	1040
„	1970-71	930	1220	2799	1213
„	1980-81	865	1310	2695	1349
<i>During</i>					
„	1981-82	960	1045	2534	1120*
„	1982-83	891	900	2591	1018*
„	1983-84	N.A.	N.A.	N.A.	1478
<i>Orissa</i>					
<i>Triennium</i>					
ending	1960-61	562	841	489	805
„	1970-71	517	944	1228	917
„	1980-81	535	999	1390	917
<i>During</i>					
„	1981-82	668	984	1385	926
„	1982-83	488	765	1385	737
„	1983-84	N.A.	N.A.	N.A.	1157
<i>Bihar</i>					
<i>Triennium</i>					
ending	1960-61	507	910	710	837
„	1970-71	487	837	1628	825
„	1980-81	692	933	980	907
<i>During</i>					
„	1981-82	677	806	1033	793*
„	1982-83	654	680	1033	681*
„	1983-84	N.A.	N.A.	N.A.	1016

* The drop in yields is attributable to drought conditions.

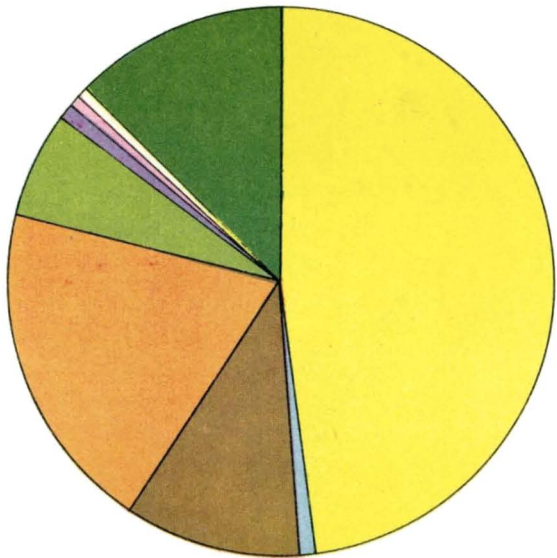
Note: Season-wise breakdown of rice yields is not available for East U.P. The average yield of rice for East U.P. during the above reference periods was as under.

Triennium ending 1960-61 :	600 Kg/ha
Triennium ending 1970-71 :	666 Kg/ha
Triennium ending 1980-81 :	773 Kg/ha
During 1981-82 :	975 Kg/ha

STATE-WISE PERCENTAGE OF AREA UNDER PRINCIPAL CROPS
TO GROSS CROPPED AREA-1980-81

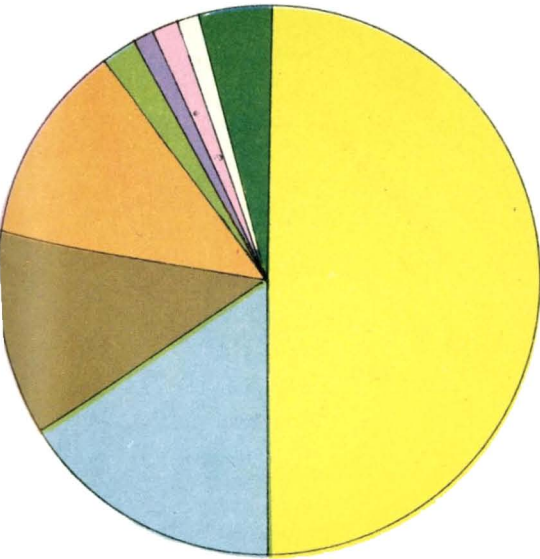


WEST BENGAL

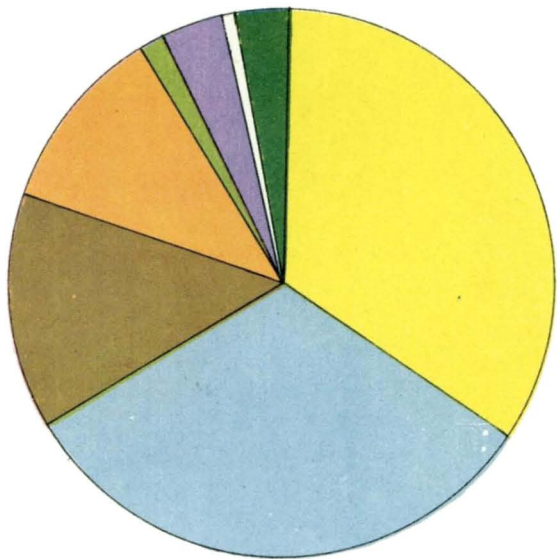


ORISSA

- | | | | | |
|-----------|--------------|---------------|--------|----------|
| RICE | WHEAT | OTHER CEREALS | PULSES | OILSEEDS |
| SUGARCANE | JUTE & MESTA | POTATO | OTHERS | |



BIHAR



EAST UTTAR PRADESH

3.5.8 Wheat: A significant development in the cropping pattern of the region is the impressive performance of wheat. In East U.P., the output of wheat went up from 6 lakh tonnes during the triennium ending 1960-61 to 39 lakh tonnes in 1981-82¹. In Bihar, it went up from 4 lakh tonnes during the triennium ending 1960-61 to 28 lakh tonnes in 1983-84. In West Bengal, it went up steadily from 0.3 lakh tonnes during the triennium ending 1960-61 to touch a high level of 12 lakh tonnes in 1975-76. Since then, there has been a setback in its production, touching a low level of 4 lakh tonnes in 1981-82. This was due to a drop in both area and yield (please see Part II of this Report). Subsequently, however, this trend was reversed and production started picking up reaching a level of 9 lakh tonnes in 1983-84. Orissa also improved its wheat production, although the total quantity produced by it is still low at 1.2 lakh tonnes in 1982-83 as against 4,000 tonnes during the triennium ending 1960-61. Eastern India contributed nearly 20 per cent (66 lakh tonnes) to the country's wheat production during 1981-82.

3.5.9 Wheat yields have shown a significant increase over the last two and a half decades, particularly in West Bengal as may be seen below.

Table 3.8. Yield of Wheat

State/Region	(Kg/ha)			
	Triennium ending			During 1983-84
	1960-61	1970-71	1980-81	
West Bengal	692	2323	1709	2596
Orissa	571	1243	1750	1906
Bihar	644	1045	1272	1554
East U.P.	738	1091	1347	1468*

* Relates to 1981-82.

3.5.10 Other Cereals: Area under other cereals comprising mainly maize, jowar, bajra, ragi, barley and small millets is small. In West Bengal, area under these crops remained more or less

¹ Subsequent data for East U.P. separately are not available. In 1983-84, however, it is reported that there was a substantial increase in production of wheat.

steady during 1961-71, but declined thereafter. In Bihar and East U.P., there was a sharp decline in the area covered by these crops, whereas in Orissa there was an increase.

3.5.11 In West Bengal, notwithstanding a fall in area, production of these cereals went up somewhat. Production increased significantly in Orissa due mainly to increase in area. In Bihar, although production suffered a setback between 1970-71 and 1981-82, there was an increase in production during the last two years due to improvement in yields. On the other hand, there has been a sustained decline in production in East U.P., due to a fall in both area and yields. During the period 1961-81, Orissa registered an annual growth rate of 11 per cent, and West Bengal of 1.5 per cent in production of these cereals. On the other hand, East U.P. and Bihar recorded negative growth rates of 3 per cent and 0.2 per cent per annum respectively, due mainly to a sharp decline in production during 1971-81.

3.5.12 The high growth rate witnessed in Orissa was due to a sizeable expansion in area. On the other hand, the growth in production in West Bengal was brought about by an increase in yields. Trends in yields of these crops between 1960-61 and 1983-84 are presented below :

Table 3.9. Yield of Coarsegrains

(Kg/ha)

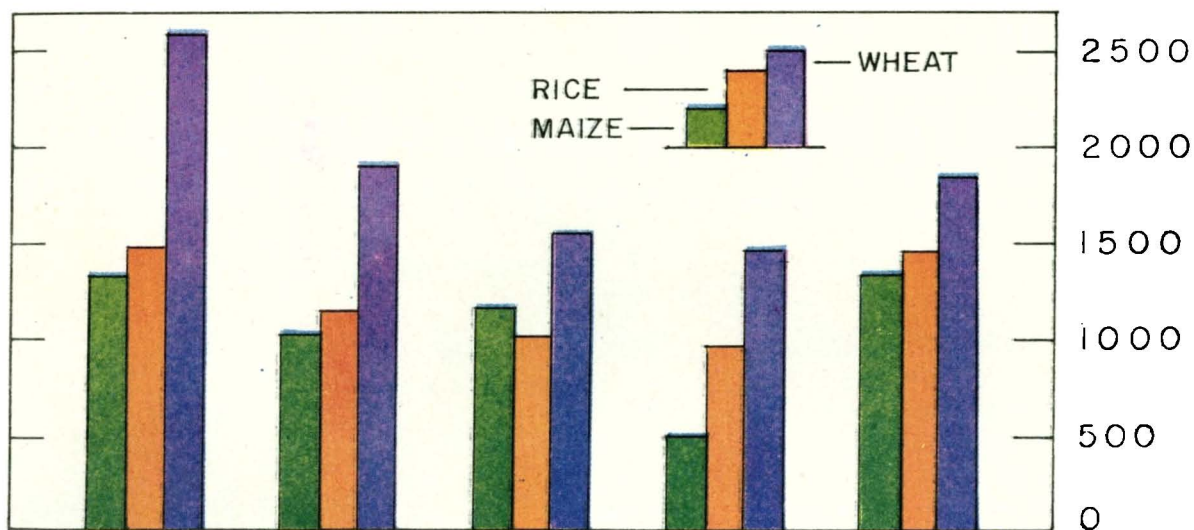
State/Region	Triennium ending			During 1983-84
	1960-61	1970-71	1980-81	
West Bengal	602	779	945	1093
Orissa	404	667	640	910
Bihar	697	821	848	991
East U.P.	734	814	704	722*

* Relates to 1981-82.

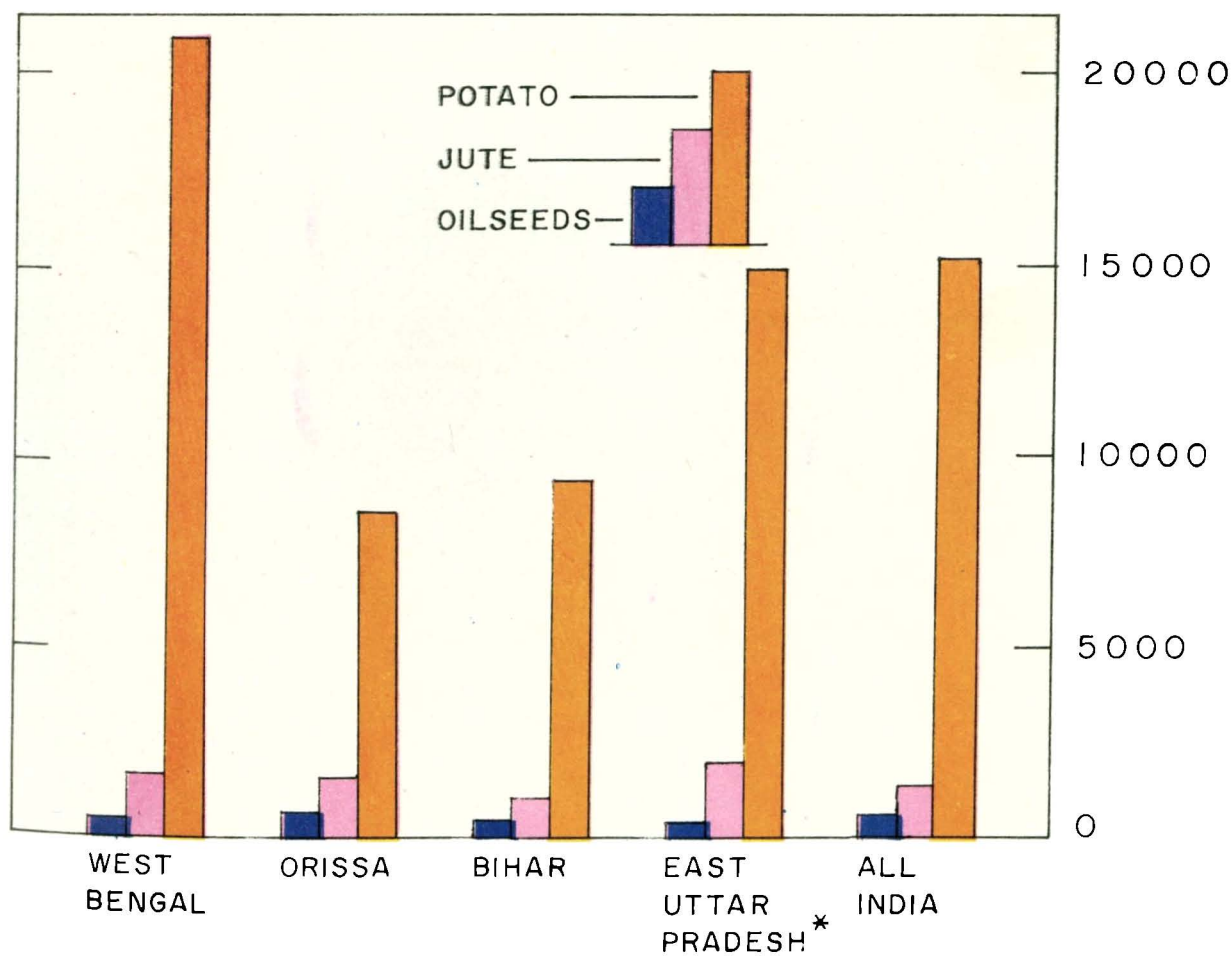
3.5.13 *Pulses*: Major pulses grown in the region are gram, tur and mung. Both area under pulses and their production have registered a declining trend since 1960-61, except in Orissa. It is noteworthy that yields of pulses have shown a steady rising trend in

PER HECTARE YIELD OF MAJOR FOODGRAIN CROPS -1983-84

(Kg / Ha.)



PER HECTARE YIELD OF MAJOR NON-FOODGRAIN CROPS-1983-84



Data relates to 1981-82

recent years in West Bengal and Orissa. In East U.P., the declining trend set in since 1970-71 persists (Table 3.10).

Table 3.10. Yield of Pulses

(Kg/ha)

State/Region	Triennium ending			During 1983-84
	1960-61	1970-71	1980-81	
West Bengal	487	561	493	655
Orissa	488	522	454	620
Bihar	475	636	538	591**
East U.P.	766	852	799	707*
Eastern India	525	624	534	592

** Relates to 1982-83.

* Relates to 1981-82.

3.5.14 *Non-foodgrains*: The main non-foodgrain crops grown in the region are sugarcane, oilseeds, jute and mesta, potato and fruits and vegetables. The area covered by these crops is relatively small, about 10 per cent of gross cropped area in East U.P. and Bihar, and 20 per cent in West Bengal and Orissa.

Table 3.11. Production of Non-Foodgrains during 1983-84

Crop	West Bengal	Orissa	Bihar	East U.P.
Sugarcane (Lakh tonnes)*	1.0	2.9	3.9	14.1@
Oilseeds (Lakh tonnes)	1.9	6.9	1.2	0.6@
Jute & Mesta (Lakh bales of 180 Kgs)	41.1	5.2	9.1	Neg.
(Lakh tonnes)	30.4	0.8	12.4	13.8
Potato@				

* In terms of gur.

@ Relates to 1981-82.

3.5.15 *Sugarcane*: Area under sugarcane in the region is small. While there was a decline in area in Bihar, West Bengal and East U.P. during 1961-81, there was some increase in Orissa. Production in East U.P. showed considerable ups and downs during 1961-81, with an improvement in 1981-82. In Bihar, the underlying trend was one of a shrinkage in production, except in 1981-82 and 1982-83. On the other hand, Orissa registered a progressive increase between 1960-61 and 1982-83. For 1961-81 as a whole, while Orissa increased its production at an annual rate of 7 per cent, Bihar recorded a decline of 3 per cent, East U.P. a marginal growth rate of 0.5 per cent and West Bengal a negative growth rate of 0.4 Bihar, as may be seen below.

3.5.16 *Sugarcane* yields are low in the region, particularly in Bihar, as may be seen below.

Table 3.12. Yield of Sugarcane
(In terms of gur)

State/Region	Triennium ending			During 1983-84
	1960-61	1970-71	1980-81	
West Bengal	46	56	56	50
Orissa	31	55	62	68
Bihar	38	39	30	30
East U.P.	31	43	36	45*

* Relates to 1981-82.

3.5.17 *Oilseeds*: Main oilseeds produced in the region are rapeseed and mustard, groundnut, linseed and nigerseed. The highest annual growth in oilseeds production during 1961-81 was achieved by Orissa (10 per cent), followed by West Bengal (4 per cent), Bihar (2 per cent), and East U.P. (0.3 per cent). Orissa is the main oilseeds producer in the region, which accounted for a little over 60 per cent of the total production in 1981-82. Yield of

oilseeds has shown an upward trend, particularly in recent years, as may be seen below.

Table 3.13. Yield of Oilseeds

(Kg/ha)

State/Region	Triennium ending			During		
	1960-61	1970-71	1980-81	1981-82	1982-83	1983-84
West Bengal	315	409	451	508	478	519
Orissa	332	593	561	694	752	735
Bihar	311	450	415	473	484	502
East U.P.	354	364	317	439	N.A.	N.A.

3.5.18 Jute and Mesta: Jute and mesta are the most important cash crops of the region. West Bengal, Bihar and Orissa together account for over 80 per cent of the country's jute production and 30 per cent of mesta production. Production of jute in West Bengal went up between 1960-61 and 1981-82 due to an increase in both area and yields. It came down somewhat in 1982-83, because of drought conditions but picked up in 1983-84. In Bihar, production came down during 1961-71, but improved somewhat thereafter; even so, the production level achieved in 1981-82 was lower than in the triennium ending 1960-61. There was a further drop in production during 1982-83. Orissa improved its production from the 1960 level. Production in East U.P. is negligible. As regards mesta, production declined in West Bengal, but increased in Orissa and to some extent in Bihar.

3.5.19 Yields of jute registered an upward trend in West Bengal and Orissa, but a decline in Bihar during 1961-81. During the same period, yields of mesta showed a significant improvement in Bihar, a slight increase in West Bengal and remained more or less steady in Orissa (Tables 3.14 and 3.15).

Table 3.14. Yield of Jute

(Kg./ha)

State/Region	Triennium ending			During		
	1960-61	1970-71	1980-81	1981-82	1982-83	1983-84
West Bengal	1253	1200	1344	1592	1551	1544
Orissa	1030	1281	1388	1331	1351	1519
Bihar	1085	895	955	1061	1116	1116
East U.P.	1167	1250	1433	2000	N.A.	N.A.

Table 3.15. Yield of Mesta

(Kg/ha)

State/Region	Triennium ending			During		
	1960-61	1970-71	1980-81	1981-82	1982-83	1983-84
West Bengal	979	985	1040	954	900	1040
Orissa	905	1033	925	912	888	888
Bihar	629	735	941	920	872	1114
East U.P.	—	—	—	—	—	—

3.5.20 *Potato*: Production of potato registered a significant increase in the eastern region. The annual growth rate in potato output during 1961-81 was 7 per cent in West Bengal and East U.P. and 4 per cent in Bihar (Annexure 3.4). This was brought about both by an increase in area and yield. Orissa, however, showed a divergent trend. During 1961-71, there was a marked increase in production, followed by a sharp decline during 1971-81.

3.5.21 Potato yields recorded a sharp increase since 1960-61 in West Bengal and East U.P. In Orissa, they declined after 1970-71. In Bihar too, yields declined after 1970-71, but improved somewhat in 1981-82 (*vide* table 3.16).

Table 3.16. Yield of Potato

(Kg/ha)

State/Region	Triennium ending			During 1983-84
	1960-61	1970-71	1980-81	
West Bengal	10327	12277	16695	20988
Orissa	3000	11183	6815	8505
Bihar	6719	9802	8022	9336
East U.P.	7050	9057	13625	14923*

* Relates to 1981-82.

3.5.22 West Bengal now ranks second in the country in terms of potato yield next only to Gujarat.

3.5.23 *Fruits and Vegetables*: The cultivation of fruits and vegetables is gaining in importance particularly in the periphery of towns in Eastern India, especially in West Bengal. About 5 per cent of the gross cropped area was utilised for the cultivation of these crops during 1980-81, as may be seen below.

Table 3.17. Area Under Fruits and Vegetables, 1980-81

State/Region	Area (Lakh ha.)	Percentage of total gross cropped area
West Bengal	3.8	4.8
Orissa	6.0	6.8
Bihar	4.5	4.0
East U.P.	1.8	2.2
Eastern India	16.1	4.5

3.5.24 Increasing amounts of inputs, e.g., irrigation, fertilizers, etc., are known to be used for the production of vegetables and the high yields obtained. Precise data on their yields are, however, not available.

3.6 *Input Use*

3.6.1 An important contributory factor for a substantial increase in land productivity is the intensified use of HYV seeds and fertilizers. Although their application has been rising, particularly since 1970, with the expansion of irrigation and promotional activities of the State Governments, their use, particularly in Bihar and Orissa is still relatively low. Between 1975-76 and 1980-81, area under HYV rice went up from 19 to 36 per cent in West Bengal, from barely one to 29 per cent in Orissa and from 15 to 26 per cent in Bihar. East U.P. improved its area coverage to 50 per cent by 1981-82.

3.6.2 Area under wheat is almost fully covered by high yielding varieties. HYV coverage of maize is around 50 per cent in Bihar, and 28 per cent in Orissa, but only 3 per cent in East U.P.

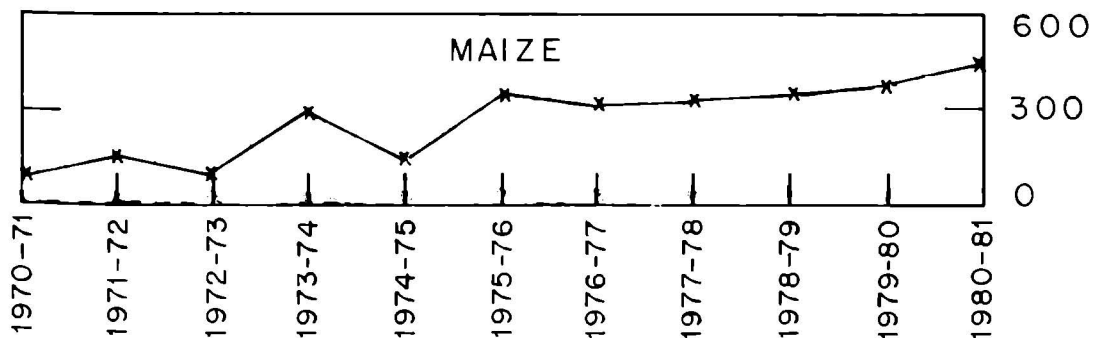
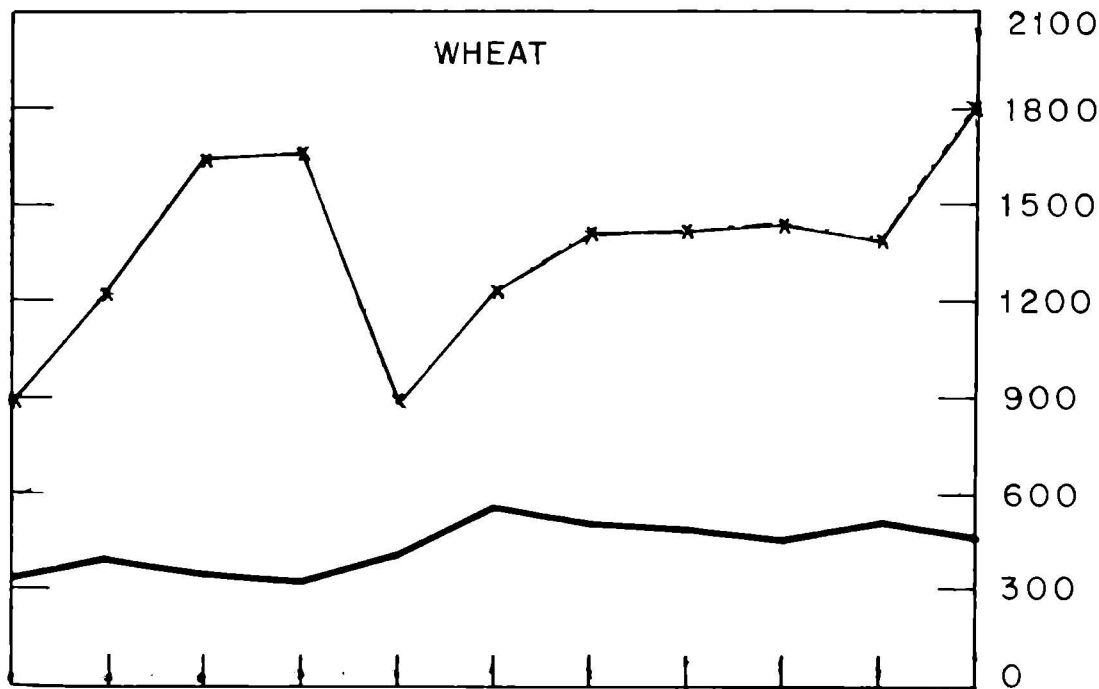
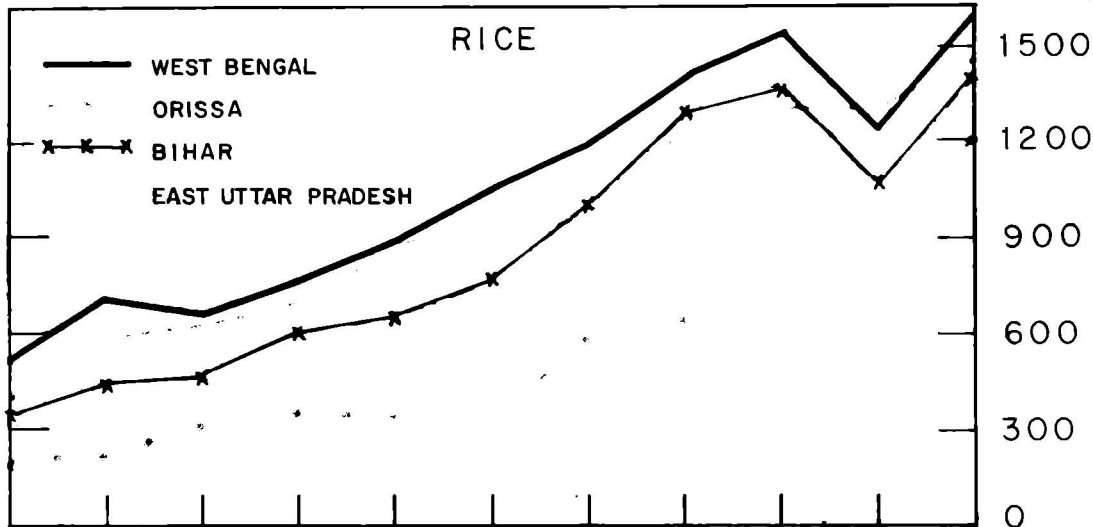
3.6.3 Consumption of fertilizers was negligible in the early 1960s. It improved during the last decade. Between 1970-71 and 1983-84, consumption of fertilizers per ha of gross cropped area went up from 14 to 44 kg in West Bengal, 9 to 26 kg in Bihar and 4 to 14 kg in Orissa. East U.P. has considerably improved its consumption, touching a level of 64 kg/ha in 1981-82. Although West Bengal is now close to the all-India average of fertilizer consumption (45 kg/ha in 1983-84) and East U.P. has exceeded it, they are much behind Punjab (152 kg/ha) and Tamil Nadu (73 kg/ha).

3.7 *Credit*

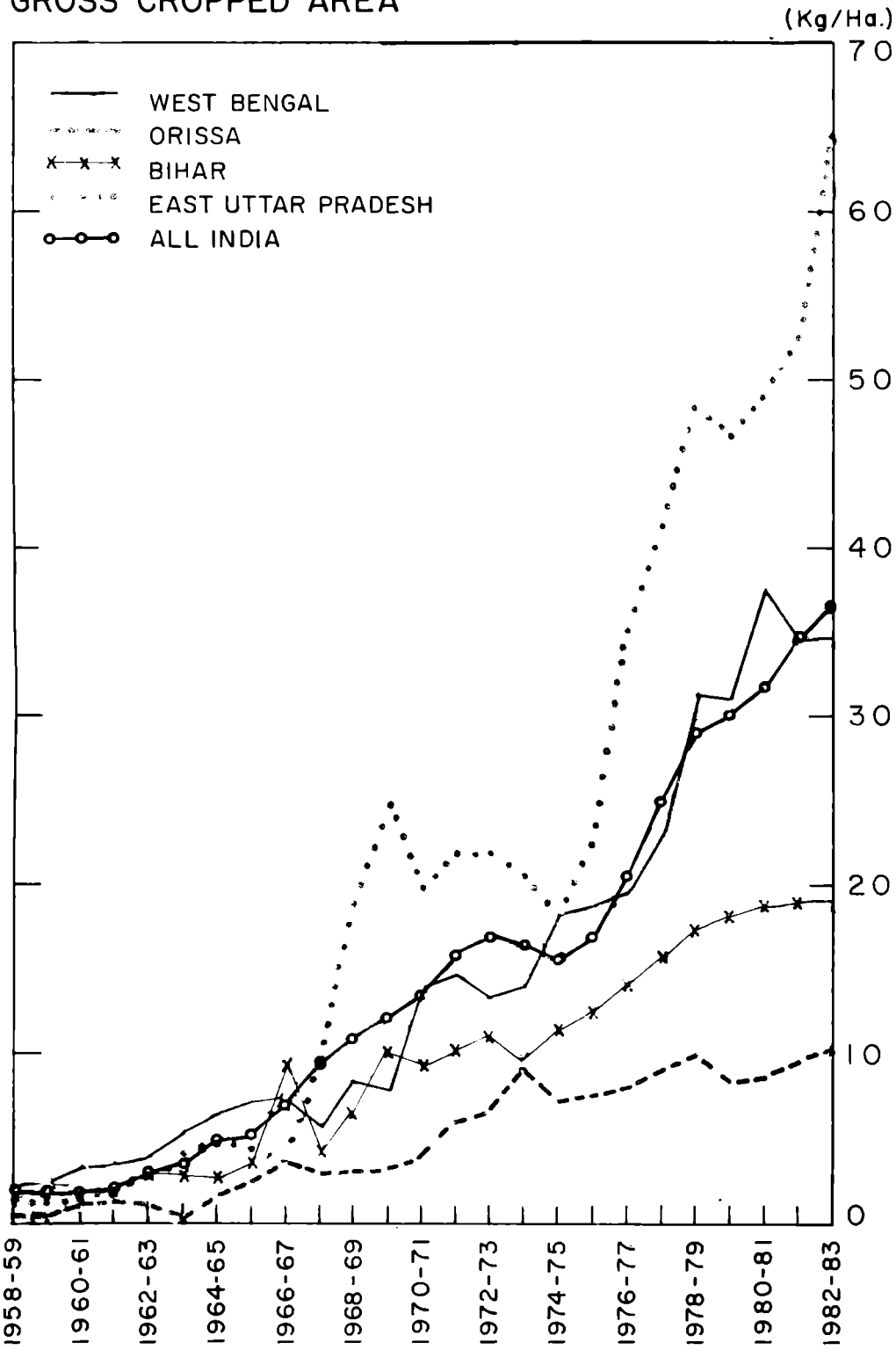
3.7.1 The use of HYV seeds and fertilizers depends crucially on the availability of credit to finance their purchase, given the poor resource position of the bulk of the farmers in the region. The scenario of institutional credit for agriculture since the mid-1970s is characterised by (i) an expansion of credit upto late 1970s and (ii) a build-up of overdues. The latter has now reached such a proportion as to choke the credit pipeline with consequent repercussions on efficient supply and use of inputs, thereby affecting adversely improvement in productivity.

HIGH YIELDING VARIETIES AREA UNDER RICE, WHEAT & MAIZE

('000 ha)



CONSUMPTION OF FERTILISER PER UNIT OF GROSS CROPPED AREA



3.7.2 Short-term credit for purchase of inputs and meeting other crop production expenses is provided mainly by Primary Agricultural Credit Societies (PACS), Commercial Banks and Regional Rural Banks (RRBs). Medium-term and long-term loans for construction of dugwells, sinking of tubewells, purchase of pumpsets and other farm machinery and for investments in plantations and horticulture, animal husbandry programmes, etc., are provided mostly by Land Development Banks (LDBs), Commercial Banks and RRBs.

3.7.3 PACS: Disbursements of short-term credit by PACS were low upto 1970-71. They picked up since the mid-1970s. Whereas there has been an increase in the disbursement of credit between 1970-71 and 1982-83 in Bihar, Orissa and U.P. a declining trend was discernible in West Bengal since 1978-79 (Table 3.18).

Table 3.18. Short-term Credit Disbursed by PACS
(Rs. crores)

Year	West Bengal	Orissa	Bihar	U.P.*
1970-71	5.4	7.8	11.5	48.4
1974-75	20.7	14.4	13.0	71.0
1978-79	51.6	31.5	21.0	157.4
1979-80	38.2	41.1	21.0@	147.6
1980-81	38.6	54.6	14.6	162.6
1981-82	41.5	59.0	25.4	179.3
1982-83	32.1	58.1	26.9	206.3

* Separate data for East U.P. are not available. @ Relates to 1978-79.

3.7.4 In East U.P., disbursements of loans (both short-term and medium-term) by CCBs to PACs showed an increase from Rs. 22 crores in 1971-72 to Rs. 67 crores in 1979-80.

3.7.5 Medium-term loans disbursed by PACS are small in West Bengal and Bihar. They recorded a significant increase in recent years in Orissa and U.P., as may be seen below.

Table 3.19. Medium-term Loans Disbursed by PACS
(Rs. crores)

Year	West Bengal	Orissa	Bihar	U.P.*
1970-71	0.2	0.9	0.9	3.0
1979-80	3.4	21.6	3.9	70.3
1980-81	2.5	12.6	2.0	26.3
1981-82	3.9	10.7	2.3	42.0
1982-83	0.6	15.7	2.2	40.8

* Seperate data for East U.P. are not available.

3.7.6 Loans disbursed by PACS per reporting member and per ha are small, as may be seen below.

Table 3.20. Loans Disbursed by PACS
(in rupees)

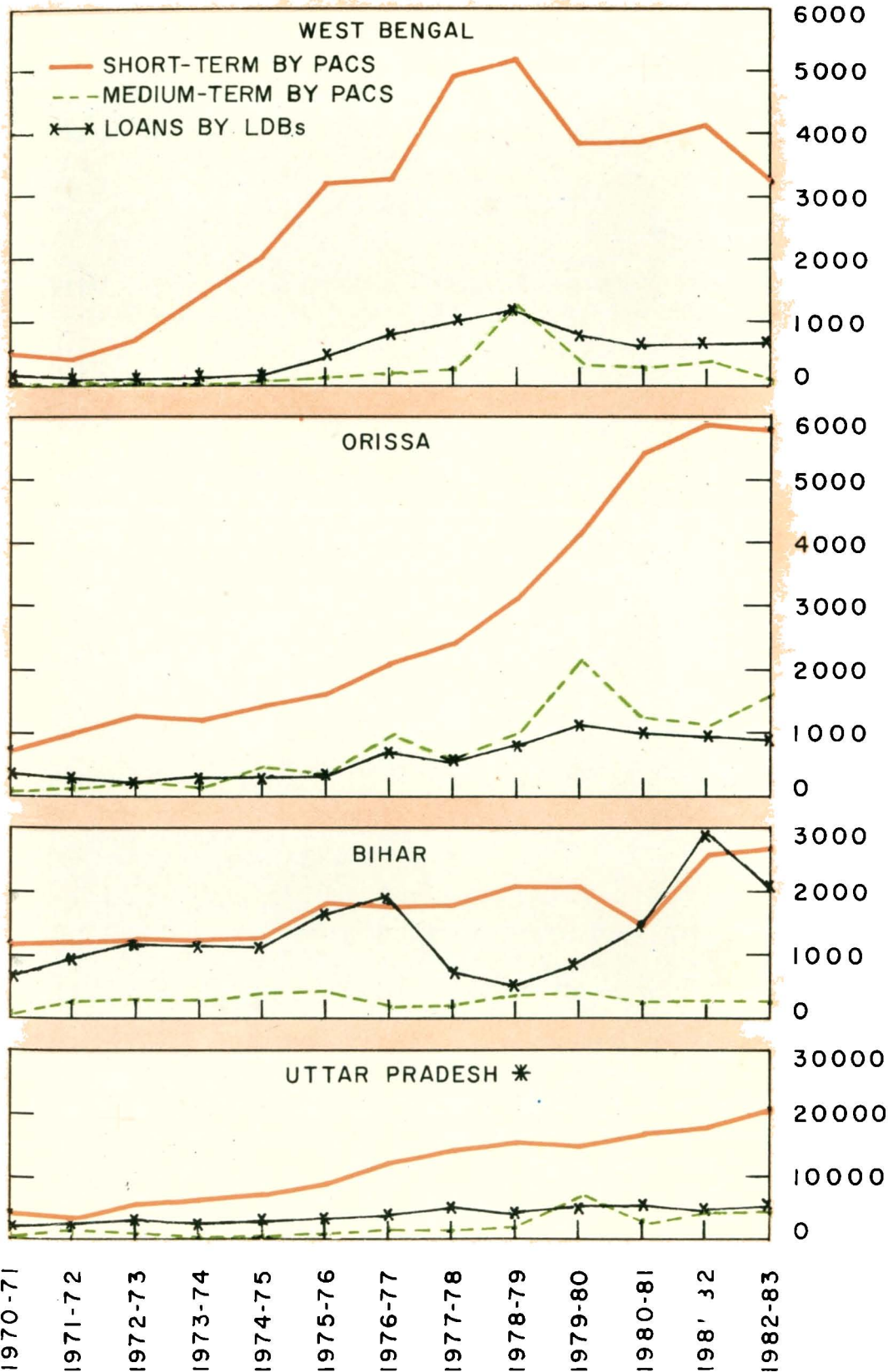
	Per borrowing member		Per ha*	
	1981-82	1982-83	1981-82	1982-83
West Bengal	600	433	57	41
Orissa	1111	1301	84	89
Bihar	102	104	24	25
U.P.	703	749	91	102

* Based on gross cropped area for 1978-79.

3.7.7 LDBs: Medium and longterm loans disbursed by LDBs showed a declining trend since 1978-79 in West Bengal and since 1979-80 in Orissa. In Bihar, loans issued by LDBs recorded a declining trend after 1981-82, the decline being very sharp in 1983-84.

LOANS DISBURSED BY PACS AND LDBs

Rs LAKHS



* Separate data for East U.P. are not available

Broadly, loans disbursed by LDBs in recent years were either stagnant or declining in West Bengal, Orissa and Bihar (Table 3.21).

Table 3.21. Loans Disbursed by LDBs

(Rs. crores)

Year	West Bengal	Orissa	Bihar	U.P.*
1970-71	1.2	3.6	6.9	21.6
1974-75	1.0	3.0	11.3	30.4
1978-79	12.1	7.9	5.2	43.8
1979-80	7.8	11.7	8.6	58.3
1980-81	6.6	9.9	14.3	52.6
1981-82	6.6	9.6	29.1	48.6
1982-83	6.7	9.0	20.2	54.3
1983-84	6.5	8.0	10.0	65.3

* Separate data for East U.P. are not available.

3.7.8 Commercial Banks: In recent years, there has been some increase in lending by commercial banks (including RRBs) to agriculture, helped by branch expansion in rural areas and priority accorded to agricultural lending. Disbursements of short-term credit by commercial banks touched a level of Rs. 18 crores in West Bengal, Rs. 31 crores in Orissa and Rs. 6 crores in Bihar during 1980-81. Term loans disbursed by commercial banks were Rs. 13 crores in West Bengal, Rs. 39 crores in Orissa and Rs. 15 crores in Bihar. (Annexure 3.5). As regards U.P., separate data for East U.P. are not available. Short-term and term loans disbursed by commercial banks in U.P. were Rs. 35 crores and Rs. 84 crores respectively.

3.7.9 Data on scheduled commercial banks' direct advances to agriculture during 1980-81 show that small and marginal farmers are the main beneficiaries of bank loans in West Bengal, Orissa and Bihar. In U.P., on the other hand, the main beneficiaries seem to be medium and large farmers.

Table 3.22. Scheduled Commercial Banks' Direct Advances to Agriculture, 1980-81

(Percentage of total)

	Short-term loans				Term loans			
	West Bengal	Orissa	Bihar	U.P.	West Bengal	Orissa	Bihar	U.P.
1 ha and less	73.0	37.6	31.4	18.6	19.5	38.5	29.8	11.6
Between 1-2 ha	17.2	26.4	35.2	20.1	32.3	22.1	25.9	15.4
Between 2-5 ha	6.3	18.8	22.4	21.5	15.0	20.8	13.3	11.7
5 ha and above	3.5	17.2	11.0	39.8	33.2	18.6	31.0	61.3
Total:	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

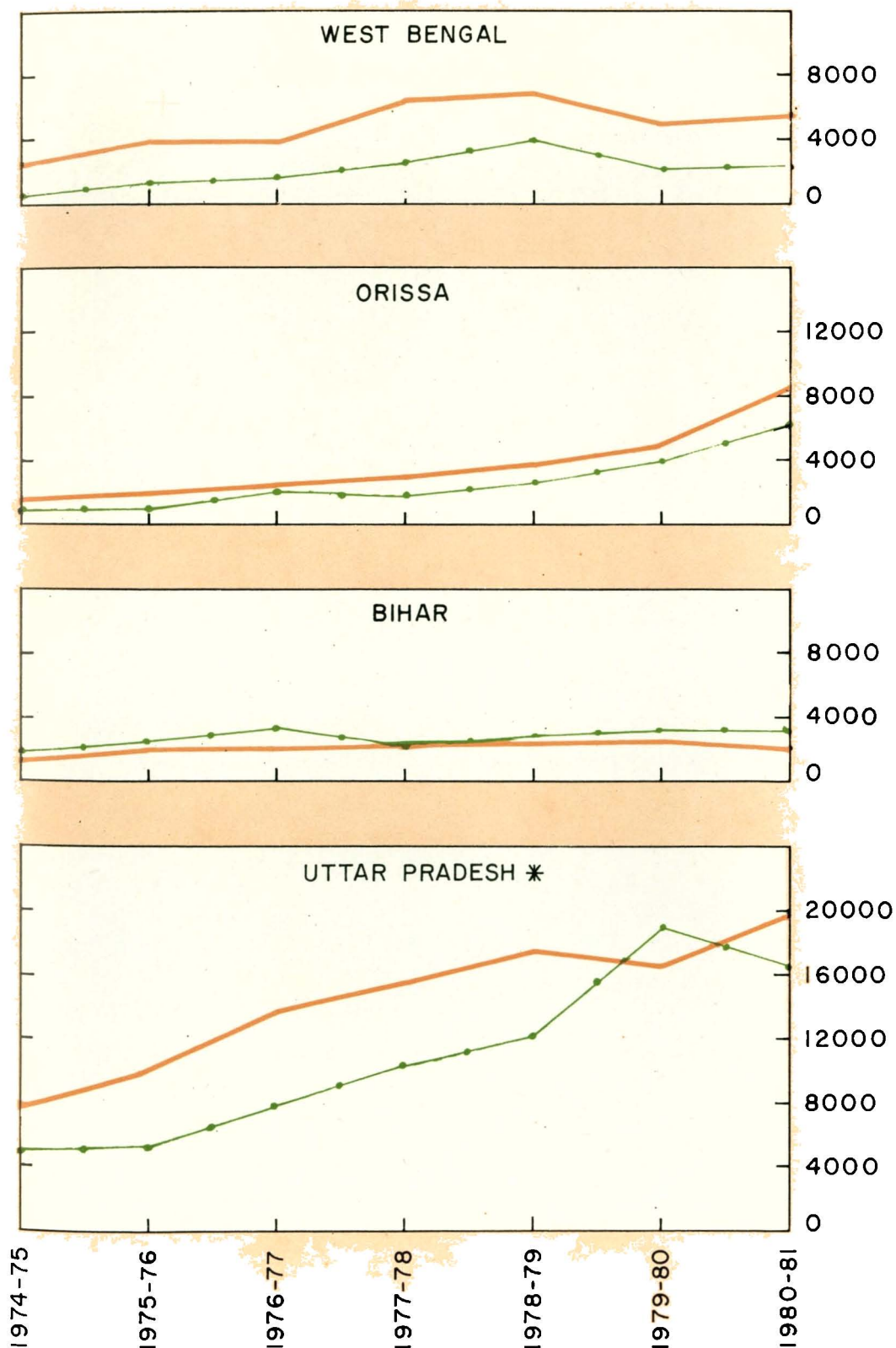
3.7.10 *Overdues* : It may be seen from the foregoing review that the pace of disbursement of credit slowed down since the late 1970s. This was primarily due to the rising trend in overdues. It has adversely affected the capabilities of the banking system to provide a sustained flow of credit to agriculture. The percentage of overdues to demand at the end of 1982-83 was particularly high in West Bengal and Bihar. In Orissa, although the percentage of overdues of PACS was relatively less, it was high in respect of LDB. In U.P., the percentage of overdues to demand was around 50 per cent in the case of PACs and about 35 percent in the case of LDBs. The performance of commercial banks is also no better (Table 3.23).

DISBURSAL OF INSTITUTIONAL CREDIT FOR AGRICULTURE

SHORT- TERM

●—● MEDIUM & LONG-TERM

Rs. Lakhs



* Separate data for East U. P. are not available

Table 3.23. Overdues

(Percentage of demand)

State	PACS		CCBs		LDBs (Primary Level)		Commer- cial banks
	1981-82	1982-83	1981-82	1982-83	1981-82	1982-83	1981-82
West Bengal	53.1	69.0	45.4	64.0	66.4	58.7	72.7
Orissa	43.0	41.3	29.1	30.6	49.4	58.8	59.4
Bihar	66.4	74.8	67.4	80.5	45.9	59.6	60.5
U.P.	45.7	50.4	41.7	49.7	36.4	36.2	48.5
All-India	43.0	40.9	35.3	38.5	38.6	42.9	47.7

3.8 Deposit Mobilisation

3.8.1 In recent years, commercial banks in the region have been able to mobilize sizeable deposits (Table 3.24).

Table 3.24. Deposit Mobilisation by Scheduled Commercial Banks
(Rs. crores)

	As on 31st March 1981	As on 31st March 1983	Percentage increase
West Bengal	4350	5788	33.1
Orissa	453	612	35.1
Bihar	1618	2257	39.6
U.P.	3732	5107	39.0

3.8.2 Deposits mobilised by PACS were of a small order, ranging between Rs. 2-4 crores in West Bengal, Orissa and Bihar (Table 3.25).

Table 3.25. Deposits Mobilised by PACS

(Rs. crores)

	West Bengal	Orissa	Bihar	U.P.*
1970-71	0.7 (0.6)	1.5 (4.0)	3.0 (1.7)	5.0 (1.9)
1974-75	0.9 (1.0)	2.0 (5.9)	1.6 (1.0)	6.3 (2.9)
1978-79	2.4 (3.1)	2.0 (6.7)	2.4 (3.6)	14.3 (16.5)
1979-80	N.A. (N.A.)	2.1 (7.4)	N.A. (N.A.)	18.7 (21.7)
1980-81	2.2 (2.9)	2.3 (8.2)	2.5 (3.7)	15.0 (17.5)
1981-82	2.7 (3.6)	2.7 (10.3)	2.7 (3.4)	16.6 (25.7)
1982-83	2.8 (N.A.)	3.9 (N.A.)	2.9 (N.A.)	25.6 (N.A.)

* Separate data for East U.P. are not available.

Note: Figures in brackets represent deposits in Rs. '000 per Society.

3.9 Special Agencies

3.9.1 In order to cater to the specific needs of weaker sections, a programme of setting up RRBs was taken up in 1975. In Eastern India, 47 RRBs have been set up with 2856 branches as at the end of June, 1983 (Table 3.26).

Table 3.26. Regional Rural Banks

State/Region	No. of RRBs	No. of branches	Average no. of branches per RRB
West Bengal	8	441	55
Orissa	9	510	57
Bihar	17	1253	74
East U.P.	13	652	50
Eastern India	47	2856	61

3.9.2 In recent years, there has been a steady increase in loans disbursed by RRBs, particularly in Bihar and U.P. RRBs are also facing the problem of overdues. Their overdues as percentage of outstanding loans as at the end of December 1983 were 36 per cent in West Bengal, 28 per cent in Orissa, 22 per cent in U.P. and 20 per cent in Bihar.

3.9.3 In terms of the recommendations of the BAWA Committee appointed by the Government of India in 1971, Large-Sized Adivasi Multi-purpose Societies (LAMPS) were organized in tribal areas. The number of LAMPS organized in the eastern region is as under.

Table 3.27. Number of LAMPS

	1976-77	1977-78	1978-79	1979-80	1980-81
West Bengal	—	—	44	51	51*
Orissa	220	224	222	222	222
Bihar	—	—	474	474	474
U.P.	56	73	103	103	103

* The number increased to 70 as at the end of June, 1983.

3.9.4 Disbursements by LAMPS have been small and mainly confined to short-term credit (Annexure 3.6). The small volume of loan business is attributed, *inter alia*, to the large area of their operations.

3.10 NABARD

3.10.1 NABARD was established on July 12, 1982. Refinance disbursed by NABARD (including erstwhile ARDC) to its member banks against loans disbursed by them in the eastern region was insignificant upto 1974-75. It touched the level of Rs. 16 crores in West Bengal, Rs. 50 crores in Bihar, and Rs. 130 crores in U.P. during 1983-84. In Orissa, the highest level of Rs. 37 crores was reached in 1981-82 and thereafter there was a decline to Rs. 30 crores in 1983-84 (Annexure 3.7). Disbursements of refinance in the four states amounted to Rs. 226 crores in 1983-84 as against only Rs. 21 crores a decade earlier.

3.11 *Special Development Programmes*

3.11.1 Government of India and State Governments undertook special programmes for improving agricultural production and productivity in the region. The important programmes sponsored by the Government of India were: (i) Command Area Development Programme, (ii) programmes for development of oilseeds and pulses, (iii) Integrated Rural Development Programme, (iv) Special Programme for Small and Marginal Farmers, (v) Drought-Prone Area Programme and (vi) Special Programme for boosting rice production. Some of the important programmes sponsored by the State Governments were (i) Compact Area Development Programme (Orissa), (ii) Programme of Economic Rehabilitation of Rural Poor (Orissa), (iii) Comprehensive Area Development Programme (West Bengal), and (iv) Dryland Agriculture Programmes. Salient features of these development programmes are briefly reviewed below. Details of the implementation of these programmes in the States are given in the State Reports.

3.11.2 *Command Area Development Programmes:* This programme is implemented in the command areas of all major irrigation projects. The main objective of the programme is to maximise agricultural production and productivity through better water management and adoption of multiple cropping pattern. Better water management is sought to be achieved through construction of field channels, consolidation of holdings, introduction of "Warabandi" and other on-farm development works.

3.11.3 Under this programme, the Central Government provides finance to the extent of 50 per cent of the cost of construction of field channels and other on-farm development works. The progress in respect of construction of field channels, consolidation of holdings, etc., in all the four states of the eastern region has been slow because the State Governments have not been able to provide matching resources for various schemes under the programme. Wherever on-farm development works have been done, there has been (i) a larger coverage under HYV, (ii) increase in gross cropped area, and (iii) a marked improvement in productivity.

3.11.4 *Development of Oilseeds:* Under this programme, Government of India provides additional financial assistance to States to promote the production of major oilseeds like

groundnut, rapeseed, mustard and sesamum and to introduce the cultivation of new oilseeds like safflower, sunflower, etc. This is done through distribution of improved seeds at subsidised rate, distribution of seed kits of improved varieties and subsidised supply of plant protection chemicals to oilseed growers.

3.11.5 Intensive Pulses Development Programme: The Central Government has sponsored an Intensive Pulses Development Programme under which subsidy is given on irrigation and seeds and for conducting demonstrations for increasing acreage and production of pulses. For increasing the production of pulses, efforts are made to bring additional areas through (i) introduction of short-duration varieties of urad/moong with assured irrigation after potato, wheat and oilseed crops during summer, (ii) raising urad in-between planted sugarcane rows and (iii) using available moisture after harvesting of *kharif* in rainfed areas. Similarly, farmers are encouraged to expand inter-cropping of *arhar*, soyabean, bajra and groundnut in irrigated areas. Minikits, of improved seed varieties are distributed among farmers for multiplication and use of improved varieties.

3.11.6 Integrated Rural Development Programme (IRDP): This programme is implemented in all blocks of the four States. The programme aims at raising the income of the weaker sections of the rural population above the poverty line through specific schemes within a specified period. They include minor irrigation, animal husbandry and cottage and small industries, etc. The beneficiaries of the programme are given subsidy ranging from 25 to 50 per cent for different categories. Institutional finance is arranged for meeting the balance of the investment cost. IRDP has made significant progress in recent years (for details, see State Reports).

3.11.7 Special Programme for Small and Marginal Farmers: In 1983-84, a new programme was introduced to provide assistance to small and marginal farmers for increasing agricultural production. Under this programme, Rs. 5 lakhs are provided to each block for giving subsidy to small and marginal farmers for minor irrigation, plantation of fuel and fruit trees and distribution of minikits of seeds and fertilizers.

3.11.8 Drought-Prone Area Programme: This programme is implemented in blocks located in drought-prone areas. The pro-

gramme essentially comprises schemes for area development to mitigate hardship due to drought conditions. Most of the works executed under this programme relate to minor irrigation, water harvesting, forestry, soil conservation, animal husbandry, etc. Besides, some individual beneficiary-oriented programmes like sinking of dugwells and growing of fuel and timber trees in private lands, for which subsidy is made available, are also taken up.

3.11.9 Special Programme for Increasing Rice Production: Government of India has recently formulated a special programme for increasing rice production in the six states of Assam, West Bengal, Bihar, Orissa, U.P. and Madhya Pradesh to be implemented during the Seventh Plan. Under the programme 400 Blocks are proposed to be covered in these six States. Of these, 350 blocks will be located in the four Eastern States, viz., West Bengal (67), Orissa (63), Bihar (118) and U.P. (102). A team consisting of Central and State Government officials will identify the major constraints in these blocks and suggest measures for overcoming them. The programme envisages close coordination between various departments particularly Agriculture and Irrigation Departments. Training and Visit (T & V) system will be used for extension work. For improving the productivity in these blocks, emphasis will be given on expansion of area under high yielding varieties, maximisation of yield in irrigated areas through adoption of high production technology, selection of suitable location-specific varieties, removal of micro-nutrient deficiency, increase in fertilizer use, etc. In 1984-85, a pilot programme was taken up in 51 blocks in the six States, of which 37 are in the Eastern region, viz., West Bengal (10), Orissa (7), Bihar (10) and U.P. (10). The pilot project was fully financed by the Government of India at the rate of Rs. 10 lakhs per block. In the subsequent years of the Seventh Plan, the programme will be implemented as a Centrally Sponsored Programme on a 50 : 50 basis.

3.11.10 Compact Area Programme: Government of Orissa launched this programme in 1979 for improving agricultural productivity. It is based on minimum yield guarantee approach. Under the programme, all inputs and extension services are made available to farmers at their doorsteps under close supervision of selected field functionaries. The programme was initially implemented in a compact area of 140 ha under rice cultivation in Puri district. As a result of implementation of this programme, yield of rice recorded sharp increase to 4.20 tonnes per ha as compared

with the normal yield of 2.35 tonnes per ha. Encouraged by the results of the experiment in Puri district, more areas and crops have been brought under the programme. (*vide* Part III of this Report).

3.11.11 *Economic Rehabilitation of Rural Poor (Orissa):* Government of Orissa introduced a modified programme of IRDP to improve the economic conditions of the rural poor. Under this programme, on an average, 10 poorest families are covered in each village. Assistance to these families is given for landbased schemes, fishery, animal husbandry and non-agricultural activities.

3.11.12 *Comprehensive Area Development Programme (West Bengal):* Government of West Bengal established the Comprehensive Area Development Corporation (CADC) in 1974. This Corporation was required to cover an area of about 522 square miles. It was entrusted to develop this area through creation of irrigation facilities by installation of deep tubewells, shallow tubewells, river lifts and augmentation of groundwater potential, etc. About 80 per cent of the capital outlay was to be mobilised from banks and the remaining 20 per cent was to be provided by the State Government as grants. The Corporation charged water rates based on actual costs. CADC centres distributed seeds, fertilisers and pesticides, etc.

3.11.13 *Dry Land Agriculture:* Under the Dry Land Agriculture Programmes taken up by the State Governments, the following two-pronged approach is adopted.

- (i) The extensive approach, where available technology and on-going programmes and resources for agricultural development are utilised for improving productivity of crops. The main objective is to grow more than one crop through mixed cropping, inter-cropping, double cropping and relay cropping, use of improved seeds, fertilizers, improved implements, pest control and application of soil amendments.
- (ii) Intensive approach, where selected micro-water sheds are intensively developed through an integrated programme of crop production, horticulture, social forestry, soil conservation, water harvesting, and use of modern implements, etc.

3.12 *Assessment*

3.12.1 The overall progress during the period under review was much less than what was expected. The implementation of these programmes was unsatisfactory. Most of the general as well as special programmes were formulated either at the national or State headquarters without adequate two-way consultation with the field functionaries. Even when instructions were given that the programmes should be modified in the light of the special constraints of different regions or felt needs of different target groups, adequate or timely adjustments were not made because of financial, bureaucratic or other reasons. Resources provided often fell far short of the minimum critical need. There was also inadequate coordination and monitoring. Projects initiated were often *ad hoc* and piecemeal. The results were, therefore, very uneven and much less than what was warranted even by the amount of resources provided and efforts made.

Annexure 3.1

Size-wise Distribution of Holdings, 1980-81

(In per cent)

Size Groups (Ha)	Holdings					Area				
	West Bengal	Orissa	Bihar	East U.P.	Eastern India	West Bengal	Orissa	Bihar	East U.P.	Eastern India
0 to 1	69.7	46.8	75.9	79.3	72.0	29.2	14.9	26.7	34.3	26.4
1 to 2	19.6	26.8	10.8	12.7	15.1	31.2	23.0	14.9	23.4	21.5
Sub-total	89.3	73.6	86.7	92.0	87.1	60.4	37.9	41.6	57.7	47.9
2 to 10	10.7	25.6	12.7	7.8	12.5	36.0	54.7	47.9	36.9	44.6
Above 10	Neg.	0.8	0.6	0.2	0.4	3.6	7.4	10.5	5.4	7.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Net Sown Area, Gross Sown Area and Cropping Intensity

(Area in lakh ha.)

State/Region	Net Sown Area			Gross Sown Area			Cropping Intensity (Per cent)		
	Triennium ending			Triennium ending			Triennium ending		
	1960-61	1970-71	1980-81	1960-61	1970-71	1980-81	1960-61	1970-71	1980-81
1. West Bengal	53.4	55.4	55.4	62.3	70.0	74.7	116.8	126.3	135.0
2. Orissa	56.0	60.9	60.7	60.5	71.7	84.0	108.0	117.8	138.4
3. Bihar	79.9	83.9	82.5	110.4	110.0	109.8	138.1	131.1	133.1
4. East U.P.	56.6	57.4	56.4	74.3	75.4	80.2	131.4	131.5	141.9
Eastern India	245.9	257.6	255.0	307.5	327.1	348.7	125.1	127.0	136.7

Annexure 3.3

Growth Rates in Foodgrains

(Per cent per Annum)

	Area			Production			Productivity		
	1961-71	1971-81	1961-81	1961-71	1971-81	1961-81	1961-71	1971-81	1961-81
Foodgrains									
West Bengal	1.2	0.1	0.6	3.3	1.0	2.2	2.1	1.0	1.6
Orissa	2.1	1.6	1.8	3.1	0.9	2.0	1.0	— 0.7	0.1
Bihar	0.1	—	—	1.5	1.1	1.2	1.4	1.1	1.2
East U.P.	0.3	0.6	0.4	2.0	2.1	2.1	1.7	1.5	1.6
Rice									
West Bengal	1.1	—	0.6	2.7	1.1	1.9	1.6	1.1	1.3
Orissa	0.9	— 0.4	0.3	2.3	— 0.4	0.9	1.3	—	0.6
Bihar	0.5	—	0.3	0.3	1.0	0.7	— 0.1	1.0	0.4
East U.P.	0.3	1.4	0.9	1.4	2.9	2.2	1.1	1.5	1.3
Wheat									
West Bengal	19.5	6.5	12.8	34.9	3.3	18.1	12.9	— 3.0	4.6
Orissa	7.2	15.7	11.3	15.6	20.0	17.7	8.1	3.5	5.8
Bihar	6.4	4.0	5.2	11.6	6.1	8.8	5.0	2.0	3.5
East U.P.	4.3	6.4	5.3	8.4	8.6	8.5	4.0	2.1	3.1
Other Cereals									
West Bengal	0.6	— 2.2	— 0.8	3.2	— 0.3	1.5	2.6	1.9	2.3
Orissa	11.0	6.0	8.5	16.8	5.6	11.0	5.1	— 0.4	2.3
Bihar	— 0.3	— 2.2	— 1.2	1.4	— 1.9	— 0.2	1.7	0.3	1.0
East U.P.	— 0.6	— 4.8	— 2.7	0.4	— 6.2	— 2.9	1.0	— 1.4	— 0.2
Pulses									
West Bengal	— 0.6	— 2.5	— 1.6	0.8	— 3.8	— 1.5	1.4	— 1.3	0.1
Orissa	5.8	6.5	6.2	6.5	5.0	5.8	0.7	— 1.4	— 0.4
Bihar	— 3.5	— 1.9	— 2.7	— 0.6	— 3.5	— 2.1	3.0	— 1.7	0.6
East U.P.	— 1.5	— 3.0	— 2.3	— 0.5	— 3.6	— 2.1	1.1	— 0.6	0.2

— = Nil or negligible.

Growth Rates in Non-Foodgrains

Annexure 3.4

(Per cent per annum)

	Area			Production			Productivity		
	1961-71	1971-81	1961-81	1961-71	1971-81	1961-81	1961-71	1971-81	1961-81
Sugarcane (Gur)									
West Bengal	0.9	— 3.6	— 1.4	2.9	— 3.7	— 0.4	2.0	— 0.1	1.0
Orissa	3.9	3.0	3.4	10.2	4.2	7.1	6.0	1.2	3.6
Bihar	— 1.0	— 2.8	— 1.9	— 0.7	— 5.2	— 3.0	0.3	— 2.4	— 1.1
East U.P.	0.4	— 0.9	— 0.3	3.5	— 2.5	0.5	3.2	— 1.6	0.8
Potato									
West Bengal	1.7	7.0	4.3	3.5	10.3	6.8	1.7	3.1	2.4
Orissa	9.6	— 10.8	— 1.1	25.1	— 15.1	3.1	14.1	— 4.8	4.2
Bihar	3.8	2.6	3.2	7.7	0.5	4.1	3.9	— 2.0	0.9
East U.P.	3.8	4.3	4.0	6.5	8.5	7.5	2.5	4.2	3.4
Oilseeds									
West Bengal	1.0	3.9	2.4	3.8	4.8	4.3	2.7	1.0	1.8
Orissa	6.4	7.3	6.9	12.8	6.7	9.7	6.0	— 0.6	2.7
Bihar	—	0.7	0.4	3.7	— 0.1	1.8	3.8	— 0.8	1.4
East U.P.	0.6	1.2	0.9	0.9	— 0.3	0.3	0.3	— 1.4	— 0.6
Jute									
West Bengal	1.3	4.0	2.7	0.9	5.2	3.0	— 0.4	1.1	0.3
Orissa	1.8	0.5	1.1	4.0	1.4	2.6	2.2	0.8	1.5
Bihar	— 2.8	2.3	— 0.3	— 4.7	3.0	— 0.9	— 1.9	0.7	— 0.6
East U.P.	— 4.0	— 2.8	— 3.4	— 3.3	— 2.2	— 2.8	0.7	1.4	1.0
Mesta									
West Bengal	— 5.7	— 2.3	— 4.0	— 5.6	— 1.8	— 3.7	0.1	0.5	0.3
Orissa	13.1	5.0	9.0	14.0	3.9	8.8	1.3	— 1.1	0.1
Bihar	— 2.8	1.2	— 0.8	— 1.3	3.9	1.2	1.6	2.5	2.0
East U.P.	—	—	—	—	—	—	—	—	—

— = Nil or negligible.

Annexure 3.5**Loans Disbursed by Commercial Banks**

(Rs. crores)

	West Bengal	Orissa	Bihar	U.P.
Short-term Loans				
1976-77	5.0	5.2	5.4	14.6
1977-78	15.2	6.8	6.1	13.3
1978-79	17.3	8.5	4.9	19.2
1979-80	12.2	10.0	5.5	19.9
1980-81	17.6	31.2	5.7	35.2
Medium-term and Long-term Loans				
1976-77	6.3	3.8	13.7	28.7
1977-78	11.7	5.8	11.9	37.8
1978-79	13.8	10.4	18.9	55.4
1979-80	9.3	7.6	19.5	62.3
1980-81	13.5	39.3	14.7	84.0

Loans Disbursed By Lamps

Membership in '000
Amount in Rs. '000

	West Bengal				Orissa				Bihar				U.P.			
	1976-77	1977-78	1978-79	1979-80	1976-77	1977-78	1978-79	1979-80	1976-77	1977-78	1978-79	1979-80	1976-77	1977-78	1978-79	1979-80
1. Membership	—	—	25	33	254	409	441	561	—	—	311	NA	27	39	94	96
2. Of which scheduled tribes	—	—	12	21	156	241	285	333	—	—	241	NA	12	15	23	25
3. Borrowing membership	—	—	5	4	48	78	149	216	—	—	132	NA	11	11	24	34
4. Of which scheduled tribes	—	—	3	2	28	*	97	98	—	—	70	NA	4	4	8	7
5. Loans issued																
i) Short term	—	—	1072 (403)	1230 (624)	7476	35622	51825 (20896)	72805 (33529)	—	—	6867 (N.A.)	NA	3650	14547	19665 (4449)	19862 (7585)
ii) Medium term/ long-term	—	—	242 (70)	170 (121)	2037	15193	21600 (13489)	54286 (25640)	—	—	12 (N.A.)	NA	789	1129	1443 (538)	8147 (3512)

Figures in brackets represent loans disbursed to scheduled tribes.

* Less than 500.

Annexure 3.7**Disbursement of Refinance by ARDC/NABARD****(Rs. crores)**

Year	West Bengal	Orissa	Bihar	Uttar Pradesh
1963-68	—	—	—	—
1968-69	0.02	0.04	0.18	1.22
1969-70	0.01	0.18	0.61	2.56
1970-71	0.10	0.06	1.13	2.93
1971-72	0.05	0.08	0.67	6.04
1972-73	0.04	0.11	1.54	11.43
1973-74	0.22	0.08	5.85	14.98
1974-75	0.69	0.82	9.32	18.49
1975-76	1.59	3.38	13.18	25.98
1976-77	5.90	5.65	16.96	37.20
1977-78	9.96	8.16	18.64	43.17
1978-79	10.45	8.75	22.53	48.77
1979-80	9.81	13.15	24.68	56.60
1980-81	9.84	19.79	24.46	72.49
1981-82	12.93	37.30	39.60	90.04
1982-83	8.31	33.92	47.40	106.30
1983-84	16.26	30.02	49.56	130.40

Source : ARDC and NABARD Annual Reports.

CHAPTER 4

GENERAL CONSTRAINTS TO AGRICULTURAL GROWTH

4.1 *Introduction*

4.1.1 The poor performance of agriculture in Eastern India is generally ascribed to its physical, institutional, socio-economic and organizational environments, which together determine agricultural growth. It is said that

(i) the soil, climate and other physical characteristics are primarily responsible for bringing about the existing pattern of farming in the region;

(ii) the high fertility of soils of the region together with its wet rice ecosystem has resulted in growth in the number of farm families to such a level that farms have become uneconomic and highly fragmented;

(iii) the pressure of population on land has become so acute that soil has been exploited to the utmost over a long period, with the result that it has been seriously depleted;

(iv) farmers have too little capital for investment and efficient use of their labour; they also lack adequate facilities for development of skills; and

(v) the persistence of some semi-feudal institutions and forces in the region acts as an impediment to investment and dampens the will and the capacity for change on the part of farmers inspite of the rich natural agricultural resource base.

4.1.2. Indeed, the forces which are now constraining agricultural growth in the region have all surfaced from the changes in its production environment, many of which have a historical genesis, referred to in the previous Chapter.

4.2 Main Constraints

4.2.1 Broadly speaking, modernisation of agriculture in a region becomes feasible and farmers become capable of maximising production per unit of land and also per capita when they have adequate control over the factors of production. In Eastern India, the actual situation is very different. Farmers' choice and decision making in the production process are greatly constrained by factors which are beyond their control.

4.2.2 The constraints faced by the farmers vary from State to State, and even within a State as between different zones, districts, blocks and even villages. For effective implementation of the strategy presented in our Report, micro-level studies will have to be carried out to identify constraints at the village and block levels. We could not do this within the time and resources available to us. This will have to be undertaken by local authorities. We have attempted in the State Chapters, in Parts II to V of this Report, to indicate location specific constraints at the zonal level. In this Chapter, we present the general constraints affecting Eastern India as a whole. These may be classified into three categories, viz., (i) social and structural, (ii) technological and (iii) organizational.

4.3 Social and Structural Constraints

4.3.1 *Agrarian structure*: The impoverishment of the peasantry under the *zamindari* system coupled with the growing pressure of population on land has gradually eroded the operating base of most cultivators. The average size of holding has now reached such a level as to make the farm size an uneconomic unit under the traditional farming technology. The bulk of farmers in the region are now operating on one ha or less, the average size of holding being less than 1/2 ha. Moreover, land is divided into very small fragments. These two factors operate concertedly to hold down farm income. Consequently majority of farmers in the region with one ha or less, who possess knowledge of farming, have no resources to be used for technological improvements. Even those farmers, who own more than one ha and some resources, are unable to take advantage of the same because of fragmentation of holdings and lack of infrastructural support.

4.3.2 The negative effects of law of succession are affecting adversely farmers of Eastern India. The heirs of farmers mostly divide the property in order to extract maximum wealth from the land which they can separately claim as their own. The law of succession has contributed to continuous sub-division and fragmentation of holdings. Even when the successors-in-interest desire to preserve the farm intact by sharing the profit of the undivided estate, the existing tenancy laws hinder them from doing so.

4.3.3 Though land reform laws have conferred ownership rights on tenants, concealed tenancy is widespread, with inadequate legal protection. Unless ownership and tenancy arrangements are properly defined, assignment of water rights, management of tubewells, obtaining bank loans for investment purposes, etc., become difficult. It is only in West Bengal that serious efforts are being made under 'Operation Barga' to register sharecroppers. Other States are yet to take up such programmes.

4.3.4 If leasing in and out of lands were permitted in the case of small and marginal farmers, it would have encouraged some of them to look for employment opportunities in non-farm sector and would have thereby helped to obviate cultivation on minuscule farms. In the absence of such an arrangement, a large number of farmers continue to hold on to their tiny plots of land which are not economic for farm operations.

4.3.5 Further, the expansion of the non-agricultural economy of Eastern India, especially in the countryside, is not enough to induce significant absorption of surplus labour from the agricultural sector into other occupations in the near future. This fact, together with the social and economic conditions now obtaining, would tend to increase the number of small farms.

4.3.6 In view of the growing number of small and fragmented farms, land consolidation is specially important in the eastern region. The progress in this regard is very slow, except in U.P. Even in East U.P., a second round of consolidation has now become necessary. The existence of a large number of sharecroppers and the reluctance of cultivators to exchange land due, *inter alia*, to sentimental or security considerations are hampering consolidation work. Further, under traditional technology, consolidation provides much less economy in rice farming than in wheat.

4.3.7 The agrarian reorganization attempted in the eastern region by imposing ceilings on large farms and conferring ownership rights to tenants has not so far made significant impact on the socio-economic conditions of most cultivators.

4.3.8 *Soil Management*: The physical production environments of the eastern region pose problems for development of modern agriculture. The heavy, erratic and uneven seasonal pattern of rainfall creates serious soil erosion problems particularly in hilly areas, constraining agricultural development. Some of the coastal soils of West Bengal and Orissa are facing problems of salinity. The large number of rivers and rivulets in the region are now silted up, making vast areas prone to floods. Areas on either side of river beds are becoming increasingly unfit for *kharif* cultivation. Over the centuries, the natural topography of this densely settled region has undergone alterations to such an extent that poor drainage and waterlogging have become acute problems over large areas.

4.3.9 Government investments for soil conservation and amelioration have not been adequate. Progress in afforestation and agro-forestry programmes, which can help arrest soil erosion, is slow.

4.3.10 *Erratic Rainfall*: The pattern of rainfall provides very little choice of crops to farmers in Eastern India during the *kharif* season. Even when the total rainfall in a season is normal, long intermittent spells of drought during crucial periods of transplantation or plant growth, ruin crops. Large areas experience frequent drought. Coastal areas face problem of cyclones. There are large areas which are vulnerable to floods.

4.4 *Technological Constraints*

4.4.1 *Water Management*: Confronted with the physical constraints mentioned above, cultivation is carried out under poor water management conditions. A sound infrastructure on irrigation and drainage, which can overcome the constraints posed by physical environments, has not been developed. Despite large surface and groundwater resources, gross cropped area brought under irrigation is only a little over 30 per cent. The exploitation of water resources is also low and inefficient. A modern drainage system, a key factor for enhancing *kharif* crop produc-

tion prospects, has not received attention. Conjunctive use of surface and groundwater, which could have helped in controlling drainage problem, has been neglected. Drainage has not received adequate attention due to the obsession with creation of new irrigation potential.

4.4.2 In surface irrigation systems, the practice of field to field irrigation has resulted in overwatering in upper reaches and denial of water in the tail-end areas of the canals. Uncertain and untimely release of water has often played havoc with agricultural production. Sometimes improperly planned canals have added to the problem of waterlogging. All these have affected agricultural productivity. The progress in the construction of field channels has been slow owing to lack of funds, inadequate coordination between the Irrigation Department and CAD authorities and lukewarm attitude of the farmers to undertake or even allow construction of field channels across their fields.

4.4.3 Maintenance of canal systems is poor. Water rates are low. They do not even cover the maintenance cost of irrigation systems.

4.4.4 The progress in groundwater exploitation is seriously hampered due to inadequate and erratic supply of electric power.

4.4.5 The deep tubewells constructed by the State Governments are underutilised. This is due to both poor maintenance and management.

4.4.6 In spite of considerable potential, the needed infrastructure on irrigation and drainage to support modern agriculture, has not received due emphasis in the eastern region. On-farm development works have been neglected.

4.4.7 Incidence of pests and diseases and weeds and deficiency of micro-nutrients are other important constraints.

4.4.8 *Research:* Research efforts to develop a crop technology appropriate to the physical environments of the region have not been adequate. High yielding varieties suitable for conditions where water level exceeds 50 cm and also for low rainfall regions are not available. Even the HYV/improved varieties recommended for water surfeit conditions in different agro-climatic

zones are not adopted by farmers due to the apprehension that such varieties might not withstand the heavy rains of the monsoon season. While research efforts in the country were hitherto confined to situations with a controlled water regime, efforts for improving rice farming technology under monsoon conditions have not been adequately pursued.

4.4.9 Farm Machinery: It is now recognized that mechanization of farm operations not only reduces drudgery but also contributes to increase productivity. The use of improved tools and implements like seed-cum-fertilizer drills, sprayers, tillers, threshers, modern ploughs and gardening tools has not yet received wide acceptance from the farmers. Main reasons are their non-availability on a commercial scale, insufficient extension work to motivate farmers to switch over from primitive tools and implements and poor resource base of bulk of the farmers to acquire them. Inadequate bullock power available to the small and marginal farmers has added to the need for improved farm tools and implements.

4.5 *Organizational Constraints*

4.5.1 Inputs: Use of modern inputs like high yielding varieties of seeds and fertilizers is low. This is largely due to shortage in supply, substandard quality and poor input delivery system. In the *kharif* season when rainfed cultivation is practised, and incidence of pests is high, other major constraints appear to be the lack of suitable fertilizer and pesticide application techniques.

4.5.2 Electric Power: Power supply is both inadequate and erratic. This discourages private investment in tubewells.

4.5.3 Extension and Transfer of Technology: Output and income levels vary greatly among the small farms of Eastern India even when they operate under similar conditions and use similar tools, inputs, etc. Farmers are mostly either unaware of the production potentialities of the varieties developed or not sufficiently motivated to adopt the modern agronomic practices. Even the available technology is not being applied in the field due to lack of professionalisation and inadequacy of extension services. Without proper extension and education, it will not be easy to change traditional attitudes of the small cultivators, who are reluctant to take risks. Even though T & V system has

been introduced in three of the States, its impact has not been felt significantly in Bihar and parts of West Bengal due to shortage of staff. Moreover, arrangements for supply of inputs to support the extension work by VAWs are not satisfactory in all the States.

4.5.4 Credit: Use of inputs and on-farm investments has suffered as flow of institutional credit is not adequate. Several constraints are in operation, restricting the flow of institutional credit for agriculture. Rising overdues have restricted the capabilities of co-operatives for lending. Managerial and financial weaknesses are other handicaps of the co-operative sector. Inadequate supervision over end-use of credit, slackness in follow-up action in recovery and lack of effective coordination between lending activities of institutional agencies on the one hand, and developmental programmes of the State Governments, input supply and extension service on the other have severely constrained adequate flow of credit to agriculture.

4.5.5 Marketing Infrastructure: Investment in basic infrastructure like roads, transportation, marketing, cold storage facilities, rural godowns and processing facilities, etc., have been neglected partly due to lower priority in the allocation of funds and partly due to an erroneous notion that investment in small farmer dominated economy of the eastern region would be unproductive. Thus, even when farmers obtain good yields from the crop enterprise, they realise little benefits due to restricted markets and sharp fluctuations in market prices. The year to year variability in profits due to fluctuations in prices, which are also often unremunerative, dampens the will and the capacity of the farmers to purchase inputs and make investments for improving crop production.

4.5.6 Farmers in Eastern India generate small surpluses. At present, there is no suitable agency to buy these small surpluses at remunerative prices and well in time. Even the Food Corporation of India and State procurement agencies are not making serious efforts to purchase foodgrains at procurement prices. The marketing arrangements for non-foodgrain crops are even more unsatisfactory.

4.5.7 On the whole, the demand constraint is also a serious factor which adversely affects agricultural growth in the region.

4.6 *Administration*

4.6.1 In the absence of an effective agricultural lobby, agricultural development programmes are progressing under an inflexible bureaucratic framework in which the needs of cultivators are not receiving adequate attention.

4.6.2 There is no effective inter-departmental coordination, both at the State level and the field level. There is no effective monitoring of the developmental efforts. Most of the farmers who are resource-poor cannot take advantage of Government efforts to overcome the constraints. Administrative inefficiency is also an important constraint.

4.6.3 In designing development programmes for Eastern India, the socio-economic characteristics of the region's agrarian economy are often overlooked. The majority of the farmers in the region are resource-poor and have little risk bearing capacity. Unless development programmes are directed more towards this group of resource-poor farmers and support and services directly linked with productive cultivation, the developmental efforts are not likely to produce the desired result. The policy measures, which we consider necessary to overcome these challenges are given in the following Chapter.

CHAPTER 5

STRATEGY FOR ACCELERATING AGRICULTURAL GROWTH

5.1 *Introduction*

5.1.1 The possibility of increased agricultural productivity through improved practices, good seeds, irrigation, manures and fertilizers, improved tools, etc., is now known to many farmers in Eastern India. But these improved techniques have had a low level of adoption in this region. The evidence of this is the insufficient use of irrigation potential, low levels of HYV seeds and fertilization and negligible use of improved farm implements. One of the main reasons for this state of affairs is the limited resource base of the farmer and the inadequate supply, services and infrastructure support provided to him due, *inter alia*, to the low level of administrative efficiency. Therefore, in designing a strategy for accelerating agricultural growth of Eastern India, these special features need to be taken into consideration.

5.2 *An Approach*

5.2.1 *Appropriate Technology for Eastern India:* There is now a general agreement that planned efforts must be made to increase agricultural production of Eastern India through modern techniques of farming. Such efforts should be so designed as to cater to the specific needs of cultivators, particularly small and marginal farmers.

5.2.2 That this can be done is evident from the pattern of agriculture developed in Kerala. Farm size in Kerala is also very small. Even then, it has become one of the high productivity States of India, mainly by practising intensive cultivation of high value crops.

5.2.3 The experiences of Japan, Taiwan and some other East Asian countries clearly demonstrate this point. A plot of one ha in these countries provides sufficient net income through intensive

use of appropriate inputs and capital. These countries have successfully developed, by conscious design, the small farm economy supported by credit and appropriate services from public and private sector institutions. This is the direction in which solutions to Eastern India's agriculture may lie.

5.2.4 Moreover, in spite of many handicaps, quite a few farmers in Eastern India are gradually switching over to modern techniques of production. This indicates a potential for considerable productivity increase if adequate means are provided through a carefully planned programme designed specifically for the region. The main areas which need special attention are discussed below.

5.2.5 *Land Management*: The number of small fragmented holdings in Eastern India is itself a strong case for redistributing and regrouping of land. Consolidation of holdings is, therefore, imperative. However, progress in this direction has been slow. Co-operative farming, involving pooling of land, would have been useful from this standpoint. The idea of pooling lands of several small holdings to make a single compact unit has not, however, appealed to cultivators in India. Hence, joint management for specific purposes such as sharing of irrigation water and machinery, arranging vital inputs, pest control and marketing may interest them, if they are convinced that with joint management, constraints imposed by the smallness of the holdings can be mitigated.

5.2.6. To improve the land base of small plot holders, two other supporting measures would be helpful, viz., (i) imposition by law of a "floor" limit of, say, $\frac{1}{2}$ to 1 standard ha below which no subdivision will be permitted and (ii) permission to small farmers to lease out their land, as in the case of military personnel, which will encourage them to shift from farming to non-farming occupations, thereby helping to reduce pressure of farm operators on the limited land resources.

5.2.7 There is very little new land at present in Eastern India which can be brought under the plough. Therefore, efforts must be made to improve cropping intensity and efficiency of farms. The physical production potential of land must be made sufficiently attractive to induce effort and investment.

5.2.8 The strategy should aim at developing a labour-cum-capital intensive agriculture and raise production through multiple crop-

ping and yield-augmenting techniques. The basic scarcity of land has, therefore, to be made up by intensive use of labour and such capital as would make its efficient use feasible. This would call for an effective programme for transfer of substantial amount of capital to the agricultural sector from the rest of the economy for several years to come.

5.2.9 Intensification of agriculture should be carried out through science-based and industry-linked modern farming methods. This will help not only in raising productivity both per ha and per capita but also generate spread effects and strengthen activities other than crop production in rural areas, including rural industrialisation.

5.3 *Spearheads of Accelerating Agricultural Growth*

5.3.1 Adequate and controlled supply of water is a precondition for intensification of crop production. Whatever be the crop pattern chosen, be it multiple cropping of short duration crops or single cropping of long duration crops, the total duration of cropping activities per ha of net sown area per year depends crucially on the availability of water in the needed doses from natural and/or man-made sources, for sustaining plant growth.

5.3.2 In Eastern India, however, supply of water is too much and too uneven during monsoon and too little in the dry season. Lack of adequate irrigation and drainage facilities and flood control arrangements restrain the farmers from applying the recommended doses of fertilizers and other modern technology. Even when the recommended doses are used, they yield poor results as flooding and waterlogging limit the full realization of the fertilizer response capacity of the high yielding varieties.

5.3.3 Therefore, the basic strategy for inducing intensive agricultural practices in Eastern India has to be through infrastructure development. Unless it is improved through investment of adequate capital on such programmes like micro-watershed development, irrigation, flood control, drainage, water management, power, research, extension, input supply, credit, transport, marketing, processing, etc., the scope for technological progress will remain limited.

5.3.4 In areas with good groundwater potential, the programme for intensive installation of tubewells and pumps to provide appropriate irrigation, drainage and water management may be considered as an important spearhead for facilitating accelerated agricultural development.

5.3.5 Where water supply is uncertain and inadequate, dry farming on a micro-watershed basis should prove very useful. The spearhead for technological progress in such areas should include, in addition, animal husbandry, fodder, fruit and fuel trees and village industries supplementing crop production.

5.3.6 Implementation of such development programmes will require collective and coordinated efforts and substantial investment, credit and efficient management. At macro-level, efficient Government support will be needed for such special programmes as are to be used as spearheads for development in specific areas and among specific categories of people.

5.3.7 At micro-level, improved technology will have to be introduced first in a small fraction of the farmer's holding and later extended gradually to other parts as the farmer's skill and resources improve with progressive help from extension, supply, servicing and credit agencies. These latter agencies should relieve the farmer from as much of non-farm work as possible leaving him free to concentrate on farm operations.

5.3.8. Strong and competent research base must be provided for further advance in agricultural technology so as to bring Eastern India on par with the other advanced regions of the country.

5.4 *Extension*

5.4.1 Policies of structural change and infrastructure development must be largely complemented by measures which make it possible and attractive for cultivators to adopt practices that will increase production on a sustained basis. Hence, the most critical aspect of agricultural planning for Eastern India is to evoke the will of farm operators to seek sustained growth. This underlines the need for institutional planning focussed on the human factor involved in the production process.

5.4.2 Sustained increase in farm production can occur when each cultivator has sufficient inducement to adopt improved farm practices. He must be convinced, through extension and education, about the impact of innovations on farm production and he must be trained to use improved techniques. Development programmes for cultivators should, therefore, be designed to help and train them through better farm planning, for optimum use of available resources.

5.4.3 It will need on the one hand personal approach as in the T & V system and on the other hand imaginative use of mass media, audio-visual as well as printed.

5.5 *Supporting Services*

5.5.1 *Inputs:* The input delivery system has been a weak link in the eastern region's agricultural infrastructure. Input of the type, quality and quantity needed by the cultivator must be delivered at the proper time and place.

5.5.2 *Credit:* To help the production efforts of farmers, adequate credit must be available in time both for purchasing inputs and for undertaking on-farm development and other ancillary activities.

5.5.3 *Price Support and Marketing:* Measures like price support protect farmers against risks of innovation. Specific levels of support prices should be determined in such a way that the farmer receives sufficient margin of profit to cover the risks of innovations.

5.5.4 Speculative activities of monopolistic traders in the eastern region frequently aggravate market fluctuations in prices. Regulation of wholesale and retail trade and establishment of regulated markets will be helpful in reducing the possibilities of exploitation of farmers by the middlemen.

5.5.5 *Diversification in Crop Pattern:* The small farmers' traditional practice of cultivation of a subsistence crop year after year should be modified by helping them to produce some cash crops which require labour-cum-capital intensive cultivation. A shift in cropping pattern for optimising income per ha per year is called for. In view of the small size of holdings, efforts should be made to grow high value crops such as vegetables, spices, medicinal plants, flowers, fruits, etc. This may be done, to start with, in a

part of the farmer's holding and gradually extended as his resources and skill improve. However, efforts to encourage cultivation of these cash crops are unlikely to receive positive response from farmers unless proper marketing support and transport facilities are arranged.

5.5.6 Since farm work is seasonal, many small farmers in the eastern region remain underemployed. Adequate means should be provided for a combination of work on the land for some members of the family and in industrial and service occupations for others.

5.5.7 *Agricultural Servicing Agencies:* In addition, local entrepreneurship for providing agricultural services should be encouraged by supporting creation of a sufficient number of agricultural servicing agents and providing to each farmer ample choice out of a select list of approved agents in his area. This will help better utilization of available credit, generate rural employment and also provide flexibility to the farmers in securing services at competitive prices.

5.6 *Organization and Management*

5.6.1 The success of efforts to induce an accelerated development of agriculture in Eastern India, however, depends upon organizational and administrative coordination in the agricultural sector. Poor organization can defeat the objective of agricultural development programmes because of failure to provide sufficient incentives and facilities to farmers. Sluggishness in implementation of Plan is frequently cited in criticisms of the eastern region's agricultural performance. This criticism would point to the need to strengthen administrative organization. An efficient management system by itself can contribute significantly to the success of development programmes.

5.7 *Policy Measures*

5.7.1 In the policy context, therefore, the measures needed for inducing an accelerated agricultural growth in Eastern India broadly fall under the following eight categories.

5.7.2 First, implementation of efficient plans to create incentive-oriented conditions for a vast number of small holders will depend upon organizational and management coordination in the

agricultural sector. This coordination has been sadly missing in the eastern region. It must be strengthened for better implementation of the Plan programmes. Programmes should be designed and managed keeping this consideration in view.

5.7.3 Second, basic technical and scientific principles in the fields of agronomy, farm management and land and water management must receive more emphasis in the programmes for agricultural reorganization and development especially to improve the productive efficiency of small farms. Land is scarce in the eastern region. The objective for reorganization, therefore, should be to facilitate the most efficient and intensive utilization of available land resources.

5.7.4 Third, the physical production potential of Eastern India must be improved. It is presently constrained by inadequate maintenance as well as development of irrigation, drainage and water management facilities. Poor irrigation and drainage facilities in the region are not only limiting its scope for raising production through multiple cropping and yield-augmenting modern scientific inputs but have also made crop production in the region extremely hazardous. The eastern region has vast irrigation potential. A properly designed water management policy can enhance its physical production level manifold. Planned exploitation of large groundwater resources, provision of adequate drainage facilities to take out surplus water and micro-watershed development wherever possible, should form the key spearheads of development strategy for this region.

5.7.5 Fourth, the delivery system for needed inputs, services and credit should be streamlined so as to facilitate increasing use of modern scientific technology. This may be helped by building up a large number of agricultural servicing agencies. Presence of a large number of custom service agencies will provide useful alternatives to the farmers at competitive prices.

5.7.6 Fifth, for each relatively homogeneous farmers' groups, one or two lead technologies should be identified and these should be made attractive enough through a "tapering" scheme of subsidies, where necessary. Once these lead technologies are accepted, complementary technologies will be adopted even if less profitable, and both should take root by the time the subsidy tapers off. If it does not, the subsidy should not be continued but another set of technologies should be tried.

5.7.7 Sixth, the crucial test of farm efficiency in the eastern region should be high productivity per unit of land. Farm operators must increase the productive efficiency of the relatively fixed land resources. This can only be done when they are trained to design an effective input-mix to fit an operating scheme for particular units. Therefore, education and extension programmes are of utmost importance in land use planning. A simple and general prescription for solving farm production problems will not help. Research, extension and education programmes must recognize diversity and choice.

5.7.8 Seventh, marketing system should be strengthened and should be such that it facilitates disposal of small surpluses by a large number of farmers at remunerative prices. The market emerges as a logical focus of activities. It should be utilized for developing a large number of evenly spread growth centres in rural areas.

5.7.9 Eighth, special programmes with as much production thrust as possible must be designed for those specific areas and people not benefiting from the general production-oriented development programmes.

5.7.10 We will describe in detail our proposed action programmes for each of the above areas. However, before presenting these programmes, we will first set out the likely growth levels that could be achieved, if the action programmes indicated by us are pursued in the region.

CHAPTER 6

PROSPECTS FOR ACCELERATING AGRICULTURAL GROWTH

6.1 *Introduction*

6.1.1 We have outlined in the previous Chapter the thrusts of our strategy for achieving accelerated growth. We present in this Chapter two possible alternative levels of agricultural development during the Seventh and Eighth Plan periods.

6.1.2 This exercise is based on two assumptions regarding the rate of expansion in irrigated area. The two alternatives of the development patterns envisaged by us are based on a careful assessment of the eastern region's physical production potential, the current trends in its agricultural development programmes and the recommended strategies. They provide broad dimensions of the 'push' that would be needed in terms of inputs, technologies and practices for propelling Eastern India to progressively higher growth paths.

6.2 *Land Use*

6.2.1 Mention has been already made of the limited scope for land expansion in Eastern India. We envisage the net sown area to stabilize around 1984-85 levels, anticipated slightly higher than the actuals recorded in early 1980s, as the latter were somewhat lower due to drought and floods. Table 6.1 provides the projected net sown area during the two Plan periods.

Table 6.1. Projected Net Sown Area

(Lakh ha)

State/Region	Triennium ending 1980-81	1989-90	1994-95
West Bengal	55	55.9	55.9
Orissa	61	61.0	61.0
Bihar	83	84.5	84.5
East U.P.	56	57.5	57.5
Eastern India	255	258.9	258.9

6.2.2 Gross sown area, however, will record expansion. Infrastructure development programmes will improve the intensity of land use in irrigated areas. It is low at present due to poor irrigation and drainage facilities and inadequate power supply. The action programmes presented in the following Chapters can considerably enhance the scope for multiple cropping, particularly because of the emphasis given on intensive cultivation of short-duration crops. The intensity of land use in unirrigated areas is also likely to show a small increase.

6.2.3 Based on these considerations and assuming improvement in power supply, particularly during the Eighth Plan period, estimates of gross sown area for the years 1989-90 and 1994-95 are presented in Table 6.2. The two alternative projections are developed from the corresponding estimates of irrigated area given in Chapter 16.

Table 6.2. Projected Gross Sown Area

(Lakh ha)

State/Region	Triennium ending 1980-81	1989-90		1994-95	
		Estimate I	Estimate II	Estimate I	Estimate II
West Bengal	75	86.5	83.0	92.0	88.0
Orissa	84	99.9	93.0	102.8	97.7
Bihar	110	133.0	126.5	142.0	132.6
East U.P.	80	91.3	86.3	95.3	90.9
Eastern India	349	410.7	388.8	432.1	409.2

6.2.4 The projected cropping intensity of the eastern region is given in Table 6.3.

Table 6.3. Projected Cropping Intensity

(In per cent)

State/Region	Triennium ending 1980-81	1989-90		1994-95	
		Estimate I	Estimate II	Estimate I	Estimate II
West Bengal	135	154.7	148.5	164.6	157.4
Orissa	138	163.8	152.5	168.5	160.2
Bihar	133	157.4	149.7	168.0	156.9
East U.P.	142	158.8	150.1	165.7	158.1
Eastern India	137	158.6	150.2	166.9	158.1

6.3 Inputs Use

6.3.1 Use of modern inputs in Eastern India has been low primarily due to lack of adequate irrigation, drainage facilities and credit. The recommended programmes for strengthening the infrastructure will considerably enhance the scope for intensifying the use of modern inputs.

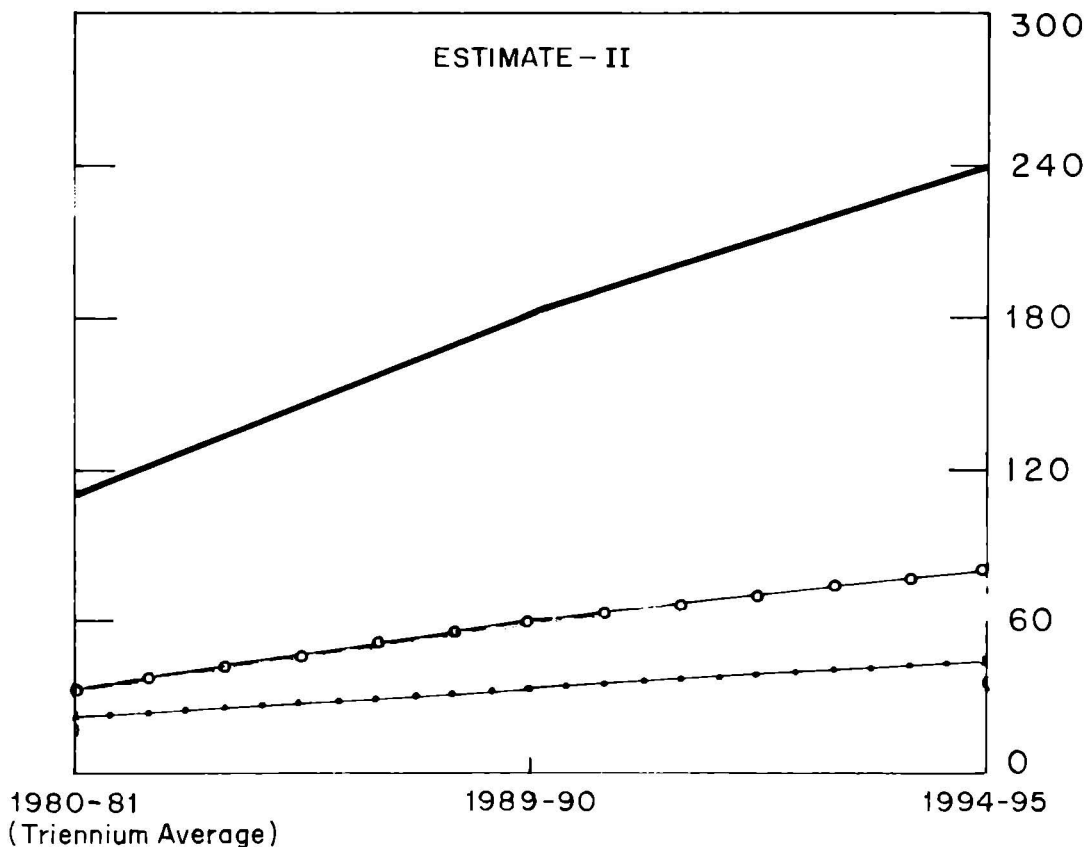
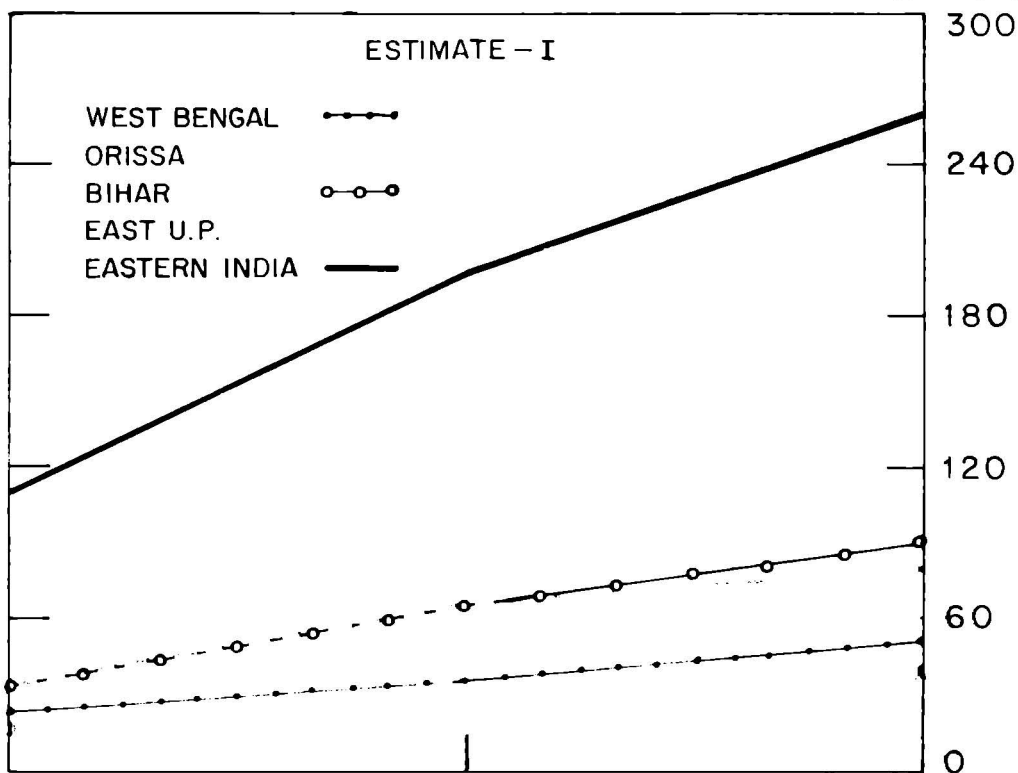
6.3.2 The implications of our action programmes in providing irrigation coverage to gross sown area are shown in Table 6.4. Even with the low projection, the requirements for high yielding varieties of seeds, fertilizers, pesticides, power and farm equipment stemming from expansion in irrigation coverage would at least be twice the 1980-81 level by the end of the Seventh Plan and nearly three times by the end of Eighth Plan period.

Table 6.4. Per cent of Gross Sown Area Irrigated

State/Region	Triennium ending 1980-81	1989-90		1994-95	
		Estimate I	Estimate II	Estimate I	Estimate II
West Bengal	32.0	43.0	41.2	57.5	51.9
Orissa	20.0	26.9	26.8	37.3	36.0
Bihar	32.1	49.7	49.1	63.6	61.5
East U.P.	42.0	72.5	69.8	82.8	82.4
Eastern India	31.5	47.8	46.7	60.3	58.0

ESTIMATE OF IRRIGATED AREA

(Lakh Ha)



6.3.3 Demand for modern inputs will increase at a faster pace due to expansion in irrigation coverage and the consequent changes in cropping pattern. Some indications of this trend are now distinctly visible. For instance, availability of water from an accelerated tubewell development programme launched in East U.P. has helped considerably in raising the fertilizer application rate. Cultivation of high yielding varieties of wheat is now progressing at a faster rate. High yielding varieties of rice are also gaining dominance over local varieties. Results of these changes were evident in 1983-84 when East U.P. harvested a record foodgrains output.

6.3.4 However, the problems will remain for *kharif* crops cultivation, particularly for rice. Even with irrigation and drainage facilities, absorption of modern inputs in Eastern India for *kharif* cultivation will be low due to climatic factors like day length, intensity of sunlight, cloud cover, etc. Rainfed crop technology will have to provide more promising results and stable base for inducing intensification of modern inputs use.

6.3.5 Demand for modern inputs, however, will increase at a much faster rate for *rabi* crops cultivation all over. Area under wheat will expand in East U.P., Bihar and West Bengal. Further, the intensive rice cultivation programme launched for Eastern India may induce area shifts to *boro* rice production in some zones. Spread in the cultivation of these two crops will considerably intensify the demand for irrigation water and power and other inputs like high yielding varieties of seeds, fertilizers and pesticides.

6.3.6 As a consequence of these adjustments in cropping pattern, area under coarse cereals and pulses may decline. Area under pulses, in particular, is unlikely to increase unless a technology is made available with which these will yield as much net income as other competing crops.

6.3.7 Initial response of the small farmers of Eastern India to increased irrigation facilities is likely to be to shift area to subsistence food crops cultivation. If this change in crop pattern is also accompanied by productivity gains through intensification of modern inputs use, market demand might restrain increased foodgrains production and induce thereby a second round of adjustments in cropping pattern in favour of non-foodgrain crops. To protect small farmers from such frustrating experiences, extension programmes must emphasise the need for cultivation of non-food-

grain crops like oilseeds, vegetables, spices, fruits, etc. Great care must be taken to ensure that the enthusiasm of the farmers for increased agricultural production is not dampened due to poor crop planning, demand constraint and lack of effective plans to adjust the crop pattern promptly enough to changes in demand.

6.3.8 Even with the currently available technology, area under oilseeds can be increased considerably in Eastern India. Production of perishable crops like fruits and vegetables has already increased substantially in the eastern region. However, lack of transportation, marketing and processing facilities and the absence of standardized high yielding varieties might constrain expansion of area under these crops. Cultivation of jute and mesta in Eastern India will continue to fluctuate, possibly with no significant trend over the projected period, unless prices are stabilized and maintained at incentive levels.

6.3.9 These changes in the cropping pattern will further intensify the use of modern inputs. For example, the consumption of chemical fertilizers will show an increase due to increase in intensity of cropping, irrigation coverage of gross sown area and dosages applied. The total requirements of NPK, according to the two assumptions of growth are shown in Table 6.5.

Table 6.5. Estimated Requirements of NPK

(Lakh tonnes)

State/Region	Triennium ending 1980-81	1989-90		1994-95	
		Estimate I	Estimate II	Estimate I	Estimate II
West Bengal	2.6	5.2	4.5	6.5	5.7
Orissa	0.8	2.0	1.9	2.8	2.5
Bihar	2.0	4.1	3.9	5.6	5.0
East U.P.	3.8	10.0	9.0	14.0	12.0
Eastern India	9.2	21.3	19.3	28.9	25.2

6.3.10 The above estimates provide the minimum requirement levels and need to be revised upward for two reasons. First, even with the available technology and existing cropping pattern, the level of fertilization is very low in Eastern India, particularly in Bihar and Orissa. If our recommendations for improving the irrigation and drainage facilities are accepted, scope for raising the level of fertilization will increase considerably, especially if it is backed by extension support and an efficient input delivery system. Second, the cropping pattern in the eastern region is changing. The strategy for agricultural development outlined in the Report will further accelerate the change-over from low to high fertilizer using crops and raise the demand for fertilizers.

6.3.11 As the high yielding varieties of rice, wheat and other foodgrain crops and high value crops like fruits and vegetables spread to cover a greater proportion of gross sown area, the ecological balance in Eastern India will change to increase the incidence of pests and diseases. Gall midge and brown plant-hopper present serious threats to rice, particularly during the *kharif* season, when high humidity increases proneness to disease and pest attacks. Fortunately, susceptibility of rice to disease and pest attacks has made the farmers of Eastern India familiar with various plant protection measures.

6.3.12 With the changes in cropping pattern and intensity of farming, plant protection becomes a priority input. Demand for pesticides, plant protection equipment and trained personnel will thus increase. An early warning surveillance system to forecast incidence of pests and plant diseases will have to be given high priority in the region.

6.3.13 The greatest problem of accelerating agricultural growth in Eastern India will, however, arise due to shortage in power supply. The estimated requirements of electricity per ha of net sown area are presented in Table 6.6. As the prospect for meeting these requirements at least during the Seventh Plan period is poor, alternative devices using diesel and non-conventional sources of energy need to be encouraged. Further, husbanding of available electricity must be given utmost importance in order to ensure a steady and uninterrupted supply of a certain minimum level for agricultural use.

Table 6.6. Estimated Requirements of Electricity for Agriculture
(KWH/ha of net sown area)

State/Region	1984-85 (Estimated)	1989-90		1994-95	
		Estimate I	Estimate II	Estimate I	Estimate II
West Bengal	104	122	118	167	153
Orissa	70	81	80	112	108
Bihar	137	150	148	193	187
East U.P.	173	206	201	240	235
Eastern India	122	158	138	179	173

6.4 *Production Prospects*

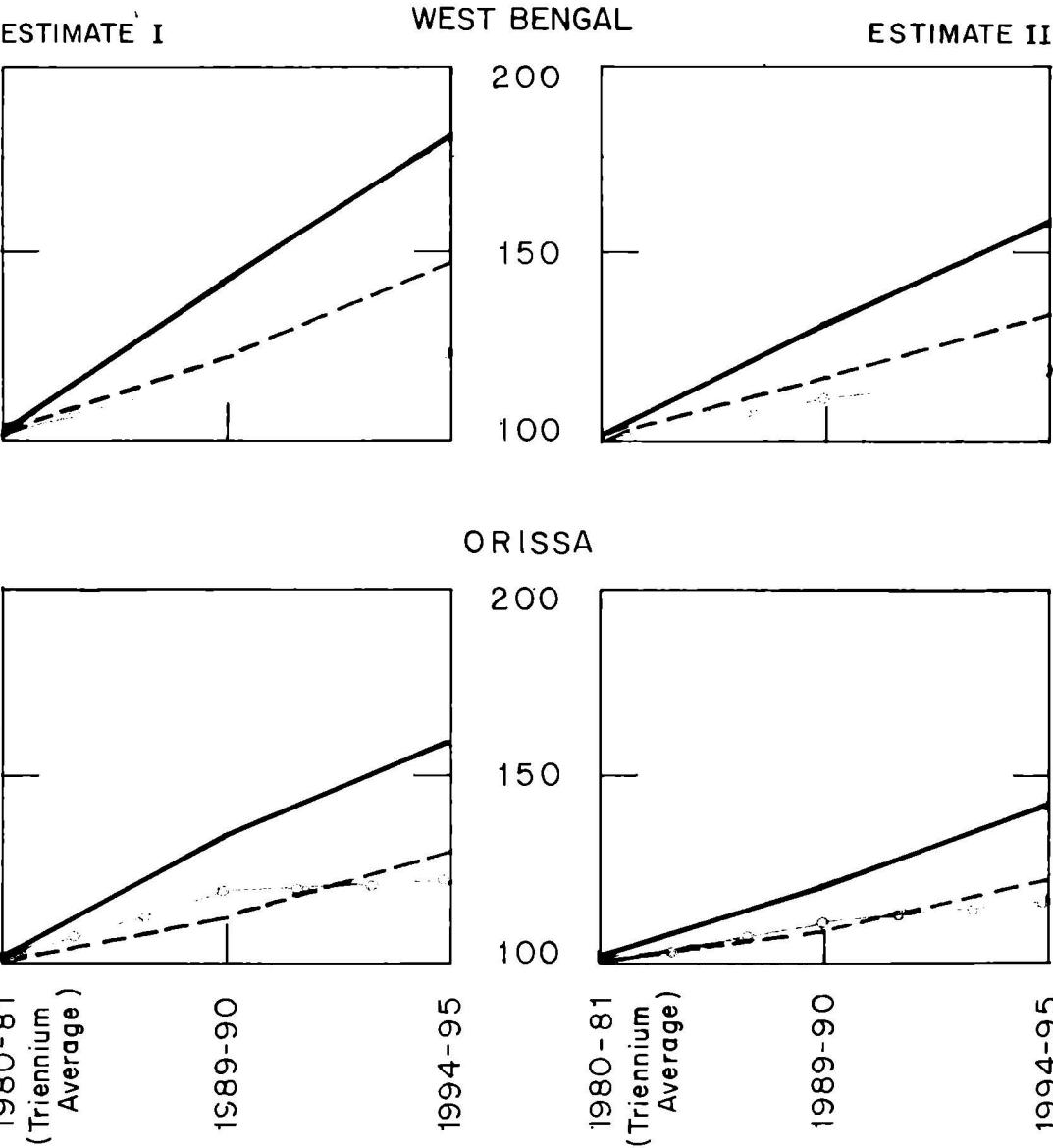
6.4.1 Annexure 6.1 presents the estimated index numbers of area, production and yield for all crops under the two projected patterns of agricultural development described in the previous paragraphs. The index number of area under all crops is derived from the projected gross sown area. The index number of yield is derived by assigning weights to the pattern of land use, with and without irrigation. Two sets of weights are used for incorporating the pattern of intensification in modern inputs use corresponding to the high and low projections. Production index is obtained from the product of area and yield indices.

6.4.2 If the level of intensification in modern inputs use progresses at the rate as described earlier, we believe, the productivity index for all crops will roughly trace out the projected paths. Substantial gap now exists between the potential and the actual farm yields. Several studies have estimated that the potential yields range between 2.0 to 2.5 times the present actual yields. Closing this gap can raise the current level of productivity to a significantly higher level.

6.4.3 On-farm experiments specifically designed to investigate the yield gap issue for Eastern India have highlighted inadequate infrastructure facilities, particularly irrigation and drainage, as

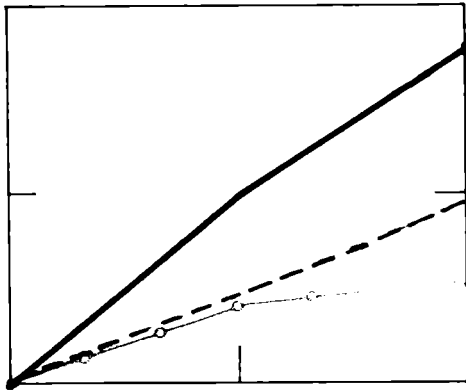
ESTIMATED INDEX NUMBERS FOR AREA, PRODUCTION AND YIELD
(ALL CROPS)

AREA PRODUCTION YIELD



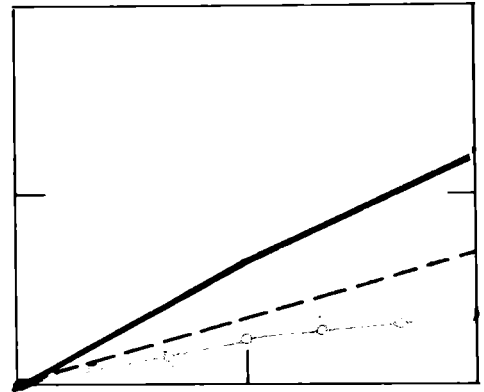
ESTIMATED INDEX NUMBERS FOR AREA, PRODUCTION AND YIELD (ALL CROPS)

ESTIMATE I

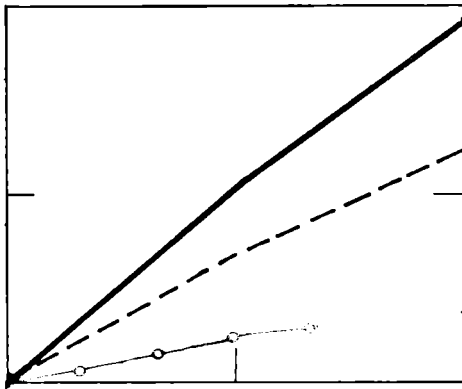


BIHAR

ESTIMATE II



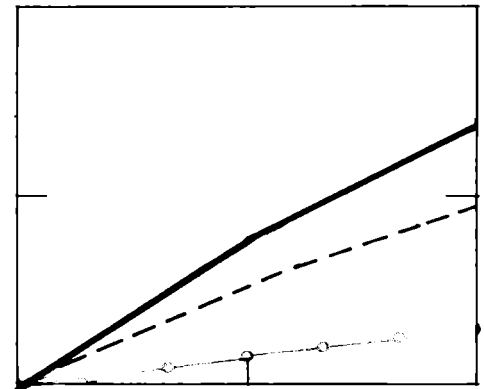
EAST U.P.



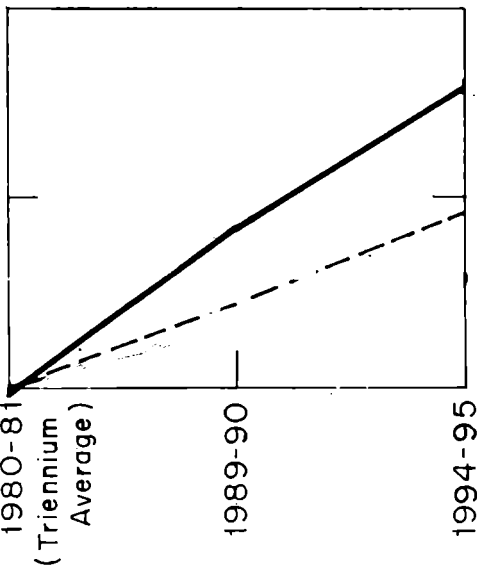
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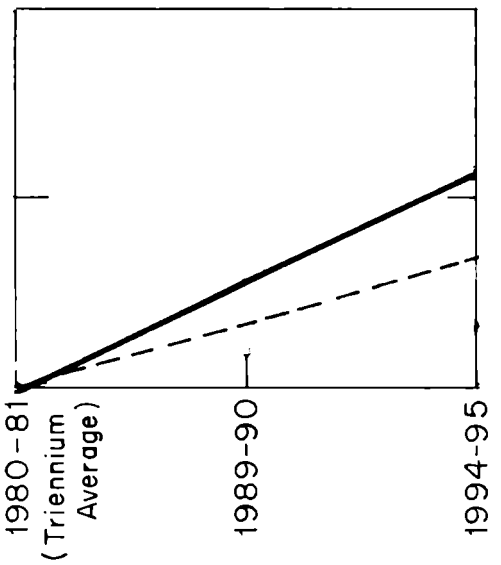
EASTERN INDIA



200

150

100



the most important contributing factors. Other factors like management, input supply and institutional problems are also contributing to widen the gap between potential and the actual farm yields. Given our emphasis on strengthening of infrastructure system and the recommended programmes for supporting extension services and input supply, we believe that the yield gap is likely to narrow down considerably over the Seventh and Eighth Plan periods.

6.4.4 The estimated growth rates for area, production and yield are given in Annexure 6.2. For the region as a whole, agricultural productivity, according to our Estimate I, is likely to exhibit an annual growth rate of about 3 per cent per annum during the Seventh Plan and a little over 3.5 per cent during the Eighth Plan. Agricultural production is likely to grow at an annual compound rate of 6 per cent during the Seventh Plan and a little over 4.5 per cent during the Eighth Plan. According to our Estimate II, the growth in agricultural productivity will be around 2 per cent and 3 per cent, respectively, during the Seventh Plan and the Eighth Plan, respectively. Under this estimate, agricultural production is likely to increase at the rate of nearly 4 per cent during the Seventh Plan and little less than 4 per cent during the Eighth Plan. Thus, the annual increase in production would range between 4.6 per cent during the Seventh Plan and 4.5 per cent during the Eighth Plan.

6.4.5 From a purely technological standpoint even the high growth rate given by us may appear to be an underestimate. But not only supply constraints but also demand constraints need to be taken into consideration. If supply of particular crop or crops exceeds substantially the effective demand, either the market will have to be extended or the cropping pattern changed promptly on the lines discussed in Chapter 12. If neither of these succeed, agricultural productivity will strike a plateau. On the other hand, agricultural production as a whole (although not of every crop) may substantially exceed even our higher estimate, if both the production and demand constraints are successfully overcome. At the stage of foodgrains production that the country has now reached, total agricultural production should receive even greater attention than merely the production of cereals.

Annexure 6.1

**Estimated Index Numbers for Area, Production and Yield :
All Crops (Triennium average ending 1980-81 = 100)**

State/Region	1989-90		1994-95	
	Estimate I	Estimate II	Estimate I	Estimate II
West Bengal				
Area	115.8	111.1	123.2	117.8
Production	141.3	129.2	180.2	156.6
Yield	122.0	116.3	146.3	132.9
Orissa				
Area	118.9	110.7	122.4	116.3
Production	133.3	120.3	158.5	142.0
Yield	112.1	108.7	129.5	122.0
Bihar				
Area	121.1	113.8	127.8	119.3
Production	150.6	135.1	189.8	163.1
Yield	124.4	118.7	148.5	136.7
East U.P.				
Area	113.8	109.5	120.9	115.3
Production	153.1	139.6	197.8	170.4
Yield	134.5	127.5	163.6	147.8
Eastern India				
Area	117.8	111.5	128.9	117.4
Production	145.1	131.3	182.0	158.4
Yield	123.2	117.8	146.9	134.9

Annexure 6.2

Projected growth rates in Area, Production and Yield

State/Region	Compound Growth Rates					
	1984-85	1984-85	1989-90	1989-90	1984-85 to	
	to	to	to	to	1994-95	
	1989-90	1989-90	1994-95	1994-95	Esti- mate I	Esti- mate II
	Esti- mate I	Esti- mate II	Esti- mate I	Esti- mate II	Esti- mate I	Esti- mate II
West Bengal						
Area	2.7	1.8	1.3	1.2	1.9	1.5
Production	6.2	4.4	5.0	3.9	5.6	4.1
Yield	3.5	2.5	3.7	2.7	3.6	2.6
Orissa						
Area	3.4	2.0	0.6	1.0	2.0	1.5
Production	5.4	3.2	3.6	3.3	4.4	3.3
Yield	1.9	1.2	2.9	2.3	2.4	1.8
Bihar						
Area	3.2	1.9	1.1	1.0	2.1	1.4
Production	5.8	3.5	4.7	3.8	5.2	3.7
Yield	2.5	1.5	3.6	2.9	3.0	2.2
East U.P.						
Area	2.5	1.7	1.2	1.0	1.8	1.4
Production	6.6	4.7	5.3	4.1	5.9	4.4
Yield	4.1	3.0	4.0	3.0	4.0	3.0
Eastern India						
Area	3.0	1.9	1.0	1.0	2.0	1.5
Production	6.0	3.9	4.6	3.8	5.3	3.9
Yield	2.9	2.0	3.6	2.8	3.2	2.4

CHAPTER 7

MANAGEMENT AND ORGANISATION

7.1 *Introduction*

7.1.1 As a result of the development efforts of the last three and a half decades, Eastern India is now near the threshold of rapid technological progress in agriculture. But when and how it will come will depend very largely on the human factor and management. The regrettable fact, however, is that in bulk of the region :

- i) many Government functionaries are slow moving and lack enterprise; often their work is not properly co-ordinated;
- ii) many co-operatives are inefficient and faction ridden, the dominant faction often discriminating against the weaker sections;
- iii) private sector is relatively efficient, but exploitative whenever there is inadequate competition;
- iv) voluntary organizations are of varying degrees of efficiency and suffer from paucity of funds and manpower and are incapable of large-scale operations; and
- v) bureaucratic control, continued for long, is likely to lead to inefficiency if rigid, and to corruption, if lax.

7.1.2 For extensive operations, we have no alternative but to depend largely upon Government functionaries and co-operatives, use private sector for providing useful competition and the much needed flexibility and voluntary organizations for developing 'models' for emulation. Government regulation and control may be kept ready but used as a last resort and for limited periods only.

7.1.3 While every effort should be made to improve the functioning of these agencies through management measures, it will not be realistic to depend on any one of these to produce the desired results. Competition among all the alternative agencies

should be encouraged. Monopoly of any agency, public or private, is not desirable.

7.2 *Government Functionaries*

7.2.1 For covering the large mass of rural population, Government functionaries have necessarily to play a leading role. This would call for a substantial improvement in management and organization. The administrative departments and agencies involved in the management of various programmes should be re-oriented and geared to accomplish the developmental goals. The personnel at all the four tiers — State, district, block and village levels — should be more sensitive to the socio-economic objectives of development, especially in backward, remote, hilly and tribal areas. Greater attention should be paid to (i) eliminating inefficiency, inertia, dishonesty and avoidable wastage of scarce resources and (ii) promoting motivation and enthusiasm for implementing programmes. There must be better co-ordination among the various departments. The programmes should be vigorously and efficiently implemented and monitored.

7.2.2 In this context, we would like to emphasize the importance of the administrative leadership. There has been considerable deterioration in it over the recent decades. Without a strong administrative leadership, our efforts at development will not produce the desired result. All concerned must take positive steps to nurture this and further nothing should be done to undermine this. The authority and prestige of Departmental Heads at the State level and Government functionaries at the district/block level should not be eroded if they are to deliver the goods expected of them. Their advice in matters of administration and discipline should be given earnest consideration. Exceptions to this have become too many. This matter is of primary importance to the political leadership at State levels.

7.2.3 The main areas where improvements are needed in management and organisation are set out below.

7.3 *Public Sector Corporations*

7.3.1 The working of Agro-Industries Corporations is not satisfactory. They have deviated from their main functions of

designing, manufacturing and selling machinery and implements. In East U.P., West Bengal and Orissa, they have taken up distribution of inputs as well. The Agro-Industries Corporations must concentrate on manufacture and sale of machinery and implements (e.g., improved ploughs, sprayers, seed-cum-fertilizer drills, etc.), improve their custom and hire services, particularly to small and marginal farmers, and open more repair and service centres. They should give up the business of distribution of inputs which seems to make them neglect their main task.

7.3.2 The Agro-Industries Corporations should be made to run on business lines. If this is not possible within a reasonable period of time, they should be wound up and the requisite services made available departmentally. The private sector should also be utilised to a larger extent than hitherto and permitted to compete with the public sector agencies.

7.3.3 Minor Irrigation Development/Water Development Corporations should be drastically reorganised to be efficient and financially viable (*vide* Chapter 9). Trained management/technical experts only should be appointed as Managing Directors of such Corporations on a performance contract basis, which should include suitable reward and penalty. They should be given all necessary power and support.

7.3.4 State Governments should undertake periodic review of the working of these public sector Corporations and adopt appropriate measures to improve their working. The main focus of this review will be to ascertain whether these agencies are providing adequately all the support and supply services expected of them, which the farmers themselves cannot have on their own but need for improving productivity per ha and per capita.

7.4 *Electric Power and Diesel Supply*

7.4.1 There is a shortage of electric power in all the four States. Moreover, its supply is uncertain. Thefts of wires, transformers, etc., are also quite common. The State Governments should take effective steps to tackle the problem of theft and the tampering of electric installations. The imposition of collective fines through suitable legislation, if necessary, may be considered in areas where

these are very frequent so as to induce all the villagers to take appropriate surveillance measures.

7.4.2 For agricultural purposes, provision of separate power lines should be given priority. As the use of power for agricultural purposes is only a fraction of its total sales, the farmers should be assured of an uninterrupted supply for specific hours in a day, along with a rotation system of power supply, during forenoon and afternoon, as in Tamil Nadu (*vide* Chapter 9, paragraph 9.3.13).

7.4.3 In some interior areas, farmers face problems of uncertain supply of diesel oil for pumpsets. The distribution machinery in such areas should be improved. While opening new petrol and diesel stations, oil companies should give due weightage to areas using tubewells and pumps which are not adequately served by petrol stations or electric supply. In fact, the "franchise" system followed by oil companies for petrol stations to provide supplies and services to their customers in urban areas could, with some modification, be usefully extended to their potential customers in rural areas. This possibility may be explored by the State Governments.

7.5 *Water Management, Inputs, Research and Extension and Credit*

7.5.1 In the spheres of basic infrastructure such as irrigation and drainage, production and distribution of inputs, agricultural research and extension and credit there is need for considerable improvement in management and organization of systems and procedures. These are dealt with in detail in chapters 9, 10, 11 and 15, respectively. In all these, the basic concern should be what will help the resource-poor farmers to go up the development ladder, step by step, instead of following the easier path of making a success story of a few resource-rich farmers.

7.6 *Panchayat Samities and Zilla Parishads*

7.6.1 Panchayat Samitis and Zilla Parishads can play a useful role in rural development.

7.6.2 In West Bengal, the responsibility for rural development at the grass roots level has been entrusted to these institutions.

Although the system has generated factionalism in some areas, it has provided a fair amount of decentralisation of power and contributed to the development of a useful communication system from grass roots level to the State level and back. However, there is scope for establishing a mutually collaborative and check and balance relationship between the elected heads of these bodies and appointed government officials, technical and administrative, at each appropriate level. In Bihar, these institutions are involved in distribution of inputs, conduct of demonstrations, etc. In U.P., a Minister presides over the Planning and Coordination Committee for each district. In Orissa, the progress made in agricultural production programmes is reviewed by these institutions from time to time based on reports received from the Agriculture Department.

7.6.3 If these institutions are to be effective in promoting rural development, there should be greater contact and coordination between them and the Agriculture and other concerned Departments.

7.7 *Co-operatives*

7.7.1 Co-operatives have not fared well in Eastern India. Most of them have been resource-poor, badly managed and/or faction ridden. Yet, they cannot be dispensed with. They have to be made to work better if the farmers of this region, bulk of whom are small and marginal, have to improve their productivity and standard of living.

7.7.2 These farmers are too poor and weak to undertake individually many of the functions needed for improving their productivity.

7.7.3 If certain public and private sector agencies undertake to perform, as recommended by us elsewhere, many of the non-farm functions, it will no doubt provide relief to the farmer and enable him to concentrate on basic on-farm operations. But even then these farmers will not be able to derive full benefit from these support services, unless they work collectively in viable groups.

7.7.4 For certain purposes, e.g., credit or supply, there is need for a minimum critical size and co-operatives have necessarily to be somewhat large.

7.7.5 But these large co-operatives often tend to become faction ridden and/or bureaucratic and unduly dominated by the Chairman and the Secretary. If there are economies of large-scale operations, there are also serious diseconomies. There is a need in the case of such co-operatives for the State Governments to arrange for careful monitoring and take effective action whenever necessary to curb malpractices or to protect the interests of the weaker sections. No large co-operative or federation of co-operatives should be allowed to exercise monopoly power.

7.7.6 There are, however, other functions, e.g., sharing of tubewells, machinery or vehicles or joint marketing or even joint farming in which small co-operatives or associations or even groups can work quite efficiently, if they comprise like-minded members with common interest. If necessary, two or more of them can even share paid staff or premises, until their own income becomes adequate. State Governments should mount a special campaign to promote such functional co-operatives and minimise the formalities for their registration, control and dissolution. If counter-productive factions emerge, it should be easy for them to form separate co-operatives or groups or to join neighbouring ones.

7.7.7 All such co-operatives and groups should be given preferential treatment for Government assistance and bank credit.

7.8 *Voluntary Organizations*

7.8.1 We came across evidence of good pioneering work done by some voluntary organizations like the Tagore Society for Rural Development and Ramakrishna Mission in West Bengal, the Vaishali Area Small Farmers' Association and St. Xavier's Institute of Social Service in Bihar. There are also similar organizations in Orissa and East U.P. Several of these voluntary organizations are motivated by high idealism, a sense of dedication to public service and have special influence on the rural folk with whom they work. Some of these organizations hold out the promise that with a little guidance from a dedicated leadership, as in Rangabelia, farmers can on their own improve their socio-economic conditions without much of outside assistance. Though these organizations cannot operate on a large scale, they can still play a useful catalytic role in the development process by acting as

path finders and pace setters in the application of innovative technology and management practices.

7.8.2 It is necessary to encourage voluntary organizations to get involved to a substantially larger extent than at present in the agricultural development process and provide adequate help to genuine and dedicated organizations. However, while encouraging increased involvement of voluntary organizations, care should be taken to ensure their proper selection. The criteria for selection should include the following :

- (a) voluntary organizations identify the beneficiaries and their needs with the active participation of the beneficiaries themselves;
- (b) volunteers are prepared to live and work among the beneficiaries;
- (c) the action plans for which funds are being sought are economically viable or socially beneficial;
- (d) necessary competence is available to carry out the action programme; and
- (e) the past performance and financial record is good.

7.8.3 Financial requirements of voluntary organizations are of three kinds, viz., (i) seed money to initiate activity in an area, (ii) project funds and (iii) overhead expenditure. At present many of the voluntary organizations depend heavily on foreign donations. It is necessary that adequate flow of financial assistance should come to voluntary organizations from Indian sources.

7.8.4 The work of these organizations should be evaluated by reputed research institutions and given due publicity to establish their credibility among private donors. Additional tax concessions will also help increase private donations.

7.8.5 NABARD and commercial banks, who have separate "Research and Development" (R & D) funds, may provide some seed money and overhead cost on a grant basis out of their R & D Funds and project cost as loan to deserving voluntary organizations, after appropriate evaluation by an expert committee.

7.8.6 Government of India/State Governments may also provide some grant and loan assistance, preferably for specific programmes and projects. Special safeguards should be provided to keep out political influence and bureaucratic interference as these will very adversely affect the credibility and efficiency of these organizations. It may be useful if Union and/or State Governments set up one or more non-political and independent Commissions, on the lines of the University Grants Commission, for channelling government assistance to voluntary organizations. Plurality of such Commissions may not be necessarily undesirable.

7.8.7 In order to facilitate donations from the Commissions referred to above or from banks and NABARD and minimise bureaucratic control, voluntary organizations themselves should consider becoming members of some Coordinating Association of their own, which can take up the task of imposing on them certain standards of financial accountability and ethical conduct.

7.9 *Business Organisations*

7.9.1 The main role of private enterprise in promoting agricultural productivity will no doubt be through providing needed supplies and services with efficiency and flexibility on the basis of healthy competition. But some of them can also make a very important contribution to this national endeavour by applying their expertise in management and technology to undertake innovative experiments in the form of pilot projects in both agriculture and linked industries, especially in the neighbourhood of secondary markets in different areas.

7.9.2 State Governments should consider inviting reputed industrial corporations, business firms, banks, etc., each to adopt a secondary market and 2 or 3 villages near it, for undertaking experiments in development of agriculture and related industries in rural areas of Eastern India. Some infrastructure facilities or other assistance may be provided to them.

7.10 *Inter-Departmental Coordination*

7.10.1 Within the State Governments, there are a number of Ministries and Departments dealing with various aspects of agri-

culture and allied activities. Lack of coordination among them is a serious constraint affecting agricultural development in these States. Coordination among the various Departments becomes difficult in the absence of a sufficiently senior officer to coordinate their activities. The APC, who used to perform this function in the earlier years, is no longer effective for the purpose, as several Secretaries of other Departments whose functioning the APC has to coordinate have acquired equal status. Therefore, to improve inter-departmental coordination, the status of APC should be raised above the level of Departmental Secretaries. Alternatively the function of coordination should be entrusted to the Chief Secretary or Additional Chief Secretary.

7.10.2 At the district level also, production programmes suffer for want of an effective coordinating authority. The District Magistrate should be the Chairman of a Committee entrusted with the full responsibility for coordinating the work of the concerned Government departments at the district level, with the senior most Agricultural Officer as the Convenor.

7.10.3 While implementing the programmes, it is important to ensure proper sequencing of actions by the concerned departments. For instance, construction of field channels should precede release of irrigation water and drainage channels should be unimpeded when waterlogging is imminent. State Irrigation Departments/CADA should ensure this. At the same time, Agriculture and Co-operative Departments should arrange for the timely provision of custom service/hire facilities, extension advice and supply of seeds, fertilizers, pesticides and credit. Marketing Departments should take advance action so that no transport, storage or marketing bottlenecks adversely affect the farmer. Without effective sequential link-up, it will not be possible for farmers to derive optimum benefit from the programmes implemented.

7.11 *Flexibility in Budgetary Allocations for Agriculture*

7.11.1 Budgetary procedures have to be suitably modified to provide for some free funds for agriculture at the State level which will not be earmarked but will be available for use in specific areas for specific purposes which cannot be foreseen but become critical during the course of a year.

7.11.2 A similar flexibility will be helpful at the district level also. This may best be achieved by the Central and State Governments leaving some funds without earmarking with the DRDA and allowing the agency to utilise them in critical situations.

7.11.3 At the State level, it is the APC and at the district level, the District Magistrate (as the Chairman of DRDA) who should have a final say in the utilisation of such funds.

7.11.4 Subsidies should not be given as 'investment subsidy' initially, as hitherto, but linked with performance. There is also a good case for gradually moving away from the system of general and continuing subsidies, wherever practicable to a system of tapering subsidy for limited periods of initiation, tailor-made for specific target groups.

7.12 *Appointment of Standing Committees*

7.12.1 For coordination and monitoring the implementation of various programmes we suggest the appointment of two Committees at the State level. One Committee will be presided over by the Chief Minister with all concerned Ministers as members. The second Committee will be presided over by the Chief Secretary with Secretaries of all concerned Departments, including Planning and Finance as members. Representatives of the Union Ministry of Agriculture, RBI and NABARD should be invited to attend the meetings of both the Committees. The APC¹ may be the convenor of both these Committees.

7.12.2 The first Committee will meet at least once in every six months and the second Committee will meet at least once every quarter to review the progress, identify bottlenecks and suggest solutions. The second Committee will submit its report and such recommendations as in its opinion deserve to be considered at a higher level to the first Committee. Enough powers must be delegated to the second Committee so that on its decisions, orders of Government can be issued on most matters from the concerned departments, without delay and without any further interdepartmental consultation. Reports of the seminars recommended in Chapter 11 should be considered by this Committee.

¹ In West Bengal, where there is no APC, Agriculture Secretary may be the Convenor.

7.13 *Monitoring and Evaluation*

7.13.1 It is necessary that implementation of various programmes outlined in this Report is properly monitored and evaluated from time to time. For this purpose, a Monitoring and Evaluation Cell should be set up within the State Government (where such a Cell exists, it should be re-organised and strengthened). Suitable guidelines for the Cell should be evolved by the Union Ministry of Agriculture, in consultation with the Planning Commission and NABARD. The Monitoring and Evaluation Cell should be under the charge of a senior officer who will be accountable to APC or Additional Chief Secretary. It should provide feedback from time to time on the basis of desk reviews, field studies, etc., to the two Standing Committees referred to above. A mid-term evaluation of the programmes should be taken up along with mid-term appraisal of the Five-Year Plan. This work may be entrusted to independent research bodies.

7.13.2 To oversee the implementation of programmes, a Co-ordinating Committee may be set up at the Union Ministry of Agriculture, consisting of Secretaries of Ministries of Agriculture, Irrigation and Finance and representatives of the Planning Commission, RBI and NABARD.

7.14 *Attitudinal Changes*

7.14.1 The officials incharge of State administration should be exhorted to be sensitive to the needs and aspirations of farmers, particularly the weaker sections. The conventional bureaucratic approach, which has often resulted in mismanagement should be changed to a more flexible and development-oriented approach to all problems affecting the rural community. Greater flexibility and decision-making at the local level should be encouraged. The policies and procedures should be so designed as to meet the felt and emerging needs of farmers, especially the resource-poor among them. The basic approach should be to work with the farmers than just to work for them. Sound human relations and effective two-way exchange of experiences should be given high priority.

7.14.2 The key word in this context should be "innovative management" of all relevant factors of production to maximise

per ha and per capita productivity instead of "conventional administration" which puts greater emphasis on enforcement of rules than on increasing production.

7.14.3 It is better management at State, district and block levels which can do more for progressive improvement of agricultural productivity in Eastern India than anything else, especially now that this region is almost near the threshold of rapid technological progress.

CHAPTER 8

LAND AND FARM POLICY

8.1 *Introduction*

8.1.1 Eastern India is a region basically dominated by small and marginal farms. The very small size of holdings and acute fragmentation makes sound water management, technological improvements, investments in land infrastructure and marketing arrangements very difficult.

8.1.2 The number of small holdings and fragments is increasing year after year owing to increase in population, subdivision of land under a law of succession which gives all heirs equal share and lack of adequate employment opportunities in the non-agricultural sector.

8.2 *Policy Issues*

8.2.1 Land consolidation, which could be a possible solution, has made limited progress so far in the region, except in East U.P.

8.2.2 Another solution to overcome the constraints arising from smallness of holding is co-operative farming, involving pooling of land. But this does not seem practicable in the foreseeable future for various reasons, including opposition of farmers themselves.

8.2.3 In this context, the basic questions are

- i) how to improve the productivity per ha as well as per capita of small farms, and
- ii) what can be done to induce increasingly large number of farm workers to shift from farm to non-farm occupations, which will help bring about progressively an increase in the size of operational holding than at present.

8.2.4 The alternative open to us is to follow broadly the Japanese/Taiwanese model. The salient features of this approach are the following :

- i) to accept the small farm as the inescapable part of the agrarian structure;
- ii) to provide all the needed supplies (of equipment and inputs) and services to farmers through other agencies, viz., public agencies, co-operatives, voluntary organizations and private enterprises on a non-monopolistic and competitive basis;
- iii) to enable the farmer to concentrate on the specialised job of farming with efficient services from these other agencies for providing all the complementary and supplementary jobs that need to be done on a custom service, rental or hire purchase basis as far as possible;
- iv) to arrange timely and adequate credit from banks or co-operatives to pay for these services and supplies; and
- v) to provide the needed transport, storage, marketing and processing facilities.

8.2.5 The following measures should be vigorously pursued with a view to reducing adverse effects of sub-division and fragmentation of holdings.

(i) *Consolidation of Holdings*: This should be given a high priority, especially in irrigated areas and areas with good ground-water potential. In view of the opposition of sharecroppers and landowners to exchange their land, consolidation work has suffered. A pilot project for consolidation, with adequate preparatory work for educating people, should be taken up in suitable areas in each district, except in hilly areas. The linking of sharecropper with landlord as in Bihar may facilitate consolidation work. Consolidation of holdings should be combined with on-farm development (OFD) works. Adequate funds for this purpose should be earmarked in the State Plans. Beneficial impact of these pilot projects should be given due publicity for mobilising support in favour of consolidation.

(ii) *Farmer Groups*: Beneficiary Groups or Associations should be formed for joint operations like sharing of wells, tanks, micro-

watersheds, pumps, machinery, transport, storage, etc. It should be possible to constitute such Groups or Associations, without detailed formalities, under the Co-operative or Societies Registration Acts. A beginning should be made in the Seventh Plan for the formation of such groups in each irrigation outlet, micro-watershed and in compact area where the Centrally Sponsored Scheme for tubewells proposed by us (*vide* Chapter 9) is launched.

(iii) *Tenancy Reform*: Small farmers having 2 standard ha or less of land should be exempted from the present tenancy legislation and permitted to lease out and lease in land freely. This will eventually lead to a more rational and economic operational holding irrespective of the nature of the ownership of the holding, so far as small farmers are concerned. Further, if a small and marginal farmer knows that, like defence personnel, he can get back his leased-out land whenever he wants to resume cultivation, he may be more willing to lease his land to another interested small farmer and move to a non-farm occupation of his liking. This facility should be, however, restricted only to small and marginal farmers from equity considerations. The present restrictions regarding tenancy should continue to apply to medium and large farmers.

(iv) *Floor Limit for Operational Holding*: In view of the traditional attachment to land and the absence of alternative profitable employment opportunities, the farmers cling to their small plots of land which are getting further sub-divided with the passage of time. The plots of land have become so small in large parts of this region that they are not viable for efficient farm operations. A "floor" limit for operational holdings should, therefore, be fixed. The operational holding should not be allowed to fall below say, $\frac{1}{2}$ or 1 standard ha. If there can be a "ceiling" on holdings from considerations of equity, there is a strong case for a "floor" for holdings from considerations of productivity. The land reform law and, if necessary, the relevant succession law should be amended to put a floor limit¹. Heirs may be given options to

- (a) sell or lease their shares below $\frac{1}{2}$ or 1 ha to a co-sharer or an adjacent farmer,
- (b) form a joint-farming group, or

¹ Homestead lands should, of course, be exempted from such floor limit.

- (c) sell or lease the holding to an agency designated by the Government.

Necessary term loans may be made available by the State Land Development Bank or an agency designated by the Government, for purchase of such lands, wherever necessary. Simultaneously, to provide a means of livelihood for such persons who sell or lease out their land, there should be adequate employment opportunities provided either locally or within a reasonable distance and also credit therefor (see paragraph 8.9.3).

8.2.6 Without the "floor" and other measures referred to above, sub-division and fragmentation will soon make the holdings so minuscule as to be uncultivable.

8.3 *Crop Planning*

8.3.1 All the constraints, big or small, need to be identified at different levels, viz., village, block, agro-climatic zone and State. Corrective action should be taken in a systematic manner by the State Governments, with the support of all other institutions and service agencies. This calls for a well planned system of assignment of specific tasks and inter-agency coodination at different levels in which local, State and Central Governments as well as credit institutions have a key role to play.

8.3.2 The financial resources required to overcome the more crucial constraints have to be estimated from the block level upwards. While funds for these may be earmarked in the State Plans, it will be desirable to place some "free" funds at the disposal of APC to meet unforeseen and emergency situations, *vide* Chapter 7, paragraph 7.11.3).

8.3.3 Crop planning can be flexible in areas irrigated by shallow tubewells and pumpsets, because the farmer can exercise control over the supply of water. However, in canal irrigated areas, the cropping pattern depends on the time and volume of water released and, therefore, the control of farmers over water is limited. Lands which are not suitable for rice should be sown to low-duty crops requiring less water. This will help in providing irrigation water to a larger area. The concept of crop planning, on a pipe outlet basis, needs to be introduced, backed by research

on location-specific high yielding and high stability varieties of crops and improved agricultural practices.

8.3.4 In areas with high variability of rainfall, suitable contingency plan should be prepared taking into account the pattern of rainfall at the time of sowing and crucial periods of plant growth. Farmers should be advised to adjust suitably the sowing time of crops in such a way that the weeks of low and erratic rainfall are avoided. For facilitating this, the Director of Meteorology, Pune has furnished, at our request, computerised data on the weekly pattern of rainfall for 82 rain gauge stations, one each selected from 69 districts of West Bengal, Orissa, Bihar and East U.P. for a period of over 60 years. These data are presented in a summary form in Part VI. These provide, for each of the selected rain gauge stations, mean rainfall and average number of rainy days and their coefficient of variations. On the basis of these summarised data, useful reliability analysis of rainfall can be carried out for most stations. Such an exercise should be taken up by the State Governments in respect of all rain gauge stations. Further, efforts should be made to take into account other location-specific characteristics like evapo-transpiration for prescribing optimum crop patterns and evolving suitable crops. For stations with very high variability, the full series of rainfall data may have to be subjected to more detailed analysis for operational purposes.

8.3.5 In the eastern region, rice is grown in large areas. Some of these areas are quite unsuitable for rice. But, farmers find that rice is easily marketed and further it is needed for their own consumption. Some of these areas are more suitable for growing pulses, millets and oilseeds. In some areas, these crops can be grown together with rice. Suitable alternative cropping patterns have to be evolved in such areas and infrastructure developed to enable a switch-over from rice to such crops.

8.3.6 Poor and marginal lands not suitable for rice should be utilised for raising millets (wherever possible), fodder crops (wherever they can be profitably introduced to support mixed farming) and fuel trees.

8.3.7 A large part of the cropped area in Eastern India is rain-fed. The Centrally Sponsored Scheme of Micro-watershed Deve-

lopment should be supplemented by State Government efforts. National Rural Employment Programme (NREP) could be utilised with advantage for construction of micro-watersheds.

8.4 Soil Erosion

8.4.1 Soil erosion should be checked through soil conservation measures like contour bunding, contour planting, etc., with suitable assistance from Government. Adequate provision should be made for this in the Plans. Banks can also help finance such of these projects which are viable.

8.4.2 A Central Scheme should be taken up for control of soil erosion in catchment areas which cut across State boundaries.

8.4.3 Afforestation and agroforestry should also be taken up on a large scale to control soil erosion.

8.5 Location-specific Approach

8.5.1 The cropping pattern will vary from region to region depending upon the soil and climatic conditions and water regime. The broad approach to agricultural development in different regions is indicated below.

8.5.2 In alluvial plains, maximisation of production of staple crops, especially HYVs in medium/large holdings, and HYVs/high-value crops in small holdings should be encouraged.

8.5.3 In areas where water supply is inadequate, low duty crops, agroforestry, orchards and mixed farming should be tried and where the land is undulating, micro-watershed development will be useful.

8.5.4 In hilly, *terai* and plateau regions, the main focus of development should be agroforestry, horticulture crops and fuel trees on micro-watershed basis, supplemented by animal husbandry and other allied activities. For utilising wasteland not fit for crop production, suitable species of fodder, fuel and fruit trees should be identified for each area. Fruit and fuel trees should be encouraged along field boundaries by provision of saplings, other inputs and extension advice. The criteria for selection of fruit trees should be, *inter alia*, the following:

- i) short gestation period,
- ii) most in demand by the local population,
- iii) perishable fruits to be grown in compact areas where transport/marketing/processing facilities can be organised on an adequate scale. Non-perishable fruits should be promoted where these conditions do not prevail.

8.5.5 In coastal saline areas, improvement of drainage, measures for soil amelioration and prevention of salt water intrusion should get high priority. Research and field trials of salt-tolerant crops which can stand different degrees of waterlogging need to be taken up. The possibility of introduction of suitable crops like coconut, sugarbeat and fuel and fodder trees may be explored.

8.6 *Development Strategy for Small and Marginal Farmers*

8.6.1 Medium and large farmers should be encouraged to allocate as much of their holdings as possible for the cultivation of HYVs of staple crops like rice and wheat. This may not be feasible for small and marginal farmers due to paucity of resources and low risk bearing capacity. Therefore, in small farms, where there is assured irrigation and which have access to motorable roads, farmers should be encouraged to raise on a part of their holdings high-value crops (HVC) and/or HYVs of staple crops. This will help improve their incomes. As their resources improve, these farmers will be able to increase, step by step, area devoted to such crops.

8.6.2 There should be a special effort to introduce intensive "gardening" type of operations, as against the less intensive agricultural type of operations, in small farmers. Modern gardening tools and scientific gardening technology should be introduced for this purpose. The farmers should be helped in the process by provision of minikits of seeds and fertilizers and extension support.

8.6.3 The requirement of costly non-renewable fossil fuel-based resources like petro-chemicals for intensive farming will no doubt be high per ha, but the total quantum needed for agriculture is relatively so small compared to other uses of these resources that it will not cause serious concern if proper priorities are followed.

Further, R & D efforts also hold out a promise for adoption of a larger proportion of renewable non-fossil fuel-based technology in the coming years in intensive farming.

8.6.4 The objective of gardening type of farming will be to help secure at least one main crop in *kharif* season with rain water and at least one main crop and one or two other crops in the *rabi*/summer seasons, primarily with canal, riverlift or ground-water. An attempt should, thus, be made to maximise the gross sown area per holding through multiple cropping and increase yield per unit of sown area through careful land preparation and weeding, sound water management, use of seeds of HYV or high value crops, scientific fertilization and plant protection measures.

8.6.5 Many of the small and marginal farmers do not have the needed animal power but have surplus labour in the family. Some of the marginal farms are not suitable for an economic use of draught cattle and also do not produce the necessary fodder. Modern machinery and gardening tools should prove very helpful, after suitable adaptation, for more efficient use of family labour and maintenance of crop production in bulk of the small farms of Eastern India.

8.6.6 In view of the recent achievements on the foodgrains production front, the country can now afford to shift the emphasis from maximising production of foodgrains to production of high value crops or mixed farming at least so far as the small and marginal farmers are concerned. Otherwise, they will be doomed to subsistence agriculture and poverty and our farm sector will never acquire the selfgenerating and dynamic growth that is vitally needed.

8.6.7 The choice of high value crops to be raised will vary from area to area, depending on soil, agro-climatic factors and more importantly the marketing possibilities. To facilitate marketing of perishable crops such as fruits and vegetables, standardisation of such crops/products on a compact area basis should be encouraged. The strategy of promoting high value crops such as vegetables can produce good results only if there are effective links between production and marketing. It would be necessary to organize demand/marketing feasibility studies to identify compact

areas for production and planning transport, storage, marketing and processing arrangements. The State Governments and the recently set up National Horticulture Board should identify suitable compact areas for different varieties of vegetables, fruits, spices, medicinal plants and flowers, assist in their cultivation and make necessary arrangements for their transport and marketing so that farmers will be motivated to take up this type of farming operations.

8.6.8 The strategy of extending high yielding or high income producing multiple cropping based on sound water management and gardening type of operations in Eastern India will call for substantial changes in the existing infrastructure for research, extension, irrigation and drainage. Besides, steps will have to be taken to overcome demand constraints. Due attention will have to be paid to strengthen the systems for input supply, output marketing and credit flows. These changes should be begun during the Seventh Plan and completed during the Eighth Plan period.

8.6.9 Alongwith cultivation of high value crops, the small and marginal farmers should be encouraged to take up supplementary activities such as animal husbandry, particularly in tribal and backward areas.

8.6.10 Where irrigation is insufficient for growing water-demanding staple crops and high value crops, farmers should be encouraged to grow drought-resistant varieties of crops requiring less water.

8.6.11 Where transport facilities are inadequate, farmers should be encouraged to produce non-perishable crops.

8.6.12 The necessary infrastructural support for all these activities should be provided by the State Governments. Considerable amount of capital investment both by the Government and banks will also be necessary.

8.6.13 Such intensive investment of capital on small farms will not only improve per capita productivity, but also help create additional employment opportunities in secondary and tertiary sectors and eventually siphon off labour from agriculture to these

sectors which is an essential prerequisite for sustained modernisation of our rural economy. Further, it will help progressively improve the standard of living and modernise the outlook of the rural poor.

8.6.14 It is neither necessary nor feasible to cover a small farm fully at one go by this labour-cum-capital intensive technology outlined in paragraphs 8.6.1 and 8.6.2. It may be better, to start with, if a fraction of such farm is covered by this new technology, the other part being confined to traditional farming. As the skill, confidence and capacity of the farmer improve and more capital becomes available with augmentation of infrastructural support, the rest of the farm may be covered step by step.

8.6.15 Serious thought has to be given to substantial diversion of capital from non-developmental and long-gestation developmental programmes to the small farm and related sectors to benefit the weaker sections of rural society, in the Seventh and Eighth Plan periods.

8.7 *Farm Machinery and Implements*

8.7.1 Mechanisation of farm operations helps to improve the efficiency of labour. In Eastern India, the farmers use mostly primitive implements due to the non-availability of modern implements and the resource constraints. The use of modern but relatively less expensive farm implements should be specially promoted.

8.7.2 As stated earlier, in small farms where gardening type of operations is taken up, the use of modern gardening tools should be popularised. In this context, tools developed in Japan and Taiwan should be studied with a view to adaptation.

8.7.3 The State Governments should prepare a list of suitable implements for each area and make special efforts to promote their use after suitable field trials. An illustrative list of such implements and machinery is given in Annexure 8.1. Care should, however, be taken to ensure that the implements are usable by locally available human and animal power.

8.7.4 State Governments should promote manufacture of improved implements through both Government agencies like Agro-

Industries Corporations and private enterprise. Private companies should be encouraged, through appropriate financial and other incentives, to manufacture tools and implements suitable for small and marginal farmers and gardening tools which can be handled easily by women. If private companies are not forthcoming, joint sector ventures may be promoted.

8.7.5 The Government of India should consider setting up a Central Institute for Small Tools for Eastern India for design, research and development of small tools and implements suitable to the region.

8.7.6 In regard to costly machinery and implements which cannot be individually owned by farmers, especially small farmers, the following options are open.

- i) Local progressive farmers who could buy a few of the more costly items and share with other farmers on a rental basis should be encouraged to set up agro-service centres. Technical advice as to what package of implements would be needed by them most, should be made available to such farmers.
- ii) Co-operatives, Farmers' Groups or Associations may be encouraged to own such assets to be utilised on a sharing basis.
- iii) Leasing agencies/companies, both in public and private sector, may be set up to hold stocks of machinery, implements, etc., for hiring out to farmers.

8.7.7 All these individuals or agencies should be entitled to term loans from banks on concessional terms.

8.7.8 There is a strong case for promotion of "Leasing agencies/companies" now getting popular for industrial machinery and consumer durables, to be extended to agricultural machinery, both in public and private sectors. In order to encourage this activity, leasing agencies/companies may be given some concessions, e.g. sites at cheap prices for construction of buildings and workshops, assured water and electric power, etc., besides tax concessions during the initial years and loans on concessional terms by banks.

8.7.9 Such of the leasing agencies/companies as have demonstrated their capabilities may be given special assistance and in-

ducement to set up repair and service facilities.

8.7.10 Selected manufacturers, who satisfy ISI standards or produce goods of reputed quality and have a good record of service and big enough operational capability, may be encouraged to adopt specified "clusters" or "compact areas" for giving "franchise" to local entrepreneurs for implements hiring, servicing and repair stations on the model of oil companies' petrol stations.

8.7.11 A healthy competition between government agencies, co-operatives and private enterprise should be deliberately promoted.

8.8 *Agro-Service Centres*

8.8.1 To provide comprehensive services and supplies to farmers, the setting up of agro-service centres by progressive farmers, private entrepreneurs or Government agencies should be specially encouraged by State Governments.

8.8.2 No single agency should have a monopoly in this sphere.

8.9 *Linkages with Industry*

8.9.1 Reference was made in paragraph 8.2.5 to the need for creation of adequate employment opportunities in non-farm sector, which will help to reduce the pressure of population on land. This will require effective linkages to be created between agricultural and non-agricultural sectors, through a planned development of servicing, supplying, marketing and processing industries/enterprises in the secondary markets and the other potential rural industry centres, to start with, and then spread further in the hinterland.

8.9.2 Supply of adequate power, transport and communication network, provision of factory sites and water supply on concessional terms and provision of adequate marketing and banking facilities in such centres are essential pre-conditions for promoting the setting up of such industries. In this connection, fiscal and other concessions, analogous to those now made available to new industries in no-industry districts, should be extended to new medium scale industries in no-industry blocks.

8.9.3 The setting up of such medium scale industries/enterprises should be encouraged in blocks, say, 50 kms. or more distant from an existing industrial centre, so as to provide, on a suitably dispersed basis, employment opportunities to farm labourers who wish to seek non-farm employment. The State Governments should identify suitable areas in each district for setting up such industries.

8.9.4 Once such linkages between agriculture and industry are established and agriculture becomes modernised, intensive and dynamic, there will be such growth of non-farm employment opportunities in smaller towns and bigger villages that conditions will be created for progressive increase of agricultural productivity per capita per annum.

8.10 *Tribal Agriculture*

8.10.1 The tribal areas require special attention. Agroforestry, production of vegetables and medicinal plants, raising of fruit trees and animal husbandry should be the focus of development in tribal areas (for details, see Chapter 13).

8.11 *Overall Development Strategy*

8.11.1 Farmers, particularly small farmers, should concentrate on making the optimum use of land and labour, for improving productivity both per ha and per capita.

8.11.2 All inputs like water, seeds, fertilizers, pesticides, production requisites like implements, pumps, pipes, power tillers and other machinery, and technical services for agronomic, horticultural, animal husbandry operations, etc., should be provided to them in time and in adequate measures by other agencies having special competence in these, on convenient payment terms, e.g., instalment payment, renting or custom service.

8.11.3 Adequate credit for the purpose should be provided by the co-operatives, commercial banks and RRBs both to farmers and agencies providing such inputs and services.

8.11.4 Division of labour rather than self-sufficiency, renting and hiring rather than ownership, labour-cum-capital intensive

technology rather than primarily labour-intensive farming, step by step increase in the proportion of high value crops by small farmers, development of transport and marketing facilities, and small and medium industries in the secondary markets and other growth centres in the countryside to siphon off excess labour in the farm sector are the key elements in our strategy for development in Eastern India.

Annexure 8.1**Illustrative list of improved Implements and Machinery**

<i>Implements Machinery</i>	<i>Designed by</i>
1. Improved iron plough 2. Bullock drawn disc harrow 3. Bullock drawn seed drills 4. Improved weeding tools 5. Manual sprayers and dusters 6. Threshers	Punjab Agricultural University, Ludhiana
7. Ganga seed-cum-fertiliser drill : A single row drill mounted on a desi plough which can be pulled by a pair of bullocks	I.A.R.I., New Delhi
8. Jamuna seed-cum-fertiliser drill : A single row drill which can be pulled by one bullock or two persons	—do—
9. Kisan seed-cum-fertiliser drill : A single row bullock drawn drill	—do—
10. An integral tool bar : A multiple farm operation implement for seed bed preparation and sowing and fertiliser operations	—do—
11. Paddy transplanter 12. Thresher 13. Wheat hoes 14. Mould board plough 15. Care junior plough 16. Wet land puddler 17. Bullock drawn disc harrow 18. Wet land leveller 19. Bund former 20. Weeder-cum-mulcher 21. Paddy weeder 22. Six row pregerminated paddy seeder 23. Paddy transplanter (IRRI) 24. Multi row jute seed drill 25. Two row seed drill 26. Pedal thresher	I.I.T., Kharagpur
27. Blade harrow (Bakhar) 28. Harrow patela 29. Hand operated seed-cum-fertiliser drill 30. Two three row seed-cum-fertiliser drill 31. Multi-tool bar 32. Weeders 33. Tubular maize sheller 34. Transplanter 35. Improved gardening tools	Central Institute of Agricultural Engineering, Bhopal.

CHAPTER 9

IRRIGATION, DRAINAGE AND WATER MANAGEMENT

9.1 *Introduction*

9.1.1 Considering the vagaries of rainfall in Eastern India, the main thrust of development strategy has to be in the domain of irrigation, drainage and water management.

9.1.2 The large untapped groundwater resources of the region, especially in the alluvial plains in the basins of the Ganga and Mahanadi and their tributaries, if tapped intensively (i) in a planned manner and (ii) with proper spacing, can provide a powerful spearhead for sustained growth of agricultural productivity, both per ha and per capita per annum. This will help to provide controlled irrigation so essential for progressive use of high yielding varieties, fertilizers and other fruits of modern technology, which are basically area neutral and useful for small farmers. It will help enable Eastern India to become once again the granary of the country.

9.1.3 Scientific exploitation of groundwater resources will also help to (i) provide water at critical times and reduce waterlogging in rainy season and (ii) increase the availability of irrigation in the dry season, thereby acting as a useful tool for water management.

9.2 *Objectives of Water Management Policy*

9.2.1 Optimum water management can be helped by

- (i) ascertaining the frequency of wet and dry days during the monsoon period and evapo-transpiration especially in sowing and maturing periods of staple crops, for better crop and contingency planning;

- (ii) sinking batteries of shallow and deep tubewells as appropriate in compact areas (a) powered by electricity, if supply is uninterrupted for at least 8 hours per day and (b) powered by diesel in other areas;
- (iii) constructing dugwells and river lifts, and tapping of water from tanks, rivers, streams, *jheels*, etc.,
- (iv) providing in each block sufficient number of light weight diesel pumps which can be carried by carts (a) to help efficient use of water from rivers, tanks, wells, etc., for irrigation and (b) to drain out excess water in waterlogged areas;
- (v) modernising canal systems with adequate provision for control structures and appropriately regulating release of water;
- (vi) constructing well laid out field channels and drains with suitable provision for their periodic maintenance;
- (vii) making adequate provision for drainage channels both in irrigated and unirrigated areas to take away surplus water to neighbouring depressions or rivers where water levels are lower during critical periods;
- (viii) diverting new irrigation channels, as far as practicable, to "dark" and "grey" areas with a view to augmenting surface irrigation and recharging groundwater regimen; and
- (ix) revising periodically delineation of areas into "white" "dark" and "grey" from the groundwater standpoint.

9.3 *Groundwater Exploitation*

9.3.1 The groundwater exploitation is around 25 per cent of the currently identified potential in West Bengal and Bihar, around 32 per cent in East U.P. and less than 10 percent in Orissa. The percentage of "dark" blocks where scope for groundwater exploitation is restricted is very small (*vide* Part VI). Hence, priority needs to be given for exploitation of the large untapped groundwater resources.

9.3.2 The State Governments should aim at maximum possible exploitation of groundwater in "white" areas. In "grey" areas, the objective should be utilization of this source to the extent it can be economically exploited. In "dark" areas, these resources should be tapped to the extent technically safe and feasible, on the basis of careful surveys, for its conjunctive use with surface water and rainfall. Different spacing norms should be applied in "white", "grey" and "dark" areas. Where symptoms of over-exploitation are noticed, Government might carefully regulate exploitation of groundwater. Otherwise, the policy in regard to spacing should not be unduly restrictive in the basins of Ganga and Mahanadi and their tributaries.

9.3.3 There is a need for updating groundwater assessment, covering all the blocks. A fresh assessment of groundwater potential, redelineating areas into "white", "grey" and "dark", should be made once in 3 to 5 years for each area and the results made available to blocks, DRDA, NABARD, credit institutions and pumpset dealers' associations.

9.3.4 *Compact Area Development*: Compact areas with good groundwater potential in "white" and "grey" areas should be covered intensively by shallow tubewells and pumpsets, either electric or diesel. Alluvial regions are especially suited for compact area development. The objective should be to concentrate efforts in selected areas with adequate potential for quick realisation of benefits rather than haphazard efforts over a wide area resulting in wastage and slow progress.

9.3.5 This strategy will give immediate boost to agricultural productivity in the *rabi* season, help modernise farm technology and augment the income of the farmers. The ground will thereafter be prepared for increase in productivity in the *kharif* season also, which will be a somewhat more difficult and time consuming task in this region.

9.3.6 *Centrally Sponsored Scheme*: In selected compact areas with good groundwater potential, "batteries" of tubewell bores should be sunk by the State Governments under a 100 per cent Centrally Sponsored Scheme, in a phased manner and according to rough "grids" to facilitate, *inter alia*, power supply. Care should be taken that the heads of such bores are raised well above

the monsoon flood levels. Land for the bores may be acquired by the State Governments, wherever necessary.

9.3.7. The cost of sinking tubewell bores and providing electric connections in the case of electric pumpsets on farmers' fields may be met fully under the Scheme by the Central Government, in view of the national importance of early utilisation of the vast groundwater potential of the region.

9.3.8 For pumpsets, farmers will have the following options :

- (i) purchase individually with or without bank finance;
- (ii) share the pumps with other farmers in a Group or Association, the cost of which could be financed by banks under a preferential Group Loan Scheme;
- (iii) hire from leasing companies, agro-service centres, co-operatives or panchayats, etc. Lease charges may be met by farmers out of short-term loans from banks/co-operative societies. Leasing companies/agencies may be given medium/long term loans by banks on attractive terms. Present acreage and other restrictions regarding provision of credit for tubewells and pumps should be suitably relaxed.

9.3.9 In the absence of such a Centrally Sponsored Scheme, progress is likely to be very slow in Eastern India because of the very small size and fragmented nature of most of the holdings. Providing electric connections will then also become very costly.

9.3.10. The sinking of tubewell bores on particular plots should be subject to such obligations from the owners and other beneficiaries that (a) they will purchase the pumpsets, share with others or hire from an appropriate agency and (b) they will not obstruct water conveyance to adjacent plots.

9.3.11 If the farmers are unable to set up and manage the pumpsets, the task may be entrusted by the Government on a contract basis, to a co-operative, a voluntary organization or a private enterprise after acquiring the site. If the contract is given to a private enterprise, the cost of the bore and electric

installations may be recovered in instalments from the contractor. The contract should include suitable safeguards against misuse.

9.3.12 In blocks, where none of these alternatives work, Government may finance the full cost of the bores and pumps and charge appropriate water rate, taking care that it does not become cheaper than in the other alternatives.

9.3.13 *Electric Pumpsets*: For electric pumpsets, in compact areas, dedicated lines should be laid so that uninterrupted power supply is assured for at least 8 hours a day. Where it is not possible to extend such dedicated lines, a rotational system of power distribution should be introduced, as in Tamil Nadu¹.

9.3.14 *Diesel Pumpsets*: In villages not electrified, or where uncertainty of power supply persists, a programme of installation of diesel pumpsets should be taken up on a similar basis. No doubt, cost of diesel pumps is higher than that of electric pumps. But, as diesel supply is more assured, they have an edge over electric pumpsets in this region. Further, they also have the added advantage of greater mobility. Light weight diesel pumps can be transported by carts and help efficient lifting of water from rivers, wells, tanks, etc., for irrigation and drain out excess water in waterlogged areas. Carts can also be utilised for carrying rolls of PVC pipes in addition to pumps for water conveyance. Banks should finance farmers for purchase of carts, pumps and pipes, with refinance from NABARD.

9.3.15 For diesel pumpsets, oil companies should arrange for properly equipped diesel sale and service stations on "franchise" basis in rural areas, on the model of what they are doing now for petrol sale and service stations in urban areas. Wherever oil companies may not be forthcoming to do so, reputed pump manufacturers may be encouraged to provide this kind of service.

9.3.16 *Promoting Multi-purpose Use of Electric Motors/Diesel Engines*: To improve utility and economics of diesel engines/electric

¹ For power distribution in Tamil Nadu, two groups of villages are formed. Normally, one group receives power from 6 A.M. to 12 noon and another group from 12 noon to 6 P.M. Further, uninterrupted power supply is made available from 10 P.M. to 6 A.M. to both groups of villages. In periods of acute shortage, formation of even three groups is resorted to. Under this arrangement, every farmer is assured of uninterrupted power supply for certain minimum hours per day.

motors and to provide additional income, they should be usable for both water-lifting and agro-processing activities such as flour-making ("chakki" operations) within prescribed limits. For this purpose, a slightly higher HP of diesel engine/electric motor may be necessary than is prescribed now for shallow tubewells. Manufacturers of diesel engines/electric motors should be encouraged to direct their R & D efforts to develop suitable engine/motor for such dual purposes. Banks should be prepared to finance such dual purpose diesel engines/electric motors.

9.3.17 Sale and Hiring: Sale of water by tubewell owners to neighbouring farmers is common in some areas of the region. This is a desirable practice, as it leads to economic use of water and helps to maximise benefit from the investment. The selling of water and hiring out diesel pumpsets by owners of tubewells and pumpsets should be encouraged.

9.3.18 Leasing Agencies: Ownership of tubewell motors and pumpsets may impose a heavy debt burden and prove onerous for small and marginal farmers. Nor should it be necessary for them to own pumpsets, given the small size of their holdings. Hence, in each block, one public sector agency and at least one private sector company may be encouraged to operate as "leasing agency/company" for electric motors and diesel pumpsets (of ISI standard or specifications approved by the State Level Technical Committee), rolls of plastic pipes and other ancillary equipment.

9.3.19 Pumpsets, which should be easily detachable and separately insured, may be purchased and kept in stock by the leasing agency/company. These may be leased to individual farmers or Farmer Groups/Associations on reasonable terms. The latter would then have to borrow money only to pay the lease rent, which can be met out of short-term loan from co-operatives/banks. Their debt burden for irrigation will then be much lower and their term loan entitlement will be available for other productive purposes. Since the pumpsets will be detachable, the threat that they may be taken away on non-payment of lease rent should be reasonably effective for timely payment of dues by the farmers.

9.3.20 Side by side with motors and pumps, rolls of PVC pipes, which are easily transportable by carts should also be avail-

able for hire from leasing companies and diesel sale and service stations. Such pipes can be used (a) to minimise the need for land levelling and (b) for conveyance of water across or around the adjacent plot holders' land with minimum damage to crops. This may also provide opportunities for "sprinkler", "drip" or "injection" irrigation, wherever appropriate and feasible.

9.3.21 Leasing agencies should be in a position to stock a large number of motors, pumps and other ancillary equipment. They may be granted, if need be, bank loans on concessional terms. NABARD may work out the details of terms and conditions of such bank loans.

9.3.22 The ownership of large number of motors and pumps would enable the leasing agencies to provide better maintenance and repair services and also manage with less than 1:1 ratio between tubewells and pumpsets, thereby economising the overall capital requirements.

9.3.23 If two or more leasing companies/agencies are set up in the same area, it will promote competition and lead to charging of reasonable rates and provision of efficient services to farmers.

9.3.24 *Dugwell Programme:* In some areas of Eastern India, there is good scope for dugwells. In Orissa a massive programme of construction of dugwells has been taken up since 1972. They are ideally suited for small and marginal farmers and are quite popular because of their dependability for irrigation. In selected areas, the State Governments should undertake a planned and suitably subsidised programme of construction of dugwells. This may be taken up as a 100 per cent Centrally Sponsored Scheme. In the construction of these dugwells, NREP and RLEGP could be involved. Dugwells may be operated manually or by bullocks or fitted with pumpsets. Pumpsets may be acquired by farmers on their own, shared with a group or hired from leasing agencies, etc., as outlined in paragraph 9.3.8.

9.3.25 *Failed Well Compensation Scheme:* In regard to failure of tubewells/dugwells constructed by farmers with bank finance, NABARD has been considering the introduction of a "Failed Well Compensation Scheme". NABARD should take steps for its early introduction in consultation with Government of India and

State Governments. The compensation should be adequate and prompt.

9.2.26 *Economy in Use of Groundwater and Electricity:* Water and electricity, two important inputs for crop production in tubewell areas are optimally utilised if rates for their use are charged on a volumetric basis. In the case of water, this can be done by charging rates on a per hour/crop basis. In regard to electricity, its use can be regulated through a meter (or some other device), charging the consumer on the basis of actual power consumed (or period of uninterrupted use) and not on the basis of HP of motors as in U.P. at present. Such an arrangement will ensure a direct relationship between water and electricity charges levied and the quantity used. Otherwise, there may be a tendency for excess use of water and power by some farmers, reducing in the process the availability of water to some others or excess charge in case of interruption in supply. The guiding principles for determining water and electricity charge for irrigation and power should be such that (i) it is related to actual consumption, (ii) it should not lead to overuse of available water resources and (iii) the farmer should not be charged for the period when there is no supply.

9.3.27 *Deep Tubewells:* Most of the deep tubewells are not working satisfactorily in this region. There is considerable under-utilisation of capacity. The actual command area served by a deep tubewell in the region is less than 50 per cent of the potential. The actual command area of a deep tubewell is about 30 ha in West Bengal, 40 ha in U.P. and 20 ha in Bihar. In Orissa there are many medium tubewells, whose command area is around 10 ha on an average. The inadequacy and irregularity in electric supply, inefficiency and mismanagement of the Minor Irrigation/Water Development Corporations, inadequate supervision and control over pump operators, paucity of financial resources, uneconomic water rates and poor maintenance of pumpsets and field channels are the main reasons for the unsatisfactory state of affairs. Hence, the objective in regard to deep tubewells should be (a) improvement in the functioning of existing tubewells, (b) a cautious approach in the construction of new deep tubewells and (c) bridging the gap in resources of the Corporations due to uneconomic water rates.

9.3.28 In areas suitable for deep tubewells their construction as well as laying down of channels should be taken up by the Government. But their management should be entrusted on a contract basis to Farmer Groups/Associations, Committee of Beneficiaries, private entrepreneurs or voluntary organizations, as may be appropriate.

9.3.29 In regard to the existing medium and deep tubewells, steps should be taken to hand them over to Farmer Groups/Associations, Committee of Beneficiaries, private entrepreneurs or voluntary organizations on a contract basis. Where such contractual arrangement is not possible and tubewells have to continue to be managed by the Minor Irrigation/Water Development Corporations, one of the following alternatives may be adopted :

- (i) State Governments may meet the shortfall in the resources of the Corporations out of the Budget, subject to the provision that within a prescribed period, they will meet the operation and maintenance cost of tubewells from the revenues generated through higher water rates. For this purpose, rates should be raised, step by step, to economic levels.
- (ii) State Governments may purchase water from the Corporations and sell them to farmers, so that the Corporations will not incur any loss on sale of water due to charging of subsidised water rates.

9.3.30 The working of the Minor Irrigation/Water Development Corporations entrusted with the responsibility of construction and operation of deep tubewells and lift irrigation works is highly unsatisfactory. The State Governments should make a detailed study of the working of these Corporations including a case by case study of the tubewells/lift irrigation works and adopt appropriate policies to improve the situation.

9.3.31 *Water Rates Policy:* Although water rates charged by the Corporations for deep tubewell irrigation are higher than the canal irrigation rates, they are still considerably subsidised. The prevailing water rates are unduly low. They need to be reviewed and restructured on the basis of the value of service principle. Water rates may be fixed on the basis of hours of

supply or volume of water supplied. The State Governments may also consider introduction of differential rates for deep tube-wells - basic water rate for the *kharif* season and a basic *plus* additional water rate for the *rabi* season.

9.4 Surface Irrigation

9.4.1 Old canal systems were conceived to provide protective irrigation mainly as famine reliefworks. They cannot be easily converted so as to provide full irrigation support in their extensive command areas. However, modernisation of canal systems can make them more effective. Another useful measure may be to develop groundwater on a controlled basis in the command areas of canals. New canal systems should be designed to provide productive irrigation with relatively compact command areas.

9.4.2 Next to groundwater exploitation, modernisation of canal systems should receive high priority in this region. Major works like new dams north of the Ganga may be deferred for a few years. The objective should be to complete the ongoing projects. New medium surface irrigation projects should be taken up mainly in areas which are "dark" and "grey" from the groundwater standpoint.

9.4.3 *Water Release:* During our field visits, some farmers reported to us that the canals are closed in June for repairs, when they require water for preparing seed beds, etc. Release of water should be suitably regulated. From this year U.P. has advanced the closure of canals from June to April and started giving water in May and June. This practice is worth emulating by other States of the region which will help early sowing of rice with consequent higher yields.

9.4.4 In this region, Irrigation Departments are not consulting and coordinating with the Agricultural Departments in regard to the date of release of water. CADA was conceived as an organisation to remedy this situation. In practice, however, this has not happened in most of the command areas. We strongly urge that the Chairman CADA, the Engineer-in-charge of the Project and the senior most agricultural officer of the region must meet frequently and discuss and decide issues relating to the release of water and closure of canal according to the water re-

quirements of crops in the command areas. The State Level Standing Committee of Officials recommended in Chapter 7 should ensure this and provide overall coordination.

9.4.5 Water requirements of crops should be carefully studied for each pipe outlet and arrangements made for timely supply of water. Monitoring of utilisation of water by Irrigation Department/CADA should be improved so that there is no unauthorised use of water, breach of flow in the minors and tampering of structures in the minors/pipe outlets.

9.4.6 *Warabandi*: Steps should be taken for a progressive expansion of command area under the "*warabandi*" (rotational water supply) system in Bihar and East U.P., and its introduction in Orissa and West Bengal. Farmer Groups should be formed under each pipe outlet and a Pipe Committee constituted for the entire Pipe Command, with representatives from among Farmer Group Leaders. Turn schedule should be fixed for each Farmer Group and for each farmer within the Group. The greater the control of farmers over the water required by them the better will be its use for crop production. Where feasible, a part of the canal water may be stored in tanks or other facilities for use when canal water is not available.

9.4.7 *Field Channels*: The irrigation infrastructure created at a huge cost to the Exchequer, is not fully utilised due to certain critical gaps such as absence or incomplete coverage of field channels and their poor maintenance. Sufficient attention has also not been paid to the construction of drainage channels due to low priority given to it in the allocation of funds.

9.4.8 Construction work on field channels and drains needs to be stepped up in all irrigation projects within a definite time span of say 5 to 10 years.

9.4.9 The Government of India has advised the State Governments to enact suitable legislation, wherever necessary, to enable construction of field channels, upto 5-8 ha blocks and for their proper maintenance. There is now a need for the State Governments to have the necessary legislative powers for carrying out construction of field channels in the entire command area, including plots of unwilling farmers. For ensuring that no recalcitrant

minority adversely affects conveyance of water through the channels or pipes within the command area of an irrigation system and for enforcing proper water management techniques, the existing provisions in the Irrigation Acts should be invoked. If these are not adequate, the State Governments may consider adopting relevant provisions of the Andhra Pradesh Irrigation Utilisation and Command Area Development Act, 1984 (Appendix 5)¹.

9.4.10 It is necessary that suitable arrangements are made for proper maintenance of field channels. This responsibility should be entrusted to a Committee of Beneficiaries to be constituted for each pipe outlet.

9.4.11 *Water Rates:* Water rates charged for canal irrigation at present are too low. They are heavily subsidised. According to a Committee appointed by the Government of Orissa, under major irrigation projects, water rates charged were only Rs. 60 per ha, although the economic cost of water for *rabi* paddy worked out to Rs. 624 per ha, thus involving a subsidy of as much as Rs. 564 per ha². Even the low water rates are not recovered in full.

9.4.12 Water rates should be raised step by step to the level of economic rates. To discourage excessive use of water, a two part tariff system should be introduced, viz., (a) the basic rate worked out on per ha basis, applicable in *kharif* season and (b) the basic rate plus additional rate for those who draw water in *rabi* season. This would encourage farmers to go in for low-duty or medium-duty crops requiring less water, thus economising water use.

¹ Under the Andhra Pradesh Irrigation Utilisation and Command Area Development Act, 1984, provision has been made for the constitution of Pipe Committee through election from among the land holders under the Pipe Outlet for a period of one year. The Committee is to have nine members and is empowered to take up construction, maintenance, repairs and upkeep of the irrigation system under the pipe outlet at the cost of landholders, to enforce "warabandi" system, prevent unauthorised and unlawful use and wastage of water and to supervise the irrigation system, etc. In case of the failure of the Committee as also of landholders in the maintenance of the irrigation system, the Irrigation Officer under Section 6 of the Act will execute the repairs and recover the costs from landholders. Section 42 of the Act provides for summary recovery of the dues as arrears of land revenue. This type of legal provisions is needed for both canal and tubewell irrigation in Eastern India.

² Report of the Committee to study the cost of irrigation under different irrigation systems appointed by Government of Orissa, 1977.

9.4.13 Over-irrigation resulting from unduly low water rates adversely affects crop yields on the one hand and denies water to farmers at the tail-end on the other. Improved revenues from water rates would help better maintenance of the canal system, more efficient use of irrigation by the present beneficiaries and extension of irrigation to new beneficiaries. Leaders of public opinion should educate the people about the harmful effects of unduly low irrigation rates.

9.4.14 Steps should be taken to ensure prompt collection of water rates. Users of irrigation facility should be advised that, as in electric supply, defaulters will be penalised and may not be given water during the next season unless the dues are cleared.

9.4.15 *Reservoir Management:* At present, reservoir management is mostly done on an *ad-hoc* basis. It has to be on scientific lines. Computerisation will be helpful. All rainfall data from the catchment areas during the last 50 years or so may be fed to the computer which will help decide how much water is to be stored at any time and how much to be released, etc. The position regarding floods and drainage flow in the delta can also be fed to the computer so that the release of water from reservoir does not aggravate flood and drainage congestion in the delta as far as possible. At present the mathematical calculations involved take time. Precious time can be saved if computerisation is done. Operational manuals for reservoirs should be prepared wherever such manuals do not exist in consultation with the Central Water Commission (CWC).

9.4.16 Some of the multipurpose reservoirs are not being operated efficiently. To improve the working of such reservoirs, comprehensive studies should be undertaken by the CWC.

9.4.17 *Artesian Wells:* Before undertaking construction of very costly high storage dams in the Himalayan region, the technical feasibility and economic viability of tapping the very deep aquifers (1500 metres or deeper) that are supposed to exist in East U.P., Bihar and West Bengal, through artesian wells or very deep tubewells, may be explored. Pilot projects may be taken up by the Central Government in these States during the Seventh Plan. Based on the results of such pilot projects, a number of such

wells with suitable canal systems may be constructed during the Eighth Plan in East U.P., Bihar and West Bengal.

9.4.18 *Conjunctive Use of Surface and Groundwater*: Measures for conjunctive use of canal and groundwater, along with rain water, should prove very beneficial in this region. At present, this is not given adequate importance. Conjunctive use of water can be promoted in the command areas of major and medium irrigation systems through a programme of sinking tubewells and enforcing suitable water rates and "*warabandi*". The data regarding rainfall patterns for 82 meteorological stations given in Part VI of this Report should be useful for this purpose.

9.5 *Other Irrigation Works*

9.5.1 *Tank Irrigation*: There are large number of tanks, *jheels* and lakes in the eastern region, especially in West Bengal and Orissa. They are not maintained properly. Major problems in this regard are multiple ownership and paucity of funds. Tanks can provide a useful source of irrigation to the farmers. The State Governments may undertake renovation of old tanks and construction of new ones utilising NREP and RLEGP. Their maintenance should be vested with Panchayats or Farmer Groups. Legislation should be undertaken to enable the State Governments to take over water rights in tanks, *jheels* and lakes and entrust their management to these bodies. A legislation similar to that passed by the West Bengal Government for taking over fishery rights in tanks, *jheels* and lakes may be introduced. (Appendix 6). Fish culture will help to reduce the breeding of mosquitoes and incidence of diseases, apart from providing food and employment.

9.5.2 *River Lifts*: There are a large number of river lifts in the region. However, it has not been possible to derive full benefits from these schemes, as the distribution system under these schemes is not satisfactory, due to paucity of funds. Therefore, adequate funds should be allotted to complete the distribution channels of river lifts so that optimum benefits can be derived from them.

9.5.3 As lift irrigation has a good potential in the region and is easy to execute in a short time, State Governments should identify suitable areas for lift irrigation and take up a programme

of lift irrigation schemes, either on their own or through recourse to bank finance. River lift projects for protective irrigation in *kharif* season may also be encouraged in drought-prone areas. The management of the river lifts may be entrusted to a Committee of Beneficiaries, Voluntary Organizations or private entrepreneurs, on a contract basis, as in the case of deep tubewells.

9.5.4 Wherever possible, construction of windmills may be encouraged for lifting water. These can pump water economically whenever wind velocity is more than 2.5 metres per second. Maintenance cost is negligible. Water lifted by windmill can also be stored, if necessary, in tanks or wells.

9.5.5 In undulated and steep topography with light and permeable soil and where water is scarce, sprinkler or drip irrigation is useful. Its advantage over flow irrigation is that it saves around 50 per cent water and obviates the need for land leveling. The Water thus saved can cover a larger area. Sprinkler and drip irrigation should be encouraged in suitable areas.

9.5.6 There is also good scope for bullock-driven and manually operated water lifting devices. State Governments should encourage R & D efforts by Agricultural Universities and enterprising private entrepreneurs to develop improved human or bullock operated water lifting devices, which are less costly and can utilise the surplus labour available in rural areas.

9.5.7 For hilly areas, minor irrigation structures such as check bunds, Kolhapur weirs, Mandi type pipe systems, etc., should be considered. Hydrams are also well suited for lifting water in hilly areas, such as Darjeeling in West Bengal. They can lift water upto a height equivalent to fifty times the height of water fall. No external prime mover is necessary for their operation. Pumped water can be stored, if necessary, in tanks for utilisation as and when needed.

9.5.8 The minor structures referred to above would enable fuller utilisation of water available from streams, *jheels*, springs, nullahs and rivulets.

9.6 *Micro-Watershed Development*

9.6.1 Micro-watersheds should be developed in drought-prone areas as a high priority measure. Appropriate crop pattern for

these areas should be laid down. In drought-prone areas, pilot work has been done in developing micro-watersheds under a Centrally Sponsored Scheme for Intensive Micro-watershed Development. More areas need to be covered under the Central Scheme as also under State Schemes. By the end of the Seventh Plan, all drought-prone districts should be covered by micro-watershed development programme.

9.7.1 *Waterlogging and Drainage*

9.7.1 *Waterlogging*: As a result of heavy monsoons, many parts of the region are faced with serious problems of floods and waterlogging, particularly because of gross neglect of drainage works. Recommendations of the National Flood Commission have not been given due priority so far. This lacuna needs to be corrected.

9.7.2 Lack of adequate drainage facilities is a major constraint in Eastern India. The construction of railway lines, highways and irrigation canals without providing adequate bridges, culverts and siphons for reasons of short-sighted economy has obstructed natural drainage resulting in serious problems of waterlogging in this region. There has been inadequate coordination between the various agencies responsible for these public utilities. There is also inadequate maintenance of natural drainages. Often there are encroachments on them. The absence of adequate drainage facilities is responsible for the poor yield of crops in many areas. It has also caused environmental hazards, spreading debilitating diseases like malaria, filaria and diarrhoea, affecting the health of human and cattle population.

9.7.3 There is need for closer coordination among railways, roads, irrigation and flood control departments to provide adequate cross drainage and ensure that natural flow of water is not obstructed. District authorities should undertake a quick survey of alignments of railways, roads and canals to identify areas where natural flow of water is now obstructed and recommend necessary additional bridges, culverts and siphons. Additional funds should be earmarked in the Seventh Plan under a Centrally Sponsored Scheme to construct these bridges, culverts and siphons in the region.

9.7.4 Steps should also be taken for removing encroachments on natural drainages.

9.7.5 Three types of drainage works are needed, viz., (i) drainage canals, (ii) intermediate drainage channels, and (iii) field drains.

9.7.6 Even though outlines of needed drainage systems have been worked out for several irrigation projects such as Gandak in Bihar and U.P., Hirakund in Orissa, DVC and Mayurakshi in West Bengal, financial provision for the purpose has been grossly inadequate. In view of the importance of developing an effective drainage system, a comprehensive Master Plan for drainage should be prepared by the State Governments, in collaboration with the Government of India and implemented as a time-bound programme, covering both irrigated and unirrigated areas. The Master Plan should cover on a priority basis areas susceptible to waterlogging due to heavy rainfall.

9.7.7 For undertaking drainage works, we propose that a lump-sum allocation of Rs. 600 crores may be earmarked during the Seventh Plan and Rs. 700 crores in the Eighth Plan for Eastern India under a Central Scheme. This provision will be over and above the drainage works to be provided for in all the on-going projects to be taken up in Seventh and Eighth Plans and field drains to be undertaken as part of OFD works by CADA.

9.7.8 Construction of intermediate drainage channels should be taken up by the State Governments. NREP and RLEGP can be utilised for the purpose.

9.7.9 Construction of field drains is the responsibility of the farmers. However, the farmers have been generally reluctant and the work has, therefore, made slow progress. These should be executed as part of OFD works by CADA in command areas and by State Irrigation Departments in other areas. CADA and State Irrigation Departments should initially bear the full cost of construction of field drains and recover it from farmers through enhanced water rates. Government of India should make available to CADA/State Irrigation Departments loans to enable them to undertake these works. Meanwhile, provision for minor irrigation per block under Special Programme for Small and Marginal

Farmers may be made available for minor drainage as well. The allocation of Rs. 3.5 lakhs per block may be raised by Rs. 1 lakh in flood-prone blocks.

9.7.10 At present, the State Irrigation Department is responsible for drainage works only in irrigated areas. It should be equally responsible for drainage in unirrigated areas as well. This Department should be redesignated as Department of Irrigation, Drainage and Water Management. Adequate funds should be made available for attending to drainage needs of unirrigated areas.

9.8 *Flood Control*

9.8.1 A major problem faced in the region is the frequent occurrence of floods. Therefore, flood control and flood moderation are vitally needed in the region. Some of the drainage programmes suggested above will mitigate the adverse effects of flood. There is need, however, to undertake additional flood control and moderation devices like the setting up of flood warning systems, flood embankments, channel improvements, afforestation and construction of storage reservoirs. Delay in implementation or non-implementation of some of these has adversely affected the region.

9.8.2 Notwithstanding the efforts made so far, floods ravage large parts of the area in the basins of the major rivers and their tributaries. The heavy sediment deposition in the river beds reduces capacity of the river to carry the flood discharge and therefore flood waters inundate the adjoining areas, causing considerable damage to people and property. To contain the impact of floods, a Master Plan on river basin basis needs to be prepared and suitable flood control measures taken up. For achieving inter-state coordination, Master Plans and suitable action programmes should be chalked out jointly by Government of India and the State Governments. The relevant recommendations of the Flood Commission should be implemented expeditiously (Appendix 11)

9.8.3 State Governments should take steps to build up an effective contingency plan for areas and crops which are flood-prone.

9.9 *Cyclones*

9.9.1 Frequent occurrence of cyclones causes great hardship to cultivators. While there can be no means of preventing their occurrence, an advance warning system could help mitigate their adverse effects. Immediate relief measures, particularly assistance for replanting in cyclone-damaged areas will help considerably. For this purpose, necessary stocks of seeds and nurseries of short-duration varieties should be kept in readiness for distribution in cyclone and flood-affected areas.

9.10 *Estimates of Investment and Credit Requirements*

9.10.1 To support the programmes set out in the foregoing paragraphs, substantial investment and credit support are necessary. An estimate of area to be covered by major, medium and minor irrigation and of investments required on these irrigation works and drainage as well as credit support needed from the banking system is given in Chapter 16.

9.10.2 There is a strong case, in the national interest, for treating the programmes for batteries of tubewells on compact area basis, dugwells in selected areas, modernisation of canals, construction of drainage works (including additional bridges, culverts and siphons needed) and micro-watershed development as 100 per cent Centrally Sponsored Schemes for the desired acceleration of agricultural productivity in Eastern India. It will be difficult to accommodate them within the State Plan ceiling, considering the other needs of these States. Without them, the much needed increase in agricultural productivity of the region will be well nigh impossible.

CHAPTER 10

INPUT SUPPLY

10.1 *Introduction*

10.1.1 The high yielding varieties of seeds, fertilizers and pesticides play a key role in improving agricultural productivity. Farmers are now well aware of the benefits of these inputs. But the eastern region lacks adequate infrastructure for input delivery. Supply falls short of demand. Retail outlets for distribution of inputs are mostly available upto the block level. Consequently, farmers living far away from block headquarters, particularly in interior and hilly areas, have to travel long distances for obtaining the inputs. Many of the small and marginal farmers can neither afford the transport costs involved nor the time, especially during the busy farming periods. As a result, on many occasions, the inputs do not become available to them in time.

10.1.2 Steps need to be taken to improve the input delivery system, particularly in interior and hilly areas, to ensure their availability in time and in required quantities.

10.1.3 The need for advance planning for seeds and fertilizers, before the commencement of crop season, has now been recognised by State Governments. Block-wise supply and distribution of seeds and fertilizers should be closely monitored by the Agriculture Department. Bottlenecks, if any, should be promptly identified and removed. Particular attention should be paid to the less accessible and tribal areas.

10.2 *Seeds*

10.2.1 Demand for certified seeds has been rising. However, supply is not adequate to meet the requirements. The importance of availability of certified seeds of HYV cannot be overemphasized. This is a basic requirement for quantum jump in production. The entire area must be saturated with high yielding varieties within the minimum possible time.

10.2.2 Agricultural Universities of the region have developed some varieties of seeds suited to different agro-climatic conditions. However, paddy seeds suitable for deep-water conditions are still not available. Due to lack of adequate coordination between the State Agriculture Departments and these institutions, foundation seeds and breeder seeds are in short supply. The production of certified seeds by the Seed Corporations is also not adequate to meet the demand.

10.2.3 The State Governments should take steps to augment production capacities of the Seed Corporations/Government Farms in regard to certified seeds. At the same time, the agricultural universities and research institutes should augment the production of breeder and foundation seeds.

10.2.4. The Seed Certification Agency should issue necessary certification to seeds produced by 'Registered Growers' and 'Contract Farmers' after ensuring that they conform to the minimum standards of quality. The Seed Corporations should make adequate arrangements to buy such seeds from the farmers.

10.2.5 Seed Corporations are not functioning satisfactorily. A case by case study of these Corporations should be undertaken by the Union Ministry of Agriculture and appropriate steps should be taken up by the State Governments to improve their management.

10.2.6 The region has to depend entirely on outside sources for meeting its seed requirements in respect of wheat, potato, jute, etc. The State Governments should make necessary arrangements for their timely procurement and distribution to farmers. For meeting the growing demands from farmers, the State Governments should consider taking steps for production of such seeds in areas with suitable agro-climatic conditions.

10.2.7 The region is faced with an acute shortage of seeds/planting material in respect of vegetables, fruits and plantation crops. The production of seeds/planting material for horticulture and plantation crops of standardised varieties should be stepped up in areas where agro-climatic conditions are suitable for their cultivation.

10.2.8 The State Governments should improve the retail network by setting up more distribution points through co-operatives or licensed private dealers. A phased programme of expansion of retail outlets should be taken up so that by the end of the Seventh Plan period, every Panchayat will have at least one sale centre.

10.2.9 Due mainly to shortfall in the availability of certified seeds, many farmers produce their own seeds. They also exchange seeds with other farmers. FCI stocks are also used for seed purposes in times of scarcity. The State Governments should take steps to distribute new and improved varieties at frequent intervals. The practice of using FCI stocks for seed purposes by farmers should be discouraged through effective extension.

10.2.10 Seed renewal rate is only 5 per cent as against the norm of 20 per cent. The annual rate of replacement should be 20 per cent in the case of self-pollinated crops like rice and wheat.

10.2.11 The State Governments may consider stocking seeds in selected areas where the demand is very high. For contingency planning, in areas prone to natural calamities, seeds of suitable alternative varieties/crops should be stocked.

10.2.12 For promoting the use of quality seeds, State Governments should provide facilities for exchange of certified seeds with grains produced by farmers and lay down appropriate barter terms for such exchange.

10.2.13 NSC and other agencies have to transport large quantities of seeds from other States to the eastern region. But, seeds are not given high enough priority in railway wagon allotments. Since seeds have to be transported quickly and at short notice, delay in wagon allotment causes serious losses in production. Hence, railways should give priority in wagon allotment for seeds, next to defence.

10.3 *Fertilizers*

10.3.1 The consumption of chemical fertilizers has increased significantly in the region since 1970-71, especially in East U.P. and West Bengal. Availability of unadulterated and suitable fertilizers and their timely application are essential for improving the productivity. The main agencies involved in the distribution of

fertilizers, whether public, private or co-operative have their distribution centres only upto the block level. As in seeds, a phased programme for covering all Panchayats with such distribution centres should be completed by the end of the Seventh Plan.

10.3.2 Over 50 per cent of fertilizer distribution in this region is handled by co-operatives, except in West Bengal. However, co-operatives have not been able to function effectively in many areas due to financial and managerial weaknesses. They also face storage constraints. The State and district level organisations should, therefore, hold enough stocks of fertilizers for supply to PACS. Rural godowns could be utilised for storage purpose.

10.3.3 At present, fertilizers are delivered at the block at fixed prices. Distances from block to village vary and cost of transportation is high in interior and hilly areas. In such areas, there is a case for permitting transport charges beyond block level to be added to the price.

10.3.4 In tribal areas, LAMPS have to serve far flung areas. The margin on fertilizers is not adequate to meet the distribution costs. Hence, certain villages in each tribal block may be declared as "Block Headquarters" for the purpose of issue of fertilizers at the pool price.

10.3.5 Fertilizers are being sold in bags of 50 kg. Many small and marginal farmers do not need such a big bag. To suit their requirements and also to reduce possibilities of adulteration when sold loose, supply of sealed packets of 10 to 20 kg should be arranged. The recent Government announcement that fertilizers should be made available in packets of 20 kg is a welcome step. In areas growing primarily vegetables, small packets of 5 kg should be made available to the small and marginal farmers.

10.3.6 *Soil Testing*: Fertilizers attain optimum efficiency only under favourable soil conditions. Many soils require suitable amendments. Existing soil testing stations are not being fully utilised. Arrangements for testing soil samples should be strengthened. The State Governments should arrange for periodical testing of soil samples and suggest appropriate fertilizer dosages. Efforts should also be made to identify areas suffering from deficiency of dolomite and micro-nutrients like boron, zinc, etc. Suitable soil amendment measures should be taken.

10.3.7 Use of organic manures and compost derived from plant residues, agricultural wastes and by-products should be encouraged by educating the farmers about their value. This not only helps to retain soil fertility, but also leads to considerable reduction in expenditure on chemical fertilizers. As such, the use of these bio-fertilizers needs to be popularised. Cultures of bacterial and other bio-fertilizers should be developed and distributed to farmers. The full cost of maintaining and multiplying these cultures should initially be borne by the Government of India for which suitably located centres should be identified by the State Governments in consultation with the Central Government.

10.4 *Pesticides*

10.4.1 Considerable damage is caused by pests and diseases particularly to HYV crops. Hence, timely detection of pests and proper application of pesticides is vital for reduction of crop losses.

10.4.2 The four States of the eastern region are trying to build up surveillance organisations to keep a watch over attack of pests and diseases, particularly on rice and wheat. It may not be possible to keep a large number of observation posts in different parts of the State. However, there should be a surveillance unit in each Division. It should be fully equipped with quick transport facilities as well as necessary materials and equipment to serve large areas at short notice.

10.4.3 Pesticides are distributed by State Agriculture Departments, co-operatives and private dealers. However, the State Governments' involvement in their distribution is negligible. Usually, apex co-operative organizations procure pesticides in bulk and distribute through co-operative societies. There should be close coordination between the apex organizations and the State Agriculture Departments and surveillance units to procure pesticides required for different crops. At block level, adequate stocks should be kept for distribution to PACS.

10.4.4 Pesticides packed in small tamper-proof containers with appropriate directions should only be allowed to be sold by dealers. Arrangements should be made for the regular collection of samples for testing the quality.

10.4.5 While giving dealers' licences for pesticides, it should be ensured that the applicants possess the necessary knowledge about pesticides and their uses as well as abuses. Farmers also need to be educated about safe handling of pesticides.

10.4.6 Banks and PACS/LAMPS should provide credit to small cultivators for purchase of spraying instruments. Private dealers/leasing companies should also be encouraged to hire out sprayers.

10.5 *Vigilance*

10.5.1 Private dealers in seeds, fertilizers and pesticides play an important role in distribution. To ensure that there is no adulteration and that farmers are not billed excessively, the State Governments should ensure that private dealers attach price tags on packets/containers supplied by them and that no loose sales are made. Further, as in some States, the State Departments of Agriculture should nominate the District Agricultural Officer as the Vigilance Officer, who should periodically check the stocks maintained by private dealers. If malpractices are detected, the dealers should be punished suitably.

10.6 *Non-monetary Inputs*

10.6.1 Besides the use of HYVs of seeds and chemical fertilizers, there are a number of non-monetary measures that could be taken by farmers for increasing productivity. Some of these measures may need additional time of the farmer and his family while others may need a greater care in the adoption of more scientific techniques in farm practices. The main practices which could help to increase productivity are timely sowing and transplantation, line sowing, optimum seed rate, maintenance of optimum plant population, nursery treatment, better water management, weed control, need-based plant protection measures and appropriate doses of fertilization. By way of illustration, a list of such measures relating to rice is given in Annexure 10.1.

10.6.2 Organic farming approach, as advocated and practised by some voluntary organizations like Vikas Maitri of Bihar, deserves favourable consideration by official agencies, which are now concentrating on chemical fertilizers and other purchased inputs. This approach is likely to be particularly suitable for tribals and other resource-poor farmers. (For some details, please see Annexure 10.2).

Non-monetary Inputs for Rice

Nursery Treatment

Instead of broadcasting, farmers should raise nurseries and underake transplanting of seedlings. The Union Ministry of Agriculture has issued the following guidelines in this regard.

(a) Thin sowing in nursery gives rise to healthy seedlings. A seed rate of 35 kg per 0.1 ha of nursery should be used depending upon the duration of the variety and fertility level of the soil. This would be sufficient for transplanting one ha field.

(b) Nursery should be adequately manured. Both organic manure and chemical fertilizers should be applied. Application of farmyard manure at the rate of one tonne 0.1 ha of nursery will provide safeguard against any micronutrient deficiency and facilitate uprooting of the seedlings with the least damage to roots.

(c) The age of the seedlings at the time of transplanting should be 3-4 weeks, depending upon the variety. Under unavoidable circumstances, older seedlings of upto 40 days age can be used provided their number per hill is increased from 2-3 to 4-6 seedlings.

(d) Nursery sowing should be staggered with 2-3 days' gap so as to obtain appropriately aged seedlings throughout the transplanting period.

(e) A spray with systematic insecticide should be given 2-3 days before uprooting seedlings. This will give protection to the transplanted crop in its early stages.

(f) Community nurseries should be raised for those farmers who do not have irrigation facilities. State Departments of Agriculture and Extension Agencies should encourage growth of community nurseries.

2. Transplanting

(a) Seedbed should be flooded one day before uprooting the seedlings. Uprooting should be done cautiously so that there is no damage to the root system.

(b) Seedlings should be transplanted soon after uprooting to improve establishment.

(c) In order to maintain optimum plant population, 2-3 seedlings per hill should be planted. The number of seedlings should be increased to 4-6 per hill for field where depth of water is more or the seedlings are overaged.

(d) Proper spacing, depending upon duration of the variety and disease/pest pressure, should be adopted. A spacing of 20 cm x 10 cm which gives 50 hills per sq.m. is recommended for short duration varieties. For medium varieties, the distance should be 20 cm x 15 cm (35 hills/sq.m.) and for long duration varieties 20 cm x 20 cm (25 hills/sq.m.)

(e) Shallow planting should be adopted. The seedlings should not be put deeper than 3-4 cm.

(f) Transplanting should be completed by 15th July and in no case beyond 15th August.

(g) Field should be kept under a shallow layer of water during the first week after transplanting.

3. *Gap Filling*

Gaps should be filled up within 7-10 days after transplanting.

4. *Irrigation*

Adequate soil moisture is necessary for rice, particularly at the following stages:

- (a) Establishment stage (7-10 days after transplanting)
- (b) Maximum tillering stage (20-25 days after transplanting)
- (c) Panicle emergence stage (50-60 days after transplanting).
- (d) Milk stage (80-90 days after transplanting).

It is important that the canal and tubewell water supplies are fully mobilised during these stages.

5. *Water Management*

(a) One week after transplanting, a water depth of 5-6 cm should be maintained till 2-3 weeks before harvesting.

(b) Wherever possible, water should be drained out 2-3 days before top dressing and reflooded one day after top dressing.

6. *Weed Control*

Timely weed control is essential to achieve high rice yields. Effective weed control is possible with the application of granular butachlor (*Machete*) at the rate of 20-25 kg per ha one week after transplanting, followed by one mechanical weeding.

7. *Disease and Pest Control*

- a) A resistant/tolerant variety should be selected.
- b) Short duration varieties sown early escape the disease-pest pressure.

8. *Upland Rice*

Some special instructions for raising productivity of the rain-fed upland rice are given below.

- (a) Line sowing (20 cm apart) behind the plough should be followed for good germination and stand establishment. This will also facilitate weeding operation. Seed drills or seed-cum-fertilizer drills and, where these are not available, seeding following the plough in motion can be useful.
- (b) Seed rate of 80-90 kg per ha should be used so as to obtain adequate plant population.
- (c) 1/20th area of the field should be sown with double the seed rate. Seedlings can be obtained by thinning this area and utilised for gap filling in the rest of the field.
- (d) Recommended doses of fertilizer should be followed. Application of phosphorus is essential for good root development. Ideally, with assured rainfall, 50-60 kg of nitrogen, 30-40 kg of phosphorus and 20-30 kg of potash per ha can be used.
- (e) All phosphatic and potassic fertilizers and one-third of nitrogenous fertilizers should be applied before sowing.
- (f) Two top dressing with nitrogenous fertilizers should be done. The first top dressing should be done immediately after weeding, that is, 2-3 weeks after sowing (tillering stage). Second top dressing should follow three weeks later (panicle formation stage).
- (g) Early weeding is very important. It must be done within 2-3 weeks of sowing.

Organic Farming

Vikas Maitri, a voluntary organization working in the tribal belt of Bihar, holds the view that the use of chemical fertilizers, pesticides and even improved variety of seeds is not necessary for increasing agricultural production. Based on experience gained by the organization through a number of experiments on different crops such as rice, wheat, sugarcane, groundnut, tomato, *papaya* and pigeonpea, etc., it has come to the conclusion that a farming approach using organic manure and local seeds can considerably improve agricultural productivity and production. An experiment conducted at Takarma village during *kharif* 1984 has shown that by using organic manure and local variety of seed, it was able to obtain a yield of 4000 kg per ha. The main findings of the organization are given below.

1. Organic agriculture assumes that all essential plant nutrients in required quantities are already present in the soil. They are locked up in its different layers in an inestimable reserve. Nitrogen which is the most sought after nutrient of the plant is present in the soil in nitrate form. As a matter of fact its supply is automatically replenished by rain, thunderstorm and nitrogen fixing bacteria of the soil. Phosphate which is another important nutrient is present in the soil both in organic and inorganic form and is slowly available to plants. Very often its deficiency in the soil is a serious problem but in such soil the deficiency can be made up by application of digested bone-powder, bone-ash or finely ground rock phosphate. Potassium which is the third most important nutrient is usually present in adequate quantities in clay soils.

2. The art of organic farming consists in tapping the nutrients present in the soil and providing them in available forms to the plants in the required quantities. Obviously the first method is the recycling of waste material mostly in the form of farm-yard manure and compost. There are different ways of preparing these materials which determine their effectiveness in crop production. The second method of tapping plant nutrients from soils has been practised in many agricultural systems for several years. In

this method trees and shrubs are planted in rotation as part of the agricultural operation. Trees and shrubs penetrate the different layers of soil and bring up the nutrients above the ground. These nutrients are then recovered by either burning them or by making compost out of their materials. In many shifting cultivation practices, the same principle is in operation. In some regions, the forests on the hills are burnt once in a period of years. The ash is then carried to the rice fields by the monsoon rains. This has a beneficial effect on the forest also as the fire destroys pests and diseases and thus preserves the health of the forest. Secondly, it provides the needed temperature to forest seeds for germination.

3. Another use of organic method of farming is how to provide the right conditions for the soil organisms to thrive. Earthworms thrive best in silt-loam soil away from direct sun and rain. It is actually the soil micro-organisms that breakdown protein and other amino-acids into nitrite and then nitrate form which then becomes available to the plants. In organic farming method, therefore the application of fertilizers, especially ammonium sulphate and pesticides is considered undesirable as these inputs adversely affect soil micro-organisms. Even bees and butterflies who play an important role in the pollination process in flowers of many crops are adversely affected by the use of pesticides. The roots of plants are themselves dynamic. With field capacity irrigation and given the right condition of aeration, they become very active in nutrient-absorption. For this reason selection of right type of soil for different crops and their humus content is very important. Roots increase the biological activity of the soil. The planting of leguminous crops therefore is doubly important as the symbiotic-bacteria of their root nodules also fix nitrogen from the atmosphere.

4. Another important principle of organic farming is the use of local seeds. There are strong and weak points in all varieties of seeds, be they local or improved, but given the right condition production from local seeds can be much higher. Local seeds have the additional advantage as they resist diseases, tolerate drought conditions, survive even in too much flooding and perform well in any kind of adverse weather. The problem of lodging arises not because of the drawbacks of local seeds but because of their vir-

tue. They grow tall in tropical countries in order to be able to compete with weeds, grass and neighbouring plants for sunlight. This also helps them in protecting from the damage of flooding by too much monsoon rain. The problem of lodging can easily be solved by interculture and by planting the seedlings at appropriate distances from one another so that mutual shading may be minimised. Another quality of local seed is that it produces more tasty and nutritious food than exotic seeds.

CHAPTER 11

AGRICULTURAL RESEARCH, EXTENSION AND TRAINING

11.1 *Research*

11.1.1 *Existing Infrastructure:* Eastern India, like other parts of the country, has evolved a uniform set-up for research, in pursuance of the Agricultural University concept of integrating research, education and extension training and the recommendations of the National Commission on Agriculture (NCA) in this regard (*vide* Appendix 7). Basic and applied research is the responsibility of the five agricultural universities, two in Bihar and one each in Orissa, West Bengal and East U.P. These universities are not old enough to be fully seized of the multi-faceted problems of the States nor is the coordination with the State Departments of Agriculture close enough as yet for acceleration of the necessary problem-oriented research work. A good number of research projects, especially with ICAR funding, are in operation but their contributions and impact, in terms of agricultural production, are not commensurate with the time and money spent.

11.1.2 The attitude and approach of the research scientists need to be tempered with a mission to be fulfilled. Regrettably, many of them seem to lack vision, purposiveness and enterprise. It will be useful if each of them is required every year to present before a discipline-wise seminar a paper, explaining his research findings in the previous year and the research programme for the next year. ICAR may help arrange such seminars, which will promote better interaction among the peer groups and improve standards.

11.1.3 Agricultural research in some other parts of the world and also India is on the threshold of a new break-through as a result of advances made in the fields of photosynthesis, genetic modification, tissue culture, biological nitrogen fixation, nutrient absorption, chemical growth regulants, weed and pest control, tillage economy, land improvement, alleviation of environmental stresses, water management, multiple and inter-cropping, use of by-products, reduction of wastes and improvement of animal ferti-

lity, breeding, nutrition and health. Scientists in the agricultural universities and research institutes in Eastern India have yet to make significant purposive use of these advances for the benefit of the farmers of the region.

11.1.4 The State Departments of Agriculture seem to be failing in creating adequate facilities and infrastructure in the farms where adaptive research centres are located. Moreover, they are not suitably distributed so as to represent various agro-climatic locations of the States. On the other hand, these have tended to get concentrated near the headquarters of the States or the main campuses of the Agricultural Universities. These tendencies need to be reversed.

11.1.5 Each State has the benefit of one or more research stations and commodity research centres set up by the ICAR. These were intended to take due interest in the regional problems and find solutions for them. But that is not always happening. This needs to be corrected.

11.2 *National Agricultural Research Project (NARP)*

11.2.1 The NARP reports prepared by groups of highranking scientists give in a nutshell a good assessment of the existing research efforts of the agricultural universities, pointing out gaps in research and practical suggestions to overcome these deficiencies. These reports have been brought out recently and hence their recommendations should be valid for the next 5 to 10 years.

11.2.2 We reiterate the recommendation of NARP that at least one research station should be located in each agro-climatic zone, supported by substations or verification and testing stations. We further suggest that each zonal station should have two wings, one for research on staple crops and the other for high value crops. Where it is not possible for one research station to accommodate two wings, a second research station might be set up for high value crops.

11.3 *Specific Research Problems*

11.3.1 As has been noted earlier, in the eastern region, the pattern of cropping is dominated by a single crop, rice, which is grown mainly during the *kharif* season. The average yield per

ha varies from around 1.0 to 1.5 tonnes. But, the same rice when grown on the same land during *rabi* season with controlled and adequate irrigation gives over three times this yield. However, during this season, demand for water is very high. During *kharif*, water control in most parts of the region is very difficult and hence use efficiency of fertilizers and other inputs is at a low level. Even during *kharif* season, whenever rainfall is low but water is adequate during sowing time and other critical periods, e.g., flowering, ripening, etc., the yield can at least be doubled. National demonstrations have also shown that productivity is capable of being increased 3 to 4 times the present yields provided water management is satisfactory.

11.3.2 Heavy or uncertain rainfall can be partially taken care of if there is conjunctive use of groundwater and provision is made for field channels. Absence of these is a big handicap. Acute fragmentation of land is also a major constraint. These issues are partly socio-economic in nature and cannot be solved by scientists and technologists alone. But they can help a great deal by evolving varieties and developing small farm technologies which can give much higher yields even in fragmented fields and under rainfed conditions. The high yielding technology currently available with us does not respond to many of these situations, as it does in low rainfall but controlled irrigation conditions.

11.3.3 The rice-growing lands of the region may be classified, for convenience, into four categories, viz., (a) rainfed uplands (b) rainfed lowlands, (c) irrigated medium lands and (d) coastal saline areas. The main problems identified in each of these areas and the suggested remedial measures are mentioned below.

- (i) *Rainfed Uplands*: The soils are light textured and low in organic matter and hence have low moisture holding capacity. As such, applied fertilizers are leached out and crops suffer from moisture stress, often at critical stages of growth. Weed and pest incidence is severe. Where, in uplands, the average rainfall is 1000 mm and above, rice and another crop on residual moisture can be grown. Where the average rainfall is between 800 and 1000 mm, rice is risky, but intercropping with pulses/oilseeds is advisable, so that in case rice fails, the second crop will survive. Water harvesting techniques are strongly recom-

mended to provide protective irrigation. Line sowing instead of the usual broadcast seeding ensures good stand of paddy and high yield.

- (ii) *Rainfed Lowlands*: These lands commonly suffer from excessive moisture, waterlogging and inadequate drainage. Submergence causes poor stand of paddy, poor tillering, iron toxicity, especially in acidic soils, and low use efficiency of fertilizers. Attack of pests and diseases lowers crop yield. These lands are most affected by early drought and late flash flood. Drainage improvement will obviously reduce adverse effects of waterlogging and flood. Some deep water (50 cm) paddy varieties are known. The seeds of these varieties should be made available to farmers. Supergranules of urea are found to be quite efficient even under deep water conditions.
- (iii) *Irrigated Medium Lands*: Delayed planting due to late raising of seedlings, coupled with high incidence of pests and diseases, and low to moderate use of chemical fertilizers and organic manures, stands in the way of high yields which these lands are capable of giving under good management and irrigation.
- (iv) *Coastal Saline Areas*: Saline lands along the coast of West Bengal and Orissa do not normally sustain good crop-growth. The answer to such problem soils is to have salt tolerant crops. Some paddy varieties are known to grow in salt affected lands, but they are not as yet fully established. Prevention of salt water inundation by embankments/dykes is an obvious choice but this measure should be taken in consultation with the Department of Irrigation and Drainage. Technologies developed in Holland can be adapted with advantage.

11.4 Research Efforts Needed

11.4.1 *Rice*: The technology of high yielding rice cultivation is not applicable to all the areas of the region now being put under this crop. Hence, a reorientation of research efforts in modifying the technology is called for. For example, suitable pest and dis-

ease resistant varieties and varieties capable of withstanding some amount of water stress, deep water and salt are yet to be evolved to suit such adverse situations as are met in this region. These areas of research will have to find a place in the Seventh Plan proposals for rice research in the country.

11.4.2 *Other Crops*: Since the climatic conditions cannot be controlled adequately, agriculture will have to be adjusted to the climate. This requires effective research effort in the direction of evolving improved varieties of crops, particularly of pulses, which would respond to the various climatic situations. The varieties may not necessarily be high yielding but should be stable medium yielding ones. The deficiency of the region in oilseeds and pulses in particular is enormous. In this context the relative merit of growing *boro* rice and other crops requiring less water may be examined.

11.4.3 *Perishable Crops*: Research is needed for evolving standardised high yielding varieties of fruits, spices, vegetables and flowers that have large demand potential both for export and domestic urban markets and are suitable for different agro-climatic zones. This is necessary to facilitate large scale marketing and better price realisation by the producer. In countries like Taiwan, USA, Brazil, Israel and Holland, very useful research work on tropical and semi-temperate zone vegetables, fruits and flowers has been done and standardised varieties with export potential and suitable for long distance transport have been evolved. Agricultural universities in Eastern India as well as the National Horticulture Board should collect all relevant information and adapt some of these foreign varieties and techniques for introduction in selected compact blocks in the region.

11.4.4 Another area of research needing attention is development of concentrates and other easily storable processed items.

11.4.5 *Water Management*: Research on how best to tackle surplus and deficit of water caused by erratic rains should receive the highest priority. Research is also necessary on irrigation procedures and water management aspects.

11.4.6 Techniques for water harvesting and conservation need to be made an integral part of crop husbandry of the region. There is also need for contingency planning to suit different

weather conditions, based on adequate reserves of seeds of alternative crops and varieties. For example, if the monsoon is too late to sow rice, it can be substituted by millets, pulses or oilseeds having low water requirements. For this purpose, rainfall data given in Part VI of the Report may be usefully studied.

11.4.7 During the *kharif* season, when flooding becomes common, the use efficiency of fertilizers is low, and it is one of the chief reasons for low fertilizer consumption of this region. Research work on this problem is being tackled on global basis. Any success in research in this area will be of immense importance for cost effective crop production in Eastern India.

11.4.8 The areas that need attention in terms of both applied and adaptive research to support crop husbandry may be summarised as follows.

- (i) identification of specially uncertain rainfall weeks in the sowing and flowering periods of important crops, area by area, and introduction or development of varieties or alternative crops which can withstand this uncertainty or avoid these weeks, on the basis of detailed study of rainfall and evapo-transpiration data for each area (analysis of rainfall data referred to above may prove useful in this context);
- (ii) development and introduction of short duration or cash crops of high value;
- (iii) methods of application of nitrogenous fertilizers in different forms (coated, supergranules, etc.) to rice at various levels of submergence for the purpose of increasing their use efficiency;
- (iv) amelioration of micronutrient deficiencies in different areas;
- (v) evolving cost effective engineering structures in the water distribution system;
- (vi) reclamation of alkaline and saline soils;
- (vii) evolution and introduction of salt tolerant varieties of crops;
- (viii) crop planning and land-use planning.

11.4.9 We have identified, at the zone level, technological and other constraints hindering growth of productivity and spelt out the research requirements in the State Reports. For operational purposes, however, efforts should be made to identify the constraints to growth at lower levels, say, the block. Drainage problems may have to be identified at the village level.

11.4.10 Importance of evolving pest and disease resistant/tolerant varieties is widely recognised, but to achieve this objective, a long-term research strategy has to be planned. In fact, special and concerted efforts in this direction will be worthwhile.

11.4.11 *Improved Implements and Machinery:* Farmers in the region rely mainly on traditional human and animal drawn implements. As a result, the preparatory tillage operations are delayed and at the same time weed infestation affects the plant population adversely. The use of improved farm implements and farm machinery is very limited.

11.4.12 The designing of improved implements, tools, and machinery which could be operated by local bullock and human power is, therefore, imperative. It is no use introducing animal drawn implements which are too heavy for local bullocks. Agricultural engineers should also think of adapting suitable implements, etc., in use under similar farm situations in other countries like Taiwan, South Korea, Philippines, Israel and Japan. Government of India should arrange for collection of designs and samples for this purpose. International Rice Research Institute (IRRI), Philippines and Asian Vegetable Research and Development Centre (AVRDC), Taiwan may be of help in this regard.

11.4.13 Research in design of improved implements and machinery is being conducted by ICAR, Agricultural Universities, IITs and State Governments. The Central Institute of Agricultural Engineering, Bhopal and Agricultural Universities have also designed improved implements for agricultural operations. Some of the implements and machinery designed by such organizations, that can play an effective role in increasing agricultural production and productivity in the region have been listed in Chapter 8, Annexure 8.1. These can be adapted to various agro-climatic zones to fit in with the draught capability of the local bullocks.

11.4.14 The development of prototypes suited to Eastern India has been a rather slow process. Agricultural Universities, Regional Research Centres, IITs., Regional Engineering Colleges, etc., should step up this effort. Private entrepreneurs and voluntary organizations who might be willing, should be helped in their research and development effort with suitable funding from banks and the Government. A Central Institute of Agricultural Engineering Research should be set up in the region to look into the specific problems of Eastern India and to adapt improved machinery and implements available elsewhere to the needs of the region.

11.4.15 Innovative skill, intermediate technology and use of improved devices of ball-bearing, gear, chain, wheel and electronics have a very useful role in this regard. As an incentive, a large enough prize (say Rs. 1 lakh) should be announced and national recognition should be given periodically to research workers and entrepreneurs, who design and/or develop improved prototypes of implements/tools/carts, etc., which prove their worth in field trials. NABARD may consider taking a lead in this matter.

11.5 *Results of Research Available on Shelf*

11.5.1 Experience of agriculturally advanced countries which have small farm dominated economies, like Japan and Taiwan shows that with the already known technology, it is possible for small farm operators to use profitably two to four times the labour input, *pari passu* with a large input of capital, as compared to the type of agriculture practised in Eastern India. It is also possible to step up productivity levels four or five times. Even with diluted application of the technologies which are being used in these countries, it should be possible to solve, to a large extent, the food and employment problems of the region. It is in this context that, in the first instance, there is need for preparing comprehensive inventories of research findings which, though relevant to agriculture of the region, are not yet in use on a large scale in the field. In preparing such inventories, it is necessary to draw upon the research findings not only of the Agricultural Universities and other research institutes functioning in the region, but also those of research institutes in other parts of the country and international institutes which, are working on problems of agro-climatological situations similar to those obtaining in the region. It will be worthwhile for ICAR to bring out a quarterly publication, giving a gist of re-

search findings from all over the world, including India, for the information of all interested persons.

11.5.2 The ICAR research institutes located in the region and some outside it, the agricultural universities and State Government laboratories have from time to time, reported research achievements in certain areas of agriculture relating to (i) raising the yield potential of crops, (ii) achieving stability in agricultural production, (iii) breeding high yielding varieties resistant to pests and diseases and also those that are drought resistant and salt tolerant; (iv) improvement in crop production technology for dryland areas, (v) irrigation scheduling in crops, (vi) integrated pest management, (vii) post-harvest technology and (viii) design and fabrication of improved agricultural implements and machinery. In Chapter 14 we have mentioned some research findings available on shelf relevant to the region in the subject areas of animal husbandry and fisheries.

11.5.3 Location specific research findings on shelf are indicated in the State Reports on an illustrative basis. Besides, research findings of international research institutes like AVRDC, Taiwan and IRRI, Philippines relevant to the region could also be drawn upon (*vide* Annexure 11.1). The Universities and State Governments should collaborate with these institutions and utilize such findings as are ready for extension in a phased manner.

11.6 *Extension and Training*

11.6.1 The results of research already available on shelf can help in substantially increasing agricultural productivity in Eastern India, provided they are effectively transferred to the farmers' fields by adaptive research and such extension efforts as (i) national demonstrations, (ii) operational research projects, (iii) lab to land programmes, (iv) training and visit system and (v) farmers' training and education programmes. However, despite some efforts on the part of agricultural scientists, many of the research findings have not gone through the necessary field trials for large scale adoption by farmers.

11.6.2 The reasons for non-adoption of technologies approved by adaptive research stations should be investigated by the agricultural universities in collaboration with State Governments and remedial measures taken. We are aware of instances where field

adoption has been thwarted due to lack of inputs, such as seeds, fertilizers and pesticides, etc., or lack of credit at the proper time and in adequate amounts. This kind of scrutiny needs to be done for each agro-climatic zone separately in respect of (i) staple crops, (ii) high value crops, (iii) improved practices in crop production, (iv) animal husbandry/fisheries, and (v) improved implements and machinery. Adequate funds should be provided to the Departments of Agriculture for speedy implementation of the recommendations. The Committee of Secretaries mentioned in Chapter 7 may be made responsible for taking up periodical review.

11.6.3 Training & Visit System: The extension infrastructure in some States has been reorganized in the last few years, under the Training and Visit system. The reorganised set-up is designed to provide extension support to farmers through an exclusive village level functionary, viz., Village Level Agricultural Extension Worker (VAW) functioning under a single line of command. This functionary is known as 'Krishi Projukti Sahayak' in West Bengal, 'Village Level Agricultural Worker' in Orissa and 'Village Extension Worker' in Bihar. The VAW is continuously trained in fortnightly capsules of extension advice which he carries in course of regular visits to the farmers through a small group of responsive contact farmers. West Bengal, Orissa and Bihar have adopted the T & V system of extension. In West Bengal and Orissa, all the districts have been covered by the T & V system. The system was introduced in Bihar in a phased manner in May 1978. Three-fourths of the districts in Bihar are expected to be covered by the end of 1984-85 and the remaining by 1985-86.

11.6.4 The T & V system should be extended to East U.P. as early as possible. The present infrastructure of multipurpose village level workers is ill-suited for providing intensive extension support especially to the small farmers in that area.

11.6.5 Training of VAWs is provided at workshops by sub-division and district level Subject Matter Specialists (SMS). The complement of sub-division level SMS Group is laid down on a uniform basis for a State. The composition of these Groups needs to be tuned to the local requirements. Disciplines like horticulture, agroforestry and dry farming, which are not represented at present should be included where necessary. Further, water management is an important discipline for Eastern India and a specialist, in this area should be provided for.

11.6.6 We found that these specialists are sometimes rotated between different disciplines on grounds of administrative convenience. This should be discouraged and a specialist should invariably be deployed only in his field of specialisation.

11.6.7 A specific proportion of the specialist's working time should be devoted to direct contact with the farmers and for organizing demonstration on farmers' fields. He should also keep himself abreast of latest research work being done at the Regional Research Stations of his area and the universities. The SMS is an important link between the research set-up and the farmer in the process of transfer of technology to the field. Therefore, his interaction with farmers, exposure to farm problems for feedback to scientists and awareness of latest findings of research suitable for field application are important for improving the content of the extension package. In the formulation of this package, he should be actively involved. At the same time, the quality of training which he imparts to the VAWs should be improved.

11.6.8 The T & V system is functioning reasonably well in areas where it has been introduced, but its impact on productivity has not yet come up to the expectations. The Compact Area Programme in Orissa under which inputs and management practices are made available in a compact area at the farmer's door steps under close supervision of carefully selected field functionaries, with a minimum yield guarantee to the farmers, has produced good results in raising productivity (for details, see Report on Orissa, Part III). This approach is worth emulation by other States of the region.

11.6.9 The ratio between VAWs and farmers in West Bengal, Orissa, and Bihar is below what has been sanctioned and far below what is needed. All sanctioned staff vacancies should, therefore, be filled up expeditiously.

11.6.10 With a view to providing motivation to VAWs, suitable selection grade/promotional avenues should be provided in the service rules. They may be provided in-service training and facilities of higher study, to upgrade their professional qualifications, after a stipulated period of service, say, 5 years.

11.6.11 Although sanctioned on a model block pattern, the total number of SMS, AEO and VAW should be regarded as a State pool and actual staffing pattern in different blocks should be varied according to the local conditions and requirements.

11.6.12 Even though the T & V system is based on the understanding that the VAW would be available exclusively for agricultural extension work under a single line of command, a persistent problem has been the continuing involvement of VAW in non-extension work. It has also proved difficult to wean extension and research staff away from generalised type of recommendations and high input and high cost technology. Extension service should become increasingly aware of this problem and take remedial measures within its own operations. In particular, extension functionaries must exert pressure on the research scientists to reorient their research priorities according to the field requirements.

11.6.13 Extension effort is fruitful only if recommended inputs are made available to the farmers on time and in adequate quantities. It has been generally observed that in States adopting the T & V system, input delivery at the farm level is not effective enough for the small and marginal farmers to adopt fully the package of inputs recommended by the extension agencies. Partly, this may be due to the fact that the VAW does not share any direct responsibility for making the desired input supply available to the farmer. There is need for a strong linkage between the input and credit delivery system and the extension agency to realise the full benefit from the technology which is sought to be extended. The complement of the staff available with the Block Development Officer should look after this function and might, if necessary, be strengthened.

11.6.14 Competence of the contact farmers needs to be upgraded so that they become suitable for their work and can effectively supplement the efforts of the VAW. To begin with, a selected number of them may be utilised, on payment of suitable remuneration, as assistants to VAWs, designating them as Associate Village Level Agricultural Workers (AVAWs) or Krishi Pracharaks, in areas where the number of holdings is too large for the existing VAWs to cope single-handed. The AVAWs could apply themselves to extension work on traditional crops and simpler practices, leaving the VAWs free for extension work on new and high value crops and products and more sophisticated practices.

11.6.15 The State Agriculture Departments should periodically monitor and evaluate the performance of VAWs and AVAWs. Those VAWs and AVAWs, in whose area of operation noticeable

increases in productivity have taken place, should be rewarded with prizes and certificates and given wide publicity.

11.6.16 Supplementary Extension Services: Besides strengthening the present departmental extension organization in the States, there is need for some additional support for the strategy for diversifying production recommended by us. These activities include, *inter alia*,

- (i) supporting and encouraging the small/marginal farmers to take up mixed farming and/or cultivation of high value crops on even a fraction of their holdings. Where possible they may combine fish culture and duckery with rice production;
- (ii) promoting livestock development, fodder production and agroforestry, especially in tribal and backward areas;
- (iii) promoting round the year production of legumes and other nutritious food in kitchen gardens for domestic consumption; and
- (iv) encouraging fisheries development in tanks and waterlogged areas not suitable for crop production.

For the purpose of carrying out the programmes covering the above activities, special extension efforts are needed to organize demonstrations and farmers' training at the block level. We feel that the departmental extension agency of the State alone will not be adequate. Organization of additional extension efforts is called for. In this venture, voluntary organizations and corporate agencies interested in agricultural development of the region can be very helpful in undertaking innovative experiments and providing models to emulate. They should be given necessary encouragement and support.

11.6.17 Elsewhere in this Report we have recommended, *inter alia*, the involvement of corporations and banks in agro-based industries envisaged for the 'Rural Industry Centres'. We suggest that State Governments may usefully persuade these agencies to adopt a few selected villages around the rural industry centres for undertaking R & D work in the sphere of agricultural development.

11.6.18 During our visits to the States, we came across several instances of successful experiments based on whole family approach in comprehensive rural development made by certain voluntary organizations. In particular, we would like to cite the work done under the Rangabelia Project of Tagore Society for Rural Development in West Bengal and Vaishali Project in Bihar. Such models of development need careful study on the part of extension agencies for possible replication, preferably with the involvement of similar mission-oriented voluntary organizations.

11.6.19 Experts in horticulture and animal husbandry in the Government or in other institutions, who have recently retired and are in good health and are prepared to work in difficult tribal and backward areas, may be usefully inducted as extension consultants in these areas, where younger experts with children to educate do not wish to stay. Suitable honoraria, the scale of which might depend on the level and type of their expertise and the degree of hardship of the area, may be paid to them. These experts might be located in voluntary organizations, wherever feasible, and associated with appropriate block and zilla parishad functionaries. They can be inducted on three to five year contract, with provision for an annual review and renewal of terms of service.

11.6.20 To improve the professional competence of the extension functionaries, adequate pre-service and in-service specialised refresher training courses should be organised at different levels.

11.6.21 *Farmers' Training:* Besides, it is important to intensify programmes for training and education of farmers, farm women and farm youth till such time as T & V system is fully staffed and stabilised. The aim of such programmes should be to make selected groups of progressive small/marginal farmers fully acquainted with the pros and cons of the recommended techniques. In our view, such a vanguard of small farmers would be a very potent instrument of extension.

11.6.22 Comparatively better-off farmers depend on media like radio and television for extension service. There is a case for deploying these mass media more effectively for agricultural extension work. Rural television programmes need special attention and priority now that the television coverage is rapidly expanding into rural areas. The programmes should be designed to advise

the farmers on specific farm operations at periodical intervals. The training courses given to the VAWs fortnightly under the T & V system should also be broadcast through the mass media for wider dissemination.

11.6.23 Pilot programmes should be taken up in all the four States of the region for conveying extension message to farmers in selected villages with the help of films or video-tapes. Video cassette players may be used in villages where there is no television coverage. The cost-benefit aspects of these media need to be carefully studied. A centre may be set up in each State to prepare video cassettes or films based on fortnightly training capsules for VAWs for wider transmission.

11.6.24 Special courses on operation and maintenance of mechanical and electrical devices in use on farms may be introduced by IITs, Craftsmen Training Centres and selected rural schools.

11.6.25 Exposure to demonstrations, farm melas, etc., of groups of farmers is another method of farmers' training. Visits of farmers from backward areas to progressive areas/States for witnessing the actual working of modern farm technologies have a salutary effect on farmers. Such visits should focus on

- (i) *Irrigation and Drainage Practices and Procedures*: Their merits and demerits, groundwater exploitation, construction of drains and field channels, prevention of water-logging, economic use of water and role of pumps;
- (ii) *Dry Farming Techniques*: On the basis of micro-watershed management, particularly for farmers from low rainfall areas having poor irrigation support; and
- (iii) *Agro-techniques and Efficient Input Use*: For high value and new crops and livestock and agro-forestry products.

11.7 Coordination

11.7.1 Both vertical and horizontal linkages between research and extension are important. The State Governments are urged to develop and strengthen these linkages. The T & V system provides suitable mechanisms for such coordination at field, district and State levels in the context of specific requirements of each State

Although the indicated mechanisms have been set up to meet the project commitments, the actual composition of the coordination committees is more the result of administrative convenience than that of proper analysis of requirements. Further, the committee meets infrequently and do not have adequate staff support. These lacunae need to be removed.

11.7.2 For effecting interchange of experiences, annual seminars should be conducted jointly by the Agricultural Universities and State Agriculture Departments with the participation of SMS, experts and progressive farmers at district and State levels. The reports of these seminars should be considered for necessary follow-up action by the Standing Committee of Secretaries referred to in Chapter 7.

11.7.3 It is important to make experts working under any one of these two areas (i.e., research and extension) conversant with the other. For this purpose, exchange of expertise between these disciplines is essential. We would like to emphasise that collaboration between the Government Departments and Universities would be of help in upgrading the quality of research work as well as extension performance. This will involve deputation of university research scientists to adaptive research stations and the posting of researchers working in these stations to the universities. Thus a symbiotic relationship needs to be built up between the experts working in the research stations and the universities in allied fields. Attractive deputation terms and financial assistance should be provided for this purpose.

11.7.4 In this context, we would like to reiterate the following recommendations made by various ICAR Research Review Committees:

- (i) Subject matter specialists working at sub-divisional levels and specialists engaged in research at the regional research stations should meet once a month in workshops for exchange of ideas and for training purposes;
- (ii) District-level subject matter specialists should be deputed to respective regional research stations for refresher training;

- (iii) Scientists located at the regional research stations should be actively associated with the training sessions held in rural areas; and
- (iv) An extension agronomist should be posted at each regional research station with adequate provision of audio visual aids.

11.7.5 Senior scientists of agricultural universities/research institutes may visit adaptive research stations and field demonstration plots as often as possible and meet farmers to appreciate their problems.

11.8 *Monitoring and Evaluation*

11.8.1 A major weakness of the extension organizations has been poor monitoring and evaluation (M&E). Due to lack of conceptual clarity at operational levels, M&E function is confused with mechanical submission of reports on progress of programme implementation or on the extent of achievement of targets of inputs consumption or coverage under different plan schemes, etc. It is necessary to train and deploy the M & E units set up for proper assessment of the impact of extension and various development programmes as also to provide feedback for any correction which may be needed, in this regard.

11.9 *Needs of Resource-Poor Farmers*

11.9.1 Special care needs to be taken to ensure that the research and extension staff work closely with representative groups of "resource-poor farmers" in particular and not merely for farmers in general as hitherto. Otherwise, research and extension are likely to have a built-in bias in favour of "resource-rich farmers" whose conditions have greater similarity with those obtaining in experimental farms. If this has to be avoided, the basic problems of the target group of farmers should be first discussed with them, thereafter research effort should be specifically focussed on these and the results discussed once again with the target group. Socio-economic aspects of the problems faced by the target group should receive no less attention than the technological aspects. In all these, the research and extension staff have as much to learn from farmers as the farmers have to learn from them.

Annexure 11.1**Recent Progress in Rice Research at IRRI, Philippines¹**

1. Under the technologies for irrigated and adequately rainfed areas available at present, an average yield of 6 t/ha is feasible. On this basis, rice producing countries have been classified into three main groups.

I) With a yield gap of less than 33 per cent (yield exceeding 4 t/ha)

II) With a yield gap ranging between 33 and 70 per cent (yield between 1.9 and 3.9 t/ha) and

III) With a yield gap of over 70 per cent (yield below 1.9 t/ha).

2. India falls under Group II countries. A number of new varieties of seeds suitable to Group II countries have been released by International Rice Testing Programme (IRTP), one of the networks of IRRI. Some examples of such varieties released by IRRI in India are given below.

Country	Designation	Origin	Name given	Year released
India	HPU 734 (IR 579)	IRRI	Himalaya-1	1982
	HPU 71 (Pusa 33)	India	Himalaya-2	1982
	IR13427-45-2	IRRI	Bharathithasan	1983
	BG90-2	Sri Lanka	Pant Dhan 4	1983
	CO43	India	*	1983
	CO44	India	*	1983

* Not available.

Source: International Rice Research Institute, Philippines.

3. For cultivation of crops in upland areas before and after rice, IRRI has entered into collaboration arrangements with a number of international institutions like ICRISAT (Peanut, sorghum and chickpea) and AVRDC for developing suitable varieties.

¹ The material in this Annexure is based on a talk delivered by Dr. M. S. Swaminathan on behalf of the IRRI at the Consultative Group on International Agricultural Research, International Centres Week, Washington D.C., November 5-9 1984.

4. IRRI places considerable emphasis on maintenance of soil health. The main problems in various soil types and amendments suggested to overcome them are given below.

- i) In rainfed lowland soils, the main problems are salinity, iron toxicity, acid sulphate problems, peat soil problems, and nitrogen, phosphorus, sulphur and zinc deficiencies. Experiments in Philippines have shown that salt injury and flood damage were controlled by planting early maturing rice varieties such as IR 50. International tests have shown that IR 4630-22-2 and IR 9884-3-3 produce good results. IR36, IR43, IR50, IR52, IR56 and IR60 have been found to be moderately salt tolerant in shallow rainfed saline soils.
- ii) To meet the problem of low yields arising from iron toxicity in acidic soils, IR 36, IR46, IR 4683-54-2 and IR 3149-43-2 have been used in hybridization and in local trials in Burma and India. They have done well in these tests.
- iii) For nitrogen deficiency, good yields (5t/ha) can be obtained by applying 50-100 kg N/ha per season. In soils with phosphorus deficiency, IR 42 and IR 54 have been found suitable. Sulphur deficiency can be corrected by applying ammonium sulphate or gypsum. Zinc deficiency can be corrected by applying zinc sulphate. In marginally zinc deficient soils, IR34, IR36, IR50 and IR52 need no such amendments.
- iv) In upland soils, the main yield-limiting factors are iron and manganese toxicities and deficiency in acid soils, For iron deficient soils, IR24, IR36 and IR43 have been found to be better.

5. A common criticism against new technology is its reliance on non-renewable forms of energy. Therefore, a major research activity of IRRI is in the direction of substitution of fertilizers based on fossil fuel by the use of bio-fertilizers to the extent possible. Considerable progress has been made in the following areas.

- i) establishing a germplasm bank of Azolla and blue-green algae,

- ii) indentifying N₂-fixing organisms in rice soils, and
 - iii) developing cultural practices to enhance biological nutrition fixation in rice fields.
6. In the last 2 years much progress has been made in improving nitrogen use efficiency in lowland rice through the following approaches.
- i) varietal differences in nitrogen utilization efficiency
 - ii) improved timing of N application
 - iii) deep placement of nitrogen fertilizer
 - iv) controlled release of N fertilizers, and
 - v) use of nitrification and urease inhibitors.
7. With the objective of providing greater opportunities for employment in rural areas, IRRI has taken up a project for fabrication and marketing of IRRI designed farm implements by small-scale industries in rural areas.
8. Another area in which research is launched is on crop-livestock integration. A project was taken up in 1984, the main focus being on ruminant animals, forage crops, dual purpose crops (grain and fodder), feed technology and pesticide residue.
9. IRRI is also engaged in developing a research network on Women in Rice Farming Systems (WIRFS). The main objective of this is to increase women's production and productivity, reduce drudgery, and help in improving women's participation both in technology development and transfer.
10. Considering that scope for land expansion for agriculture is very limited, IRRI is strengthening its collaborative relationships with advanced institutions in developed countries for harnessing recent scientific tools including those in biotechnology and genetic engineering to solve specific field problems. Eastern India in particular can considerably take advantage of these developments.

CHAPTER 12

MARKETING DEVELOPMENT

12.1 *Demand Constraints*

12.1.1 The programme for intensification of agriculture outlined in this Report is expected to bring about a sizeable increase in the production of traditional crops and high value crops such as vegetables. In this context, it is important to ensure that there would be effective demand for the crops produced. Otherwise, the production programmes will suffer adversely for want of marketing outlets. Demand constraints can inhibit agricultural productivity no less than the production constraints discussed earlier.

12.1.2 In regard to rice, the main crop of the region, in normal years there may not be any demand constraint. In years of bumper harvest, however, the State Governments should be prepared for procurement operations on a selective basis to ensure reasonable prices to farmers. States should keep ready suitable contingency arrangements for such procurement, through the Central and State procurement agencies. This is particularly important in Orissa and U.P. which are self-sufficient in foodgrains and any excess production would tend to cause a slump in prices.

12.1.3 Whereas in the case of foodgrains and main non-food crops such as cotton, jute and oilseeds, arrangements for price-support operations are feasible, for perishable crops like fruits and vegetables, such arrangements may not be easy to operate. For such crops, there is no alternative but to organise a strong marketing and cold storage infrastructure, quick and effective transport facilities to alternative markets and timely advice to farmers in regard to adjustment of production to emerging demand patterns.

12.1.4 In modern agriculture, the ability of the producer to adjust promptly to demand is important. However, in the eastern region, for quite some time to come, the small and marginal farmers may not be in a position to undertake such adjustments. The medium and large farmers in this and the neighbouring regions will,

therefore, have to be alerted to the need and benefit of such adjustments. In this, effective market information service has an important role to play. Systematic marketing and demand studies should be conducted periodically by the State Marketing Departments for all crops grown at present and the new crops that are sought to be developed.

12.2 *Marketing Infrastructure*

12.2.1 The strategy of improving agricultural productivity and production levels would bring into sharper focus the need for a strong and resilient marketing infrastructure.

12.2.2 The marketing infrastructure in the region is weak. Regulation of markets under the Agricultural Produce Markets Acts has been rather slow. As on 31st March 1984, only 25 per cent of the principal wholesale assembling markets had come under regulation in the three States of West Bengal, Orissa and Bihar and 40 per cent in U.P. (data for East U.P. are not readily available separately). Co-operative marketing has not made much impact. Hence, private traders dominate the rural areas, charging profit margins much higher than warranted by the cost of service rendered. Moreover, they generally resort to unfair trading practices.

12.2.3 All markets-rural, assembling, wholesale and terminal-need to be brought under the purview of the Agricultural Produce Markets Acts and regulated according to a time-bound programme. The State Governments should prepare comprehensive plans for development of regulated markets. The Central Schemes to develop regulated markets and rural markets have been confined to a small number of markets. Their coverage needs to be improved.

12.2.4 The regulated markets have not produced the expected results because either the market committees do not exist or, where they exist, they have been ineffective. The basic physical facilities have also been inadequate. The following measures have to be taken to improve the working of regulated markets.

12.2.5 First, steps have to be taken to organise effective market committees in all regulated markets with due representation of both traders and producers, including small farmers. Second, State

Governments should notify all important crops, livestock and forest produce that can be traded in these markets. Third, adequate facilities for sale/auction, grading, weighing, storage and market information, etc., should be provided. Fourth, regular arrangements for appointment of market functionaries should be made. The control of these market functionaries should be vested with market committees. Efforts should also be made to reduce the number of supervisory levels. In our view, one level of supervision should be sufficient.

12.2.6 Small farmers mostly bring their produce to the nearest rural markets like *haats* and *shandies*. These may be organised as regulated assembling markets.

12.2.7 For marketing, apex marketing federation, primary marketing societies, warehousing corporations and regulated markets have been set up. They have not produced, by and large, the desired results. The present marketing structure needs a review, particularly at the apex level. While primary societies may deal with all agricultural commodities, at the State level there is need for some specialisation. Wherever apex societies have been set up to deal with a specific commodity, e.g., sugarcane, cotton, etc., they have been successful. While it may not be possible to set up an apex organization for each commodity, it will be useful to have separate organizations for separate groups of commodities, e.g., perishable and non-perishable commodities.

12.2.8 We also consider it necessary that each State should have a full-fledged Directorate of Agricultural Marketing to look after the following functions effectively :

- (i) enforcement of marketing and grading regulations;
- (ii) market surveys, research and co-ordination with relevant State Government Departments like Agriculture and Co-operation; and
- (iii) planning and development.

12.2.9 Further, in each State, there should be an autonomous Agricultural Marketing Board entrusted with the responsibility of developing existing markets, location of new markets, extension of

loans/subsidies to financially weak markets, prescribing licence fees/market fees and granting of licences to market functionaries.

12.2.10 Directorates of Agricultural Marketing have not been set up in Bihar and Orissa. The latter has also no statutory Agricultural Marketing Board. These lacunae may be removed early.

12.2.11 *Watch Groups*: The setting up of Watch Groups consisting of market functionaries, local experts and representatives of farmers and the trade at all principal markets to monitor prices and marketing arrangements regularly in respect of all major marketed commodities should be helpful. These groups should report to the State Directorates of Agricultural Marketing any errant trends as soon as noticed. In this context, the State Directorates may usefully keep in view three-year moving average of weekly prices (in both current and real terms) and the tolerable margins of deviations from the same. This should enable the authorities concerned to take prompt corrective action.

12.3 *Co-operative Marketing*

12.3.1 The network of co-operative marketing in the region is unsatisfactory. The volume of business handled by the co-operative marketing societies is also low.

12.3.2 In West Bengal, Orissa and Bihar, there is a two-tier co-operative marketing structure and in U.P., a three-tier structure. At the primary level, besides general marketing co-operatives, there are special commodity co-operatives. In West Bengal, Orissa and Bihar, there are Tribal Development Co-operative Corporations for marketing minor forest produce and other agricultural produce of the tribal areas and for serving as an apex marketing society to LAMPS.

12.3.3 In all the States, marketing societies are primarily engaged in distribution of inputs as may be seen below (Table 12.1).

Table 12.1. Business of Marketing Co-operatives
(Rs. lakhs)

	West Bengal		Orissa		Bihar		U.P.	
	1980-81	1981-82	1980-81	1981-82	1980-81	1981-82	1980-81	1981-82
Marketing of Agri-cultural Produce	648 (29.7)	1639 (39.4)	183 (11.0)	182 (11.7)	710 (8.9)	618 (8.9)	6132 (26.8)	9643 (32.7)
Distribution of inputs	1534	2525	1488	1367	7108	6072	15824	12936
Sale of Consumer goods	1	—	—	11	146	251	957	6913
Total	2183	4164	1671	1560	7964	6941	22913	29492

Note: Figures in brackets represent percentage of total.

12.3.4 There are 1013 primary marketing societies at mandi and taluk level (including special commodity societies) in the four States.

Table 12.2. Number of Marketing Societies

	West Bengal	Orissa	Bihar	U.P.
General Marketing Societies*	306	60	298	241
Fruit and Vegetable Societies	—	10	50	22
Other Special Commodity Societies	—	25	—	1
Total	306	95	348	264

* Excluding LAMPS.

12.3.5 Around 25 per cent of the marketing societies in West Bengal, 20 per cent in Orissa and Bihar and 12 per cent in U.P. are dormant. The volume of business handled is also not large, as shown below (Table 12.3).

Table 12.3. Business handled by Primary Societies

	Total No. of Societies	Societies not doing any business	Societies with business of		
			Less than Rs. 5 lakhs	Between Rs. 5 and Rs. 10 lakhs	Rs. 10 lakhs and above
West Bengal	306	79	158	36	33
Orissa	95	21	26	11	37
Bihar	348	74	265	6	3
U.P.	264	31	76	55	102

12.3.6 Besides the marketing societies, multipurpose co-operative societies (FSSs and LAMPS) also undertake marketing of produce, in addition to their normal credit business. The business handled by them, however, is not significant.

12.3.7 The large number of dormant societies and the low volume of business handled by the societies underline the need for an in-depth review of the working of the State Co-operative Marketing Federation and marketing societies affiliated to it by the Registrar of Co-operative Societies and appropriate remedial measures taken on the basis of such a review.

12.3.8 In view of the fact that a large number of farmers sell their produce at farm gate, there is need for co-operative marketing societies to make arrangements for purchase of goods at village sites.

12.4 Public Distribution

12.4.1 In our view, the public distribution system needs to be extended particularly to the tribal/backward areas or

areas identified for production of specific high value crops. Only if there is an assurance by the public distribution system that adequate supplies of foodgrains at reasonable prices will be available, the small/marginal farmer will consider shifting from traditional foodgrain crops, principally rice, to high value crops. Extension effort and technology alone will not bring about such a transformation.

12.5 *Perishable Commodities*

12.5.1 Several agro-climatic zones of the region, viz., Darjeeling district in West Bengal and hilly areas of Bihar and Orissa have a rich potential for development of orchards. Provided marketing could be developed, a large variety of fruits, vegetables and flowers could be grown in the region.

12.5.2 For facilitating marketing, production of standardised varieties of such commodities in popular demand should be organised in suitable compact areas. The necessary adaptive research and extension effort should be mounted in each agro-climatic zone backed by an effective input supply system.

12.5.3 At present, marketing of perishable commodities except milk in identified milkshed areas, is dominated by private trade. The traders lift the produce generally at the farm gate or contract out the standing crops at unreasonably low prices. Operations in the primary and secondary markets are also rigged by the trade. By and large, benefits of market regulation have yet to reach the producers.

12.5.4 On account of the perishable character of horticultural products and growth of semi-monopolistic trading rings, special marketing arrangements are necessary. It is our view that an integrated approach is needed towards the entire gamut of production, collection, transport, storage, processing and marketing of this group of commodities, preferably in the framework of a producer-oriented co-operative system.

12.5.5 The experience of the Anand Project in the case of a perishable commodity, viz., milk, has induced the Union Ministry of Agriculture to try a project on somewhat similar principles for other perishables like vegetables. The State Governments may

consider undertaking similar projects, after making suitable modifications in the light of local conditions.

12.5.6 The Group on Perishable Agricultural Commodities set up by the Government of India in January 1981 recommended a three-tier co-operative structure for an integrated programme of production and marketing for these commodities, (Appendix 13) as follows.

- (i) At the national level, a National Horticulture Board to provide the needed degree of coordination and monitoring of production and marketing of horticultural crops, initiate suitable measures for encouraging the growth of sound organizations of growers at various levels and provide necessary expertise for the development of an economically efficient marketing system.
- (ii) At the regional level, four Regional Horticultural Growers' Co-operative Federations for the promotion of organizations of growers at the base level on economically sound lines; establishing a well planned storage and distribution system ensuring availability of perishables to consumers at reasonable prices; arranging supplies of requisite inputs to growers' co-operative societies at reasonable rates; and taking steps to provide employment opportunity for women who play a dominant role in the post-harvest operations.
- (iii) At the base level, Primary Horticultural Growers' Co-operative Societies, each covering a sizeable compact area of production of one or more perishable commodities. These societies will provide service to its members by way of information and advice on production problems as well as arrange timely supply of good quality inputs. They will also arrange to collect the produce of the members in an orderly and planned manner and arrange for its marketing in local and distant markets.

12.5.7 We generally agree with the above recommendations, except item (ii). We feel that each of the four States of the eastern region should set up a Horticulture Marketing and Processing Company, if necessary, as a joint venture with private sector.

This will help better organization and management in processing and marketing of fruits and vegetables, both in domestic markets and abroad.

12.5.8 We would also like to stress the need for learning from the experiences of the successful project for production and marketing of apples in Himachal Pradesh. No doubt conditions in this region are different from those in that State, but the 'project' approach tried in Himachal Pradesh and recently extended to Jammu and Kashmir for development of horticulture should be considered by the State Governments of the eastern region for replication with suitable modifications.

12.5.9 So far no effort has been made in the region to take advantage of the potential export demand for perishable products. East and North European countries and Japan import a large part of their requirements of fruits and vegetables during the long snow-bound winter. Meat and meat products as also vegetables are imported by Gulf countries in sizeable quantities. Singapore meets its requirements of fruits and vegetables, by and large through imports. There is considerable scope for production of flowers in demand abroad, like rose, tuberose, gladioli in Eastern India, in suitably identified compact areas. The nature of this demand is, however, sophisticated and stringent standards of quality have to be met. A beginning to take advantage of this demand needs to be made in a well planned and adequately financed manner.

12.5.10 A start might be made by the State Governments and public/private sector agencies like export corporations by exploring the markets for a few selected items. Producers may be invited to undertake cultivation of specified varieties and qualities of these items under fully supervised conditions. Selected producers should be adequately supported by extension advice, credit facilities and input supplies. Quality planting material should be provided by the contracting export agency.

12.5.11 We understand that the National Horticulture Board, which has been recently set up, will make a special endeavour to establish a foothold in the international market for horticulture produce. State Governments and NABARD should actively collaborate in this effort and help promote coordinated production and marketing.

12.6 Transport

12.6.1 Transport has a significant role in making a marketing system efficient and useful. Effective and quick transport is a key factor, especially for the development of horticultural crops and livestock products which are of perishable nature. We envisage these as fast expanding sectors of the region's agricultural economy.

12.6.2 Roads play a most important part in the transportation of agricultural commodities. Generally, in the region, the network is fairly satisfactory up to the town level but inadequate beyond urban limits and scarce in interior areas. The road infrastructure from the national highway to the district level has not shown much improvement over the last decade. At the lower level there has been some extension of road mileage, particularly under the MNP, but not enough.

12.6.3 All the villages need to be connected through link roads, negotiable at least by bullock carts, to nearest motorable roads. Access to motorable roads and through them to the marketing points is an important pre-requisite for developing production of perishable crops on compact area basis. It is possible to organise production of such commodities within a radius of 50 to 70 kms from centres of demand so long as producing areas are easily accessible from nearby good motorable roads.

12.6.4 There should be adequate financial provision for maintenance of village roads so that these do not become unserviceable during the rainy season. The maintenance of these roads should be entrusted to local bodies (panchayats, etc.) and special funds should be placed at their disposal. Only where these organizations fail in this task, should the PWD take up the work.

12.6.5 There is a special need for developing improved types of bullock carts, suitable for the draft power and size of local animals, as also of cycle rickshaws/*thelas*. Innovative skill, intermediate technology and use of improved devices of chain and wheel, ball-bearing and gear have a very useful role in this regard. A pilot study conducted by IIM, Bangalore revealed that improved models of bullock-carts gave returns of upto 30 per cent of capital invested against 7 per cent in the case of conventional bullock carts. I.I.Ts.

Regional Engineering Colleges, etc., can undertake this effort. Private entrepreneurs who might volunteer, should also be helped in their research and development efforts with suitable funding.

12.6.6 Large scale standardised production of improved bullock carts, rickshaws/*thelas* etc., successfully tried in the field for a particular area, should be organised through 'registered' manufacturers.

12.6.7 We look upon rural transport as an important avenue for tertiary sector employment. Rural entrepreneurs not fully employed in agricultural activity should be encouraged, through suitable credit facilities, to acquire standardised transport vehicles like carts, cycle rickshaws, tempos, mini-trucks, etc., at reasonable prices. Side by side, adequate arrangements for servicing such vehicles should be also built up. There should be a training programme for local service and repair personnel, wherever needed.

12.7 Storage

12.7.1 The present extent of storage losses in foodgrains could be brought down significantly if efficient and adequate storage facilities are developed. Besides preventing losses, adequate and efficient storage reduces intra-seasonal and inter-seasonal price fluctuations.

12.7.2 The NCA was of the view that provision for storage of 50 per cent of the marketed surplus of foodgrains should be made at the primary centres. These godowns could also be used for other commodities. Planning of storage capacity is also necessary to service the public distribution system, particularly in drought and flood-prone areas and in compact areas identified for production of horticulture and other high value crops.

12.7.3 The producers' share in the utilisation of commercial storage is at present marginal. Storage capacities at market centres are being utilised mostly by the private trade. The farmer has no option but to dispose of his produce once he brings it to the market at the prices prevailing on the day. It is necessary, therefore, to take special measures to ensure availability of adequate storage facilities to farmers as also credit against the hypothecation of stocks.

12.7.4 The procedures for marketing of produce hypothecated with the banks also need to be simplified. At present it is difficult for the farmer to dispose of his produce in a warehouse. He has to settle first the dues of his banker. Measures to improve the negotiability of warehouse receipts need to be taken. It is important to curb the monopolisation of storage space by the trade and counteract other restrictive practices in this regard.

12.8 *Cold Storages*

12.8.1 Another lacuna is the very inadequate cold storage facilities in the four States. Building up of this infrastructure is of particular importance for supporting the expected increase in the volume of trade in perishable commodities.

12.8.2 The NCA had recommended that adequate measures should be undertaken by co-operative and public sector undertakings to provide cold storage facilities in producing areas and terminal markets. In pursuance of these recommendations, NCDC has taken up a project for setting up 4.8 lakh tonnes of cold storage capacity in the co-operative sector, with World Bank assistance, by 1985.

12.8.3 Public sector agencies like the National Horticulture Board should have a programme for provision of cold storages in producing areas and marketing centres. Facilities for processing and preservation of perishables like fruits and vegetables should also be provided at selected marketing centres to avoid wastage in peak periods of production. Private sector enterprise should also be encouraged to play a constructive competitive role in this regard.

12.9 *Rural Industry Centres*

12.9.1 The policies and measures recommended above should help significantly in meeting the demand constraints referred to at the beginning of this Chapter. The promotion of rural industry centres, especially in the secondary markets to start with, recommended elsewhere in this Report and a more even spread, particularly of medium scale industries, in rural areas, will be a very potent complementary measure in this direction and needs to be pursued in a purposive manner.

CHAPTER 13

AGRICULTURAL DEVELOPMENT IN TRIBAL AREAS

13.1 *Introduction*

13.1.1 In Eastern India, particularly in Bihar and Orissa, tribals constitute a sizeable proportion of the total population. As per 1981 census, scheduled tribes account for as much as 23 per cent of the total population in Orissa, 8 per cent in Bihar, 6 per cent in West Bengal and 0.2 per cent in East U.P.

13.1.2 Agriculture is the main source of livelihood of most tribals. However, agriculture in tribal areas is most underdeveloped and backward. Consequently, productivity is very low. Development of agriculture is, therefore, important for improving the socio-economic conditions of tribal population.

13.1.3 For accelerating the pace of socio-economic development of tribals, the State Governments have formulated sub-plans in which priority has been given to agricultural development. However, the task of agricultural development in tribal areas is so complex and formidable that it needs imaginative and concerted effort and well designed thrust.

13.2 *Special Features of Tribal Areas*

13.2.1 In formulating a planning strategy for tribal areas, their special features must be recognised. They are mainly the following.

- (i) *Community Ownership of Resources*: In tribal areas, resources are mostly owned by the community as a whole. Hence, the decision on the use of available local resources is made by the community and not the individual.
- (ii) *Spectrum of Resources*: The tribal economy is basically a subsistence economy, but reasonably well balanced. Unlike in the plains, it is more broadbased covering several activities like forestry, horticulture, animal husbandry and cultivation of some staple crops.

- (iii) *Skill Spectrum*: The skills of tribals cover a wide spectrum such as hunting, fruit-gathering, weaving, basket-making, agriculture, etc. They are not highly specialised or sophisticated. However, the skills developed over centuries by tribals are suited to the particular environment in which they live. Given the traditional skill endowments, the tribals are slow to accept new skills.
- (iv) *Traditional Institutions*: The tribals attach great importance to their traditional values, morals and institutions. Most of them have an egalitarian ethos, with a great concern for their community. This is both a sociological constraint and an advantage - a constraint because an individual-oriented development programme will not be much appreciated and an advantage, because if the community could be involved in development, it will have the desired impact.
- (v) *Modern Institutional Constraints*: The tribal areas are handicapped by inadequate modern institutional infrastructure. Even where new institutions have been established, they are not attuned to specific local situations, because of differences in perception between those who run the institutions and the tribals.
- (vi) *Extensive Resources and Limited Manpower*: In contrast to the plains, where the man-land ratio is high, in most of the tribal areas the man-land ratio is low. Therefore, the basic parameters of planning for the national economy as a whole (based on labour-surplus hypothesis) will not necessarily hold good for tribal areas, because they have limited manpower relatively to natural resources, particularly forests.

13.3 Major Constraints in Tribal Areas

13.3.1 Agro-climatic conditions and resource potential in tribal areas vary widely. There are areas with vast agricultural lands which are utilised only marginally. On the other hand, there are areas where sub-marginal lands are pressed for cultivation and are hardly able to provide bare subsistence. The demographic distribution of tribals in these areas indicates that very little of fertile

valley and plain lands are in their possession. Most of them occupy slopy, undulating, rocky or hilly land where only some low value crops can be grown. Similarly, the level of socio-economic development of tribals differ from region to region and sub-regions within the same region.

13.3.2 On the basis of the level of socio-economic development, the tribals can be grouped into four major categories, viz., (a) primitive tribals living mostly in isolated and inaccessible areas and practising primitive agriculture, (b) shifting cultivators, somewhat more advanced than the primitive class and engaged in slash-and-burn method of cultivation, (c) tribal communities which are in transition and have taken to settled agriculture and are in the process of acculturation and (d) accultured communities who are living in the vicinity of the industrial and mining complexes. The improvement in productivity and standards of living of the first three categories along sound social and economic lines is our main concern.

13.3.3 Primitive tribals live in inaccessible areas and their main source of livelihood is hunting and gathering of fruits, tubers and fuel wood. Only the officers of Forest Department are in touch with them and any programme to help them has to be implemented through that Department. They need to be handled with great care and understanding and protected at all cost from forest contractors and poachers. They are good in tending trees and animals and development projects should concentrate on these. Forest officers need to be specially oriented and provided necessary resources, if such tribals are to be helped.

13.3.4 In many parts of Eastern India, particularly in Orissa, many tribals practise shifting cultivation. The frequency of the tribals coming back to the same land is now greater. The deleterious effects of such shifting cultivation can be seen in certain areas of the Koraput district of Orissa, 'where the barren rounded reddish brown hills are unable to grow even a blade of grass due to continual erosion and leaching'. There is need for a resettlement programme for tribals in such areas.

13.3.5 In tribal areas of the transitional type, most of the farmers are small and marginal and practise subsistence farming. In the absence of commercial outlook and infrastructure, they have

often no incentive to maximise productivity. Irrigation facilities in these areas are extremely poor, being only two to three per cent.

13.3.6 The labour-intensive technology which is currently being emphasized in the non-tribal areas of this region is not often suitable for the first two categories of tribals, although it may have some use for the third category. Introduction of labour saving technology after suitable adaptation, may prove more appropriate and help to modernise their outlook and increase their income, provided it remains under their own control and is not used by outsiders to exploit them. Utilisation of community organizations, which are strong among tribals and banning of contractors should be a key element of this approach.

13.3.7 Illegal land alienation is a big problem in many tribal areas. The Acts in force to prevent such land alienation are poorly implemented. Owing to extreme poverty, low saving, and reliance on money-lenders for their cash needs, many tribals mortgage their land to non-tribals or even to some privileged tribals. This deprives the tribals of their only asset, namely land, which is their sole means of livelihood. Further, the non-tribal (or privileged tribal) landlords do not depend fully on agriculture and, therefore, they do not make investment for improving productivity. Such landlords, instead of developing land or employing improved technology and inputs, seek to increase their income by exploiting the tribal labourers working on the land.

13.3.8 In the absence of developed infrastructure like markets, communications, etc., most of the tribal farmers do not get fair price for their produce. On the other hand, being simple folk, they are always exploited at every stage—purchase of necessities, sale of their farm and forest produce, payment of wages, etc.

13.3.9 Most of the tribal farmers cultivate their land under input starved conditions, as they are poor and have little means available for production. Poverty of small and marginal tribal farmers limits not only their ability to make adequate investment but also makes them shy to approach financial institutions for credit. Consequently, tribals continue to depend on other sources of finance like Mahajans or local traders and big farmers who charge usurious rates of interest. Financial institutions need to modify their approach and procedures substantially and make them simpler to overcome this

special problem of tribals. If these institutions need some assistance for this purpose, that should be provided by Government. The fact that tribals are usually very honest and particular about debt repayment should be given special consideration. Those who pay interest regularly, should be given adequate extension of time for repayment of principal, when needed. Usual penalties for default may be relaxed in the case of tribals.

13.3.10 Improvement in productivity needs introduction of modern technology like use of improved seeds, fertilizers, implements, etc. However, due to poverty and illiteracy, the tribal farmers are not in a position to make use of improved technology. Attempts to impose such technology on them without proper care may prove even counter-productive. The technology to be introduced must take into account their skill endowments as well as resources. There is, therefore, need for special adaptive research stations in tribal areas which can adapt or develop suitable technology for use by the tribals.

13.3.11 Forests are a key factor for tribal society. It is estimated that tribal people dwelling in forest areas obtain about 10 to 50 per cent of their income from minor forest produce. However, indiscriminate deforestation in certain areas has deprived the tribal people of this source of income. Consequently, their dependence on agricultural sector has further increased.

13.3.12 Most of the tribals practise subsistence farming and harvest single crop. In many cases, the produce is not enough to meet their requirement for the whole year. In this situation, a large number of tribals migrate to other areas to avoid starvation. If some irrigation can be developed in these areas, in addition to helping to protect *kharif* crops, it can also help raising a second crop which would provide the needed food and work to the tribal people.

13.4 *Strategy for Agricultural Development in Tribal Areas*

13.4.1 The agro-climatic conditions of tribal areas and socio-economic conditions of tribal communities vary from region to region. It is, therefore, necessary that local conditions should be given full consideration in formulating the strategy for agricultural development in tribal areas.

13.4.2 In this context, two important factors, viz., (i) low-grade economy with scanty savings and (ii) low skill, should be kept in view. As tribals are not able to take risks and are slow to assimilate new skills and attitudes within a short period, a step by step introduction of improved technology would show better results than massive introduction of modern technology. Use of non-monetary inputs in tribal areas should be encouraged.

13.4.3 For promotion of suitable technology in tribal areas, adaptive research stations set up in tribal areas should conduct regular field trials on various programmes such as 'Lab-to-Land' projects. The regional adaptive research stations should also act as a feedback channel from the field to the State level. Besides research, these stations can also undertake the function of field extension. In tribal areas, only the tested and tried programmes and practices should be introduced. Any failure can seriously impair the confidence of the tribal community in the change-agent.

13.4.4 It may not be possible to stop shifting cultivation altogether in the near future due to various reasons. However, some steps can be taken to protect the soil from erosion. Tribals should be persuaded to plant some fruit trees on the bunds and not to burn or cut them at the time of shifting. Since tribals usually hold fruit trees as sacred, this should not be difficult. It would help reduce soil erosion and improve water harvesting. This would also improve land fertility over a period.

13.4.5 The task of improvement of land under shifting or *jhum* cultivation can be entrusted with advantage to a separate Corporation. This will undertake cultivation of plantation and horticultural crops in such land and will engage the tribals on payment of wages for the work done. After the plants have matured, the land will go back to the tribals. However, the Corporation will continue to help the tribals in input supply, extension and marketing.

13.4.6 In tribal regions, the area under irrigation is negligible. Therefore, more emphasis should be put on dry farming practices. In the tribal regions of Orissa, Bihar and Purulia district of West Bengal, there are large areas under millets and oilseeds. However, due to outdated farm practices and lack of suitable seed varieties, the yield is very low. Improvement in dry farming practices in unirrigated areas as well as development of suitable varieties would help boost production and productivity.

13.4.7 Micro-watershed development would show good results in many tribal areas and should be given high priority.

13.4.8 Development of irrigation facilities in tribal areas would improve crop intensity. Therefore, high priority should be accorded to minor irrigation in any programme for tribal development, as recommended in Chapter 9.

13.4.9 The community organizations of the tribals should be adapted or a special co-operative society should be organised, comprising the beneficiaries of a micro-watershed development project or command area of an irrigation pipe outlet, to ensure optimum results.

13.4.10 While developing irrigation systems, different forms of irrigation should be given careful consideration in the light of local conditions. During our visit to Koraput district, we noticed that groups of tribal farmers were irrigating their land under common lift irrigation schemes. In the same district, we also came across a relatively better off tribal farmer who had installed a river lift on his own. After meeting his own requirements, he was selling water to other tribal farmers. In Mirzapur district of East U.P., we came across a case where, by regulating a nullah and constructing a small reservoir, a piece of barren land was converted into fertile land, as a part of micro-watershed development project. Here, tribal farmers were growing high value crops like vegetables. Such projects should be considered suitable for financing by banks.

13.4.11 In command areas of surface irrigation projects, many tribals are not able to avail of benefit from the projects because their lands are not developed or they are not in a position to invest on construction of field channels, etc. They are also not fully aware of the appropriate agricultural technology. It is, therefore, necessary that land shaping and development should form an integral part of irrigation projects in tribal areas and should be taken up by Government.

13.4.12 For making full use of irrigation facilities in tribal areas, much more intensive extension support is necessary than in other areas.

13.4.13 In marginal and sub-marginal lands and areas affected by acute soil erosion, soil fertility is very low. In these areas, fruit, fodder, fuel and medicinal plants should be grown to provide better avenues of income to the tribals. Some of the poorer areas now put under very low yielding millets and rice could be also usefully transferred to such crops/plants. Tribals are not merely fruit collectors, but are also good at taking care of trees. Therefore, horticulture development programmes with adequate extension and marketing support can be very successful in tribal areas. During our visit to the Koraput district of Orissa, we saw that pineapple plantations were successfully developed on hilly slopes and each tribal was earning Rs. 2000 to Rs. 3000 per annum by selling pineapples. Similarly, orange and cashew plantations can be successfully developed in different areas. This would also help to reduce the problem of shifting cultivation.

13.4.14 While developing fruit and vegetable cultivation in tribal areas, a standard commercial variety should be encouraged in each compact area. This would facilitate marketing. If different farmers grow different varieties of fruits or vegetables and each produces only one head load, they may not be able to get the best price for their produce. The aim should be to produce at least one lorry load on each market day from one compact area, so that not only transport cost is reduced but also the produce can be taken to an alternative market if the traders in the nearest market try to depress the prices. LAMPS can also provide some alternative to traders.

13.5 *Allied Activities*

13.5.1 In some tribal areas, there is good scope for poultry, pig-gery, rearing rabbits, goatery, cattle and sheep rearing, pisciculture, sericulture and apiculture. Tribals seem to prefer meat animals to milk animals which needs to be kept in view. Development of these and allied activities would help to improve the socio-economic conditions of tribals. These activities would be quite successful in the hinterland of industrial and mining complexes and in areas with good road connections to urban centres. The tribal should be offered a 'package deal', i.e., supply of basic inputs, transport, storage and marketing facilities. Artificial insemination of local breeds with a view to suitable upgrading of the cattle needs to be given much higher priority than at present.

13.6 *Role of Women*

13.6.1 Women play an important role in tribal areas. But the usual training programmes are addressed to men who may not be taking some of the crucial decisions. Women need to be drawn in a significant way in the training programmes for tribal areas. From this stand-point, the programme adopted in Madhya Pradesh for training young tribal couples seems to be quite effective and useful and may be introduced in Eastern India.

13.7 *Credit*

13.7.1 Increased flow of institutional credit is one of the most important inputs required for improving agricultural productivity. Tribals should be persuaded to take advantage of credit.

13.7.2 There should be special provision for credit for production and non-production (consumption) purposes through LAMPS/PACS, suitably oriented for the purpose. Procedures for credit disbursement should be simple. The use of credit vouchers should be resorted to. Each tribal borrower should be given a loan pass book (Vikas Patrika) which would have all entries of loan disbursements and repayments. This would reduce the possibility of exploitation of tribals by officials or middlemen.

13.7.3 Institutional credit should be provided mainly for viable projects. For small and marginal tribal farmers, schemes which generate additional income within a short period should be given priority. This would not unduly increase the repayment burden on tribals.

13.7.4 Availability of institutional finance assures credit at a reasonable rate of interest and also provides an opportunity to tribals to dispose of their crop at market prices. During our visit to the Koraput district of Orissa, we met some tribals who grew tobacco. According to them, prior to availability of bank finance, local traders used to provide advance against pledge of crop. As a result of this, the cultivators had to sell their crop of the value of Rs. 2,500 for a paltry sum of Rs. 500-600. Now with the availability of bank finance, the cultivators are no longer under the clutches of money lenders and they could get better prices for their produce.

13.7.5 For tribal areas, a special institution, i.e. Large-sized Adivasi Multi-Purpose Society (LAMPS) has been set up to (a) purchase from the tribals their surplus farm and forest produce, (b) sell to them their consumer necessities, farm inputs, etc., and (c) provide consumption and production credit. This institution is expected to provide all services under one roof, but in practice, it is not doing so. Further the efficiency and effectiveness of each LAMPS depends on its accessibility to all the tribals in its jurisdiction and this largely depends on the areas allotted to it. Usually, tribal areas are hilly and sparsely populated, but each LAMPS has a large area of operation. Unless there are sufficient number of LAMPS, they would not be able to serve efficiently all the tribals concerned. Where the number of LAMPS cannot be suitably increased, the existing LAMPS should be provided with banking-cum-input supply motor vans (with four wheel drive where necessary) so that tribals attending weekly *haats* can be reached and serviced at least during the *haat* days. Alternatively, branches may be set up in outlying areas. Some of the programmes and procedures of Grameen Banks of Bangladesh may be usefully adopted in tribal areas. LAMPS are expected to serve different groups of tribals. But most of the benefits from LAMPS tend to get confined to comparatively better off groups and do not percolate to the poor and weaker sections of the tribals. In order to make LAMPS more effective, either different LAMPS or wings of LAMPS should be organised to serve different groups of tribals or these should be enjoined to pay special attention to the weaker sections. In many areas, LAMPS are also dominated by non-tribals and consequently, tribals do not get benefits from them. It is, therefore, suggested that the membership of local non-tribals in LAMPS should be banned.

13.7.6 For meeting the increasing demand of tribal areas, LAMPS should have enough resources. For this, LAMPS should have a line of credit with the District Central Banks supplemented by line of credit with other financial institutions for purchase and sale of minor forest produce. The commercial banks can involve themselves in tribal development by providing finance for irrigation, animal husbandry, horticulture, processing and marketing activities. Different banks can adopt different areas for these purposes.

13.7.7 The success of LAMPS also depends upon their viability. In the distribution of agricultural inputs and essential commodities, they get a very small margin. Sometimes they incur losses, because

of high transportation charges in tribal areas. As a result, they do not have any special incentive for increasing the turnover of inputs like fertilizers and popularising their use. Therefore, the LAMPS should be given a special subsidy for transportation of inputs and outputs initially. As the volume of business increases, this subsidy can be reduced. In the case of fertilizers, certain villages in each tribal block may be declared by the Ministry of Agriculture as "Block headquarters" for the purpose of issue of the pool price.

13.7.8 LAMPS have to deal with two organisations — CCBs for credit and Tribal Development Corporations for marketing. Because of this dual control, supervision is not effective. There is need to take steps to ensure proper supervision over the working of LAMPS.

13.7.9 LAMPS are at present dominated by Government officials. This system should change over a period of the next 5 years in favour of tribals.

13.7.10 There is a need for a plan to develop all *haat* locations as rural industry centres within the next 5 to 10 years.

13.8 *Marketing*

13.8.1 For facilitating the marketing of farm and/or forest produce, the development of infrastructure like roads and transportation system is essential. Most of the tribals still carry the produce on head loads. Institutional credit for purchase of a bullock cart or cycle rickshaw can reduce this drudgery. Government should give adequate subsidy for this purpose in tribal areas. Banks should also provide credit for vehicles to LAMPS or co-operative societies for transport of farm/forest produce to the different markets.

13.8.2 Procurement of minor forest produce from tribals is a major function of LAMPS. For this, they should have linkage with regional, State or National apex organizations. In the absence of such linkages, LAMPS may not show interest in this activity and consequently, tribals would again depend on traders for selling minor forest produce.

13.8.3 So far most of the tribals have been involved only in the collection of minor forest produce. Any value addition to forest produce can increase the income of tribal people considerably.

Tribals can take up the extraction of oil from *sal*, *kusum*, *karanj*, *neem* and various other seeds. Similarly, instead of selling of *bidi* leaves (*Kendu or Tendu or Timru*), tribals should be engaged in rolling them. Similarly, tribals can be trained in processing some other produce like lac, gum, etc. The processing of forest produce would not only provide employment to tribals, but it would also utilise the services of women and children in their traditional habitat. Similarly, small industries based on raw materials available in the forest and tribal areas should be developed nearer to these areas which can provide employment to tribals, particularly during the lean season. The Committee on Forestry Programmes for Alleviation of Poverty appointed by the Ministry of Agriculture, Government of India in March 1982 has recommended a number of projects in forest areas (Appendix 12). These projects may be taken up in suitable areas in Eastern India.

13.9 Social and Farm Forestry

13.9.1 Forests are an important part of tribal life. Most of the tribals, particularly primitive and backward groups, are largely dependent on forests for their various requirements. They get food, fodder, fuel, manure, timber and oils from forests. Besides these, forests are an important source of pulp. The country is experiencing a shortage of pulp and the paper industry is hardly able to utilise two-thirds of its capacity. Therefore, forest development is very important from tribal as well as national point of view. Tribals can play an important role in forest development. Large areas in Chhotanagpur Plateau as well as Orissa have been lying barren which can be allotted to tribals for the development of social forestry as in Gujarat or 'farm' or "agro-forestry" as in Rajasthan. In Rajasthan, tribals are involved in planting trees on their lands and are expected to ensure the survival of the trees. For this, they are paid remuneration at the rate of Rs. 10 per plant in instalments. This scheme has proved a success. In some cases, this may mean dereservation of barren forest lands. This should be allowed. Similarly, where marginal and sub-marginal lands are not suitable for agriculture remunerative returns can be utilised for tree plantation by the tribals.

13.9.2 The implementation of various developmental programmes in tribal areas would depend on a dedicated and efficient cadre of Government servants. Liberal allowances and promotional oppor-

tunities, if necessary, have to be provided to attract and retain really good people in these difficult areas. In the absence of this, officials who are ready to exploit the tribals for improving their own income remain in these areas. Care should be taken not to post in tribal areas, officials belonging to a caste or community generally considered as exploiters by the local tribals.

13.9.3 For supplementing the regular Government staff, services of some experienced retired technical officers, especially in horticulture and animal husbandry, could be also usefully utilised as advisers. To avoid bureaucratic control, they may be attached to a local voluntary organization, with assured co-operation from the block authorities. They should be paid, in addition to their pension, an attractive honorarium by Government, through the voluntary organization.

13.10 *Role of Voluntary Organizations*

13.10.1 The task of tribal development is gigantic and only the Government can provide the needed manpower and resources. However, in certain areas, some voluntary organizations are playing a useful role in tribal development. Dedicated members of voluntary organizations have been able to identify themselves with the tribals and interpret their needs and aspirations to the development administration. The voluntary organizations can play more effective role than Government agencies as they are not subject to rigidities of rules and regulations and are more flexible for meeting local requirements. The State Governments should, therefore, encourage and also provide necessary help to genuine and dedicated voluntary organizations.

13.10.2 As has been mentioned in Chapter 7, at present many of the voluntary organizations are unduly dependent on financial support from various foreign agencies as local voluntary donations are inadequate. It is necessary that adequate financial support should come to voluntary organizations from the Government and the banks. At the same time, it is important that political and bureaucratic control is kept to the minimum. Assistance from Government to voluntary organizations should be channelled through some non-political commission or agency. Direct intervention by Government should be eschewed. Finance should be provided for specific programmes or projects, subject to periodical independent evaluation.

Adequate margin for overheads should be provided to meet legitimate management and infrastructure expenses of voluntary organizations. NABARD and the banks should provide some grant assistance to voluntary organizations in tribal areas from their R & D funds.

13.10.3 Involvement of tribals at grass roots level in the formulation and implementation of various developmental programmes would also accelerate the pace of development. Representative tribal organizations at village level can serve as useful intermediaries which can identify the genuine needs and difficulties of tribals, provide help in the formulation of suitable thrust for development and build up pressure against exploitation. Such organizations may be of the traditional variety like Manjhiship and Parganaiti of the Santhals, village councils of Saora, traditional Panchayats, Gram Sabhas, etc. These agencies can have their own extension workers and help in implementation of small projects like dugwells, popularisation of new crops and varieties, use of inputs, etc. In the Keonjhar district of Orissa, a scheme of Village Volunteer Force in tribal villages has been formulated for the development of tribal villages. Such organizations should be encouraged and given necessary guidance and help.

13.10.4 For various reasons, the problem of motivation of tribals is quite different from that of non-tribals. This needs to be kept in view and specially studied by all voluntary organizations and officials working for tribals. Simplistic generalisations may be counter-productive. Sympathetic study of the special problems of the tribals and readiness to adjust various programmes to the prevailing capacity of the different groups of tribals are the two key elements in any effort for agricultural development in tribal areas.

13.10.5 There is need for special radio, television and video cassette programmes dealing with the problems faced by the tribals in agriculture and related subjects. These may be designed by units specially set up for the purpose and disseminated through community sets.

13.10.6 It will be useful if at least once every year officers of agriculture, horticulture, animal husbandry, irrigation and drainage, transport and co-operative departments meet the knowledgeable representatives of the tribals and voluntary organizations in each

tribal district in a seminar to discuss freely and frankly the problems faced, solutions tried and results obtained. Proceedings of such seminars should be given careful consideration by all the concerned authorities at State and Central Government levels.

13.11 *Flexibility in Planning and Implementation*

13.11.1 Flexibility in planning and implementation, which may require a modification of a programme introduced on the basis of experience, is essential. In view of the fact that the community wields considerable influence in tribal areas, it should be motivated to take up development, with Government support, wherever necessary.

13.11.2 Finally, the degree of success in tribal development depends upon the extent to which the tribals are involved in the formulation and implementation of programmes.

13.11.3 Development of the right type of human relationship is the key to the development of the tribals. Mere technological and economic approaches would not be enough. These are necessary but must be supplemented by anthropological and socio-psychological approach. Government agencies, voluntary organizations and research institutes should collaborate closely towards this end.

CHAPTER 14

ANIMAL HUSBANDRY AND FISHERY DEVELOPMENT

14.1 *Introduction*

14.1.1 In the context of the small farmer dominated economy of Eastern India and given its rich potential, development of animal husbandry and fisheries can play a vital role in raising productivity per capita and improving the socio-economic conditions of the rural poor. This will improve the resource base of these farmers. It will also help to provide subsidiary foods such as milk, meat, eggs and fish to improve the nutritional standards of the people.

14.2 *Animal Husbandry*

14.2.1 According to the Census of Livestock and Farm Equipment, 1977, West Bengal, Orissa, Bihar and U.P. account for about 35 per cent of the country's livestock population (Annexure 14.1).

14.2.2 Besides providing energy and nutrients for agricultural production and protein food for human consumption, animal husbandry is an important avenue of employment and a source of income for the rural population, particularly weaker sections.

14.2.3 With increasing urbanisation and rising income levels, the demand for livestock products like milk, meat and eggs is increasing. This has to be met by development of animal husbandry activities.

14.2.4 With the adoption of improved methods of breeding and feeding, health care of animals and proper management, increase in productivity as well as the socio-economic betterment of weaker sections can be brought about. The small and marginal farmers should, therefore, be given facilities to take up mixed farming.

14.2.5 The present development strategy emphasizes breeding and disease control, but fodder production is neglected. The Animal Husbandry Department, being 'veterinary' oriented, has problems in providing the needed extension and input support for fodder production.

14.2.6 In our view, the Agricultural Department should be made responsible for extension and input support for fodder production, as recommended by NCA. Only then will fodder get its due importance in the cropping pattern. Compact areas for special programmes for fodder production should also be identified. Animal Husbandry Department of the agricultural universities will, however, continue to carry out, on a collaborative basis, studies on the research aspects of fodder development. Earlier efforts to upgrade local breeds and introduce improved breeds have failed largely because of lack of quality fodder at reasonable prices. This lacuna needs to be corrected.

14.2.7 Development programmes in the animal husbandry sector should be organised as far as possible in the framework of producer-oriented co-operative marketing system.

14.2.8 Animal husbandry programmes should be an integral part of the development projects intended for hilly and tribal areas and, wherever appropriate, of the dry land projects in other areas.

14.2.9 Special livestock production projects were formulated under a Centrally Sponsored Programme, based on the recommendations of NCA. They had a focus on small and marginal farmers and included projects for subsidised rearing of cross-bred cows, poultry, sheep and pigs and disease control. Minikit programmes for distribution of fodder seeds to farmers have also been initiated. Since this programme is particularly important for small farmer dominated economy of the region, it needs to be developed and expanded substantially.

14.2.10 The artificial insemination programme, which is likely to be of substantial benefit to a very large number of marginal farmers and landless labourers, at a relatively small cost should be given much greater attention and resources than is being done today. The present tendency of some veterinary officers to give higher priority to distribution of animals needs to be controlled, so that the artificial insemination programme does not suffer. Upgrading of local breeds will be a more economical and quicker way of helping a large number of people than distribution of animals.

14.2.11 *Research Findings and Future Possibilities for Development:* Currently research efforts are directed to produce cross-bred

animals having high productivity, supported by feed and fodder resources, including, for example, some agro-based industrial by-products and other non-conventional feed and suitable health measures. Animal husbandry research will get a further fillip with the establishment of several national centres and institutes in the near future. Among these, the Bureau of Animal Genetic Resources, National Institute of Animal Genetics and Central Institute for Research on Buffaloes will be of particular importance to Eastern India.

14.2.12 An illustrative list of some recent research work/findings is given in Annexure 14.2.

14.3 Dairy Development

14.3.1 *Breeding*: The region has mainly non-descript indigenous breeds of cattle and buffaloes with poor conception, growth rate and milk production. The number of animals in the area, however, is very large as compared to total milk production. The region accounts for about 35 per cent of the country's cattle and buffalo population, and produces less than 30 per cent of the country's milk production (Table 14.1).

Table 14.1. Milk Production

(Lakh tonnes)

State	1971-72	1980-81	1981-82	1982-83	Per capita milk pro- duction (Kg.) (1982-83)
West Bengal	4.9 (2.3)	12.8 (4.1)	13.3 (4.0)	13.7 (4.0)	25
Orissa	3.4 (1.6)	2.5 (0.8)	2.6 (0.8)	2.7 (0.8)	10
Bihar	17.5 (8.3)	19.4 (6.1)	20.4 (6.2)	21.3 (6.2)	31
U.P.	43.0 (20.3)	57.2 (18.1)	59.5 (18.1)	62.0 (18.0)	56
Total	68.8 (32.5)	91.9 (29.1)	95.8 (29.1)	99.7 (29.0)	38
All-India	211.7	315.6	329.1	344.3	50

Note: Figures in brackets represent percentage of all-India total.

14.3.2 Considerable efforts are needed to improve the milk production capacity of cattle by undertaking cross-breeding programmes. There are 16 Intensive Cattle Development Projects (ICDP) in Eastern India. The number of districts covered by Operation Flood is 34. The efforts made by the breeding centres under these programmes are not satisfactory. These centres need strengthening. The budget provisions for these purposes need to be augmented.

14.3.3 The availability of good quality breeding buffalo bulls in the region is inadequate. Steps may be taken to increase their number.

14.3.4 *Feeding:* Most of the area has poor quality fodder, such as paddy straw or wheat straw, which have very low protein content. Hence there is poor growth, poor fertility and low milk production. Special efforts are needed to use modern technology for improving the nutritive value of such straws.

14.3.5 Availability of concentrate feed in the region is also limited. Many farmers are poor and do not know the importance of concentrate feed, especially for rearing cross-bred female calves. This results in poor growth, late sexual maturity and low milk production of cross-bred cows. Efforts are needed for increasing the availability of these inputs as well as provision of extension education to farmers. NABARD's scheme for rearing of cross-bred heifers and financing cattle breeders to increase the number of good quality animals needs to be taken up on a large scale in the region.

14.3.6 Although some agricultural universities have demonstrated the methods of cultivating suitable fodders for livestock in the region and of growing these crops in between two cereal crops, the technology has not percolated to the farmers. There is also a need to conserve the surplus green fodder which is available in the monsoon season, in the form of dried hay or as silage which could be used during the scarcity period, like the summer months. Chaffing of fodders to reduce wastage is also necessary.

14.3.7 *Veterinary Aid:* The diagnostic service centres in the region are not satisfactory. These will have to be strengthened. There is also a lack of awareness among farmers about the need for regularly vaccinating animals. Calf mortality is very high. Proper methods of sanitation and management, clean housing conditions for calves and regular deworming of calves need to be promoted.

14.3.8 Milk Production and Marketing: The per capita availability of milk in the region is low. The existing milk marketing arrangements are inadequate and unorganised. The present milk handling capacities are low. The dairy co-operatives are either inefficient or mostly defunct. Steps need to be taken to overcome these shortcomings.

14.3.9 West Bengal, Orissa, Bihar and East U.P. participate in Operation Flood II Project. Each State has Plan schemes relating to milk supply, dairy plants, loans and grants to milk unions, etc. A considerable step-up in State Plan outlays is called for.

14.4 Poultry Development

14.4.1 Demand for eggs in the region is high, but production is low. At present, the annual production of eggs in the four Eastern States is about 20 per cent of the country's total production.

Table 14.2. Production of Eggs, 1977

	(In millions)
West Bengal	878
Orissa	370
Bihar	880
U.P.	328
Total	2456
All-India	<u>13,495</u>

14.4.2 The low level of egg production in the region is mainly because farmers are not conversant with the modern scientific management practices. The modern poultry production techniques of using hybrid birds is mostly concentrated in a few pockets (particularly in West Bengal). The availability of feed and health care is not adequate. Marketing has not been well organized.

14.4.3 State Governments need to take steps to strengthen the infrastructure for poultry development and supply of inputs by organising primary producers' co-operative societies/units and Poultry Development Corporations at the State level.

14.4.4 Development of improved meat strains of poultry should receive greater attention. Adequate supply of parent stocks needs to be ensured. Infrastructural facilities at the Central Poultry Breeding Farm at Bhubaneswar should be adequately strengthened for scientific experiments in meat strains.

14.4.5 Efforts may be made to increase concentrate feed capacities.

14.4.6 There is also a need for more extension work to educate the farmers on the importance of vaccinating the birds to prevent diseases and improve general management practices.

14.4.7 As farmers do not have adequate experience, there is a need to undertake supply of grown-up pullets so that risks during the growing period could be reduced. For this purpose, NABARD has a scheme to finance Central Grower Units by co-operatives/corporations/hatcheries. The scheme provides for using Grower Units as mother units to supply grown-up pullets, concentrate feed and veterinary aid to groups of farmers in the adjoining areas and marketing of eggs and birds. States in the eastern region should take advantage of this scheme.

14.4.8 Egg marketing by small entrepreneurs can also be taken up on a wider scale. In this connection, the NABARD scheme for financing of egg carts may be popularized.

14.4.9 Duck production is high in West Bengal. NABARD scheme for duck rearing could be taken advantage of by all the States in the region.

14.5 *Sheep and Goat Development*

14.5.1 The region has a large sheep and goat population.

14.5.2 In regard to sheep, mostly Shahbadi and Chhotanagpur breeds which have coarse wool suitable for carpet making are reared. Steps should be taken to introduce cross-bred varieties to upgrade the quality of sheep.

14.5.3 Efforts to provide inputs and services to shepherds through intensive sheep development blocks of the State Governments, have to be intensified.

14.5.4 In regard to goat development, there is need to introduce improved stall-fed breeds, which will help improve milk and meat production. The existing efforts in this direction need to be intensified, so that progressively traditional breeds could be replaced by improved stall-fed breeds.

14.6 Piggery Development

14.6.1 There is good scope for piggery development in the region, particularly in tribal areas. Steps should be taken to introduce exotic or cross-bred varieties. Intensive breeding-cum-marketing schemes should be taken up.

14.7 Fisheries

14.7.1 The eastern region accounts for about 45 per cent of the country's inland fish production (*vide* Table 14.3). The coastal States of West Bengal and Orissa have also good potential for marine fish production.

Table 14.3. Production of Fish during 1982

	('000 tonnes)	
	Inland Fish	Marine Fish
West Bengal	222	28
Orissa	37	33
Bihar	108	—
Uttar Pradesh	39	—
Total	406	61
	(45.1)	(4.4)
All India	901	1421

Note : Figures in brackets represent percentage of total.

14.7.2 Development efforts are necessary to augment both inland and marine fishery on scientific lines. It is important to promote relevant technologies of production, processing and marketing in both these sectors to ensure availability of fish for local consump-

tion as well as to enable realisation of remunerative prices by fishermen. Export of prawns and other high-priced marine products should be a major consideration in our strategy. These efforts will help to improve the socio-economic well-being of fishermen.

14.7.3 Marine Fisheries Development: One of the constraints faced in the development of marine fisheries is the rising operational costs faced by the owners of small and medium-sized mechanized fishing boats. It will help the fishermen if such boats are given exemption of central excise duty on the diesel oil consumed by them, as in the case of deep sea fishing vessels. Improvements in refrigeration, landing and marketing facilities are also called for.

14.7.4 Inland Fisheries Development: In view of the large potential for development of inland fisheries, a Multi-State Fisheries Project, with World Bank assistance, is being implemented since 1980 in West Bengal, Orissa, Bihar and U.P., besides Madhya Pradesh. The main objectives of this project are : (i) establishment of fish seed hatcheries (for production of quality fish) which are in short supply and (ii) development of 1.17 lakh ha. of fisheries area. The major problems faced in the development of fish ponds in the region are : (i) multiple ownership of water rights in West Bengal and (ii) difficulties faced by banks in financing individual fish farmers due to the leasing policies pursued by State Governments and security norms.

14.7.5 Many waterlogged areas, tanks, lakes, *jheels*, etc., are inadequately utilised or are unutilised because the owners do not cooperate and undertake fisheries operations. Development of fisheries in these areas could increase the income of the farmers and reduce health hazards caused by mosquitoes, etc. Ownership disputes often result in inefficient use of fisheries resources. The NCA had recommended enactment of Fisheries Acts to regulate fisheries and related activities. The recent West Bengal Inland Fisheries Act, 1984 makes important provisions for proper utilisation of inland water areas for pisciculture and can usefully be studied for replication by the other States in the region, wherever necessary (Appendix 6).

14.7.6 The Act provides that if a multi-ownership tank is not utilised in accordance with the prevailing norms of pisciculture, its management and control can be taken over by the State Government or transferred to any other person for its proper utilisation.

14.7.7 The Act further provides that a cluster of fishermen or other persons or both may form and register a fish production group for the purpose of efficient production and sale of fish in a collective way. This is intended to be a somewhat simpler process than the formation of a co-operative and is likely to be more advantageous than setting up a formal 'functional' co-operative.

14.7.8 Further, the State Government can declare any area as a fish market within which purchase and sale of fish can be regulated according to the rules that may be prescribed.

14.7.9 *Leasing Policy:* In the eastern region, except in West Bengal, the leasing rights are owned by the Government/Gram Panchayats. The fishing rights of such water areas are generally auctioned on a yearly basis. This poses a problem for bank financing. Since loans for undertaking fish culture are given on long-term basis, the lease should be granted on a long-term basis and not on an annual basis to facilitate bank lending.

14.7.10 In Bihar, the Government policy was to allot the areas exclusively to fishermen's co-operative societies and not to individuals. Banks were reluctant to provide finance to such societies because of their weak financial position. Only recently the State Government has allowed leasing of water rights to individuals.

14.7.11 Another constraint faced in the development of fish ponds is the security norms. Since the cost of investment per pond development exceeds Rs. 10,000 per ha and as most of the beneficiaries in the region are small farmers without much collateral security to offer, RBI/NABARD may review their present security norms. It will be helpful if a provision is made for unsecured loans say upto Rs. 10,000 for fish pond development.

14.7.12 The eastern region has large water resources in ponds and lakes which can be profitably used for pisciculture. But, at present, only a part of it is culturable, due to poor maintenance over years. Hence, urgent attention needs to be given to renovation of such derelict and semi-derelict water areas which can be profitably used for pisciculture. Since the cost of improvement is high and cannot be left to private initiative, more Plan resources will have to be set apart for this purpose. NREP and RLEGP can be used for this purpose.

14.7.13 Another important aspect which needs attention is the development of infrastructure facilities for marketing, either in the Government or co-operative sectors, so that small fishermen are assured of remunerative prices for fish catches.

14.7.14 In West Bengal, promotion of pisciculture by ensuring peoples' participation and involvement of financing institutions on a larger scale have yielded encouraging results, particularly in brackish-water fisheries. Fishery development schemes have been quite useful in generating self-employment and income among the rural population of the State. Other States in the region might study the West Bengal programmes for fish development for replication of some of their useful features.

14.7.15 *Research Findings and Future Possibilities for Development:* Fish production in inland waters can be raised considerably with the help of high yielding fish technology based on fast growing fish species, especially carps of Indian and exotic origin. The Central Inland Fisheries Research Institute has achieved a breakthrough in artificial breeding to make fish seed available throughout the year. New methods have also been evolved to integrate aquaculture with agriculture and animal husbandry to boost fishermen's income. The setting up of the proposed Bureau of Fish Genetic Resources will give a further fillip to the fisheries' research effort.

14.7.16 The research findings and ongoing research programmes in the areas of animal husbandry and fisheries (Annexures 14.2 and 14.3) relevant for the region may be carefully studied for any further adaptive research which may be necessary before these could be transferred to the field. There is a need for strengthening the adaptive research capacity in the States.

Annexure 14.1**Livestock Population**

(As per 1977 census)

(In lakhs)

Category	West Bengal	Orissa	Bihar	U.P.	Total (2 to 5)	All India
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Cattle	118.8	121.2	151.6	257.7	649.3 (36.0)	1801.4
Buffaloes	8.2	13.6	44.6	139.7	206.1 (33.2)	620.3
Sheep	7.9	14.3	11.5	20.6	54.3 (13.3)	409.1
Goats	52.1	34.2	99.3	84.6	270.2 (35.7)	756.2
Pigs	3.6	3.0	9.2	16.1	31.9 (41.7)	76.5
Others	0.2	—	1.4	4.7	6.3 (19.7)	31.9
Total	190.8	186.3	317.6	523.4	1218.1 (33.0)	3695.4
Poultry	154.9	94.9	140.8	55.0	445.6 (27.7)	1608.7

Note : Figures in brackets represent percentages of all-India total.

An Illustrative List of Recent Research Work on Animal Husbandry

1. Improved cross-breds like Karan-Swiss, Karan Fries at NDRI, Karnal, Sahiwal herds at Hissar and Ganjari and Murrah buffaloes at Ludhiana.
2. Improved strains of sheep for wool and mutton at Central Sheep and Wool Research Institute, Avikanagar, several synthetic strains by cross-breeding suffolk and Dorset, Merino and Rambouillet.
3. High-yielding strains of goats for milk, meat and fibre under the All-India Coordinated Research Project (AICRP) on goats at Karnal, Trichur and Ranchi.
4. Poultry technology for optimising the production efficiency of layers, broilers and quails at the Central Avian Research Institute, Izatnagar as also various centres of the All-India Coordinated Research Project (AICRP) on poultry breeding and commercial strains for production of white-shelled eggs.
5. *Work on animal nutrition*: Economic rations for livestock using non-conventional feeds and chemically treated conventional low-quality feeds under the AICRP.

An Illustrative List of Recent Research Work on Fisheries

1. Integration of fish culture with paddy, e.g., Ratna Jaladhi or Jaya with Catla, rohu, mrigal and common carp has given encouraging results in bilateral ponds beside the rice plot. Sewage effluents were used for the summer crop. To control excess algae, penaeus, javanicus fingerlings were introduced.
2. *Penaeus mondon* fingerlings in brackish-water, paddy-cum-fish culture programmes in high saline zones, also giant fresh water prawns (*Macrobrachium rosenbergii*) along with carps stocked during *kharif* in high saline areas along with paddy varieties like CSR-1, SR-26B.
3. Captive rearing of giant fresh water prawns (*Macrobrachium rosenbergii*) done at CIFRI Research Station in specially designed fish ponds.
4. Successful cage culture of 'catla' in tanks.
5. Preparation of sinking type dry pellet feeds with good water stability and acceptability for rohu fingerlings.
6. Use of turtle (*Kachuga tectum*) as potential bio-agent to control a variety of obnoxious weeds.
7. Improved indigenous fishing boats and gear for efficient and enhanced service developed at the Central Institute of Fisheries Technology.
8. A hatchery system for spawning and rearing of commercial varieties of prawn larvae evolved by the Central Institute for Fisheries Education (CIFE).
9. A cheap and efficient method developed at CIFE for the culture of organisms from slurry of organic waste for use as feed for carp spawn and evolved prawn larvae.
10. Technology for composite fish culture evolved for perennial ponds and tanks.

CHAPTER 15

CREDIT POLICY

15.1 *Introduction*

15.1.1 The programme for achieving higher productivity and output calls for a marked increase in the volume of both production and investment credit, with a large share going to the weaker sections and the backward areas. The bulk of the farmers in Eastern India are small and marginal farmers. Their resources are meagre. On their own they cannot afford to take up the needed on-farm investments and go in for yield-augmenting inputs, viz., HYV seeds and fertilizers. Their credit entitlement is limited. They are more liable to default in the event of a crop failure or price slump than others.

15.1.2 There is, therefore, a need for such credit policies and programmes as would enable the small and marginal farmers to make step by step progress towards scientific and intensive use of their limited land resources by a greater input of both labour and capital. Most of the constraints they face cannot be overcome unless their capital resources are augmented, step by step, on a case by case basis.

15.1.3 The co-operative credit structure, which is the main institutional source for provision of agricultural credit, is choked with heavy overdues in Eastern India. The major thrust of credit policy should be to provide adequate and timely credit to farmers, particularly in the small and marginal category and to sharecroppers. This would call for steps to (i) improve the overdues climate, (ii) rehabilitate and strengthen the co-operatives and (iii) supplement their efforts by commercial banks and RRBs.

15.1.4 Reorganisation of the rural credit structure and improvement in the overdues climate may require policy decisions at the all-India level by GOI, RBI and NABARD. These would include :

- (i) review of interest rate structure, with an in-built mechanism for rewarding prompt repayers and punishing wilful defaulters;

- (ii) provision of reasonable credit to borrowers with good repayment record and adequate repayment capacity for meeting unavoidable social obligations (within certain limits) so that they do not have to borrow from money lenders;
- (iii) inducements to save and relief to be provided by way of grace periods and postponement/rephasing of loan repayment in cases of genuine difficulty;
- (iv) measures to improve the financial and managerial capabilities of co-operatives;
- (v) introduction of an effective but simple supervised credit system;
- (vi) ensuring, *inter alia*, adequate working capital through short-term credit and determining the credit entitlement, both short and medium-term, for each borrower;
- (vii) a review of the policy in regard to subsidies; and
- (viii) linking of credit with insurance.

15.1.5 It has to be recognised that credit is only an input to provide the needed resources to farmers for financing their production and investment requirements in an improved technology package, the latter being necessary for moving from one production function to a superior one. Any credit policy, to be effective, has to take into account credit absorption capacity of the farmers of a region and make a step by step progress in disbursement of credit which can produce the greatest incremental impact on production levels.

15.1.6 Differences in levels of development as between regions and classes of farmers imply the need for different credit strategies between different regions and between relatively affluent and the weaker sections of the rural society. The policy of helping weaker sections initiated since late 1960s will have to continue. At the same time, there is a need for adopting credit strategies suitable for handicapped regions, such as Eastern India, with particular emphasis on supervision and follow-up of the various credit programmes.

15.1.7 Our basic approach to credit policy is to introduce gradually an economic and effective supervised credit system with its emphasis on serving the needs of weaker sections and handicapped areas, which is vitally needed in the eastern region. Our main recommendations in the sphere of credit policy¹ are given below.

15.2 *Short-term loans*

15.2.1 In addition to cost of inputs and labour, irrigation costs and service charges for hiring machinery and equipment from leasing agencies, etc., cultivators incur consumption expenditure between the sowing and harvesting season and have also to meet the cost of bullock maintenance. Adequate provision for such consumption expenditure of the family will have to be included in the short-term loan requirements of bulk of the farmers, who cultivate with their own labour

15.2.2 Short-term credit should be timely and adequate, so that a farmer will not have to go in for supplementary finance to a money lender.

15.2.3 Loans should be given as at present partly in kind or in vouchers for supplies and services and partly in cash. In some States, the cash component is large. The cash component should be confined to cost of labour put in by the farmer and some consumption expenditure in the growing season.

15.2.4 At present, the kind component is given by banks and co-operatives by way of cheques to a specified dealer. The borrowers sometimes are not happy about this arrangement, as dealers either do not supply the needed inputs in time or supply sub-standard material. There is, therefore, a case for introduction of a voucher system (e.g., Indonesia) so that borrowers can obtain the needed inputs against vouchers from a list of selected dealers, approved by the State Governments in consultation with the banks. This list should be reviewed from time to time.

15.2.5 The due date for repayment should be fixed, say, two months after the expected harvest or one month after the market-

¹ The policy measures recommended by us in this chapter would need to be implemented by RBI in the case of commercial banks and by NABARD in the case of co-operatives and RRBs.

ing of the crop. A notice should be served at harvest time or at least a fortnight before the due date. The due date should never be fixed at a time when the loanee is likely to have inadequate income, i.e., before the likely marketing month or long after marketing.

15.2.6 In case of default on due date, there is a provision for charging penal interest. Such penal interest rates now vary from 1 to 2 per cent above the regular rates or are not charged at all in some cases. Such small penalty does not produce the desired result. We, therefore, recommend that penal interest rates should be 2 per cent per annum above the regular rates for the first four months of default and raised sharply to 4 per cent per annum for small and marginal farmers and 5 per cent per annum for others if overdue for more than four months.

15.2.7 In the case of wilful default, additional penal measures should be imposed, including attachment of property (but not of production requisites). The recovery proceedings should be initiated at the time of the next harvest. Suitable adjustments should be made in the dates for penal action in the case of mixed farming, animal husbandry, etc. Before the signing of the loan documents, the details of penalties for default should be made clear to the loanee both orally and in writing.

15.2.8 In the case of genuine difficulty arising from unforeseen calamities such as crop failures, sickness or death in the family, sickness or death of bullocks, etc., a grace period for repayment should be granted or short-term loan converted into medium-term loan. In such cases, penal measures should not be imposed. RBI and NABARD should issue the necessary guidelines to banks and co-operatives in regard to the situations which can be considered as "genuine difficulty" and the extent of relief to be provided in each case. However, it will be necessary for the credit institutions to build up adequate field staff to assess genuine cases of hardship.

15.2.9 In cases of natural calamities, there is at present a provision for conversion of short-term loans into medium-term loans, provided the designated authorities in the States issue certificates to that effect. But the certificates are not issued promptly. This is because of the delay in the issue of *annawari* in areas affected by natural calamities. A Working Group appointed by the Govern-

ment of India has now made detailed recommendations regarding the procedure to be followed for declaration of *annawari* (*vide* Annexure 15.1). These recommendations may be implemented by the State Governments. NABARD may pursue with the State authorities that certificates are issued promptly after a careful assessment.

15.2.10 If a borrower is faced by natural calamities for the third year in succession, there is a provision for writing-off of the first conversion loan referred to in paragraph 15.2.9 above in the case of small and marginal farmers, subject to a ceiling of Rs. 300/-. Since a small or marginal farmer cannot meet the debt burden of crop failure for three years in succession, there is a need to write off the first conversion loan in full. To facilitate such write-offs by the co-operatives, Relief and Guarantee Funds should be set up by the State Governments with adequate help from the Centre. The share of Government of India and the State contribution for this Fund may be in the ratio of 3 : 1.

15.2.11 In genuine cases, where overdues are only a small fraction of the amounts due, and which may not be covered under conversion arrangements, the loanees may be given fresh loans on the understanding that the interest will be regularly paid in future and entire dues including the arrears would be cleared out of sale proceeds from the harvesting of the next major crop. NABARD has, in fact, suggested to the State Co-operative Departments that default of individual members of co-operative credit societies up to 10 per cent of their eligibility for short-term loans should be ignored and fresh finance made available on the understanding that they would clear both the dues out of sale proceeds of the next crop. This concession should be increased to 20 per cent during the first three years of the Seventh Plan to facilitate the special productivity programme for Eastern India. The State Co-operative Departments should take advantage of this concession and issue necessary instructions to PACS. Similar concessions should be extended by RBI and NABARD to commercial banks and RRBs.

15.2.12 Although there is a provision that a State Level Technical Committee should work out the scales of finance for different districts, in some States (e.g., Bihar) the scales of finance as indicated by the Registrar of Co-operative Societies are adopted, without due regard to local conditions. This has resulted in under-financing in some cases and overfinancing in some others, both of

which are undesirable. Scales of finance fixed should be realistic. The State Level Bankers' Consultative Committee should ensure that both commercial banks and co-operatives adopt scales of finance worked out by the Technical Committee and the District Level Consultative Committee should ensure that scales of finance appropriate to the district are adopted by the financing institutions.

15.2.13 At present, credit limits are sanctioned to borrowers in most cases on a crop season basis. The introduction of cash credit system with credit limits on yearly basis as in the case of industry and trade should be considered for agriculture also. This would help farmers to plan their production programmes for the entire year in advance and will promote multiple cropping.

15.2.14 There is a need for every farmer to know his credit entitlement. PACS may, therefore, prepare statements of credit entitlements (for both short-term and medium-term loans) in respect of each member of the society. This would enable him to know the extent to which he can avail of short-term and medium-term credit from the society.

15.2.15 In many cases, PACS do not prepare credit limit statements either properly or promptly or both. CCBs should help PACS in the preparation of credit limit statements in order to enable the latter to meet the credit requirements of their members adequately.

15.3 *Medium and long-term loans*

15.3.1 Medium and long-term loans are required by farmers for such purposes as construction of dugwells, tubewells and water conveyance system, for land levelling, raising plantation and horticulture crops, for pumpsets and farm machinery, repair of houses and meeting social obligations, etc. They may be made available to farmers individually or in groups after a careful assessment on the basis of appropriate norms and the general reputation of the beneficiaries as prudent and efficient farmers. RBI and NABARD may issue guidelines for loans for house repairs and social obligations, so as to prevent overborrowing for nonproductive purposes.

15.3.2 The investment cost should be properly assessed and adequate loans to cover the same should be provided. Both overfinanc-

ing and underfinancing are harmful. The former leads to misutilisation and the latter results in incomplete investment or drives the farmer to seek supplementary finance from money lenders.

15.3.3 While sanctioning term loans for tubewells, dugwells, pumpsets and other minor irrigation structures, there should be no stipulation on the minimum size of holding. The scope for sharing or selling water should be taken into account in working out the economics of the scheme. NABARD may issue suitable instructions in this regard to LDBs, commercial banks and RRBs.

15.3.4 Repayment should be fixed in suitable instalments with a reasonable grace period, according to norms prescribed by NABARD, region wise and crop wise. NABARD should periodically review the adequacy of these norms on the basis of monitoring and other field studies and make appropriate changes as and when found necessary.

15.3.5 A notice should be served a fortnight in advance of the due date of repayment/interest payment.

15.3.6 As in the case of short-term credit, a penalty should be imposed on defaults. The penalty should be 2 per cent per annum for the first default and 4 per cent for small and marginal farmers and 5 per cent for medium and large farmers for the second and subsequent defaults.

15.3.7 In the case of wilful default, as in the case of short-term loans, penal measures should be imposed including attachment of property, but not of production requisites. The State Governments should facilitate the recovery of such dues, by taking appropriate administrative measures.

15.3.8 In case of genuine hardship, the repayments due may be postponed or rescheduled and penal measures withdrawn.

15.3.9 Even in borderline cases where it is difficult to determine "genuine hardship", if loanes have been regular in payment of instalments for 3 years in succession and where total instalment payments made in the past exceed the total interest due upto the reference year, they may be given reasonable extension of time for repayment of principal and penalty measures waived. In such

cases suitable adjustments may be made in the "demand" of CCBs/ PLDBs to improve their loan eligibility.

15.4 *Credit Obligations*

15.4.1 **Loanees should be made fully aware of their obligations and due dates of repayment. Hence passbooks should be issued, wherein all assets and loan transactions of beneficiaries from credit institutions are to be entered. These may be issued by the Bank/ LDB Manager/PACS Secretary in consultation with the local revenue officer, where necessary. NABARD has been considering the introduction of this step. This system should be introduced with effect from July 1985.**

15.4.2 **All loanees may be issued "Loan Cards" for each loan. Due dates of repayment/interest should be entered in bold letters in local languages in distinguishing colours which will enable the loanee to know his loan obligations and due dates at a glance.**

15.4.3 **Reminders in writing and, if possible, in person, should be served to loanees at the harvest time. Failure to issue reminders should not, however, affect the legal obligations of loanees.**

15.4.4 **In the case of default, the Society Secretary/Bank Manager should advise the loanee either in person, or through Field Officer/ Supervisor or by letter, the additional amount that he will have to pay by way of penal interest on the next due date and other penalties that may be imposed, in case defaults persist.**

15.4.5 **Each PACS/Bank should prepare a list of all defaulters (other than first or exempted defaulters) once in every six months. Such a list should be displayed on the notice board of the society and the bank. The co-operation of panchayats may also be enlisted and the list of defaulters may be displayed on the notice board of panchayats also. The publication of lists of defaulters in society/ panchayat office will act as a deterrent to defaults.**

15.4.6 **It is necessary to ensure that loans are utilised for the purpose disbursed. The responsibility for supervision and follow-up of proper utilisation of loans should be placed on PACS Secretary/ Field Officers/Supervisors, who should report cases of misutilisation promptly to CCB. Bank Managers/Supervisors and PACS Se-**

cretaries/Field Officers who are negligent in their duties should be suitably penalised. Those doing good work should be suitably rewarded. The charge of Field Officers should be reviewed to make it manageable.

15.4.7 Besides, there is a strong case for improving bank-borrower relationship. The Society Secretary/Bank Manager should meet his clients at least once in a quarter. It will be helpful if each Society/Bank organizes a meeting of farmers once in six months or a year at panchayat level to facilitate the dissemination of information on the loaning facilities available to farmers and their repayment obligations.

15.4.8 In the case of loanees, with a record of no default for three consecutive years, two special concessions may be given : (a) income of their family members may be taken into account in fixing their loan entitlement and (b) special loans may be given for meeting unavoidable family obligations, e.g., wedding, medical and funeral expenses, subject to a prescribed proportion of their income or loan entitlement.

15.4.9 RBI and NABARD should consider amending their rules and statutes, where necessary, to enable them to implement the suggestions made above.

15.5. *Deposit Mobilisation*

15.5.1 Banking habit may be promoted among farmers by (a) providing that the minimum deposit during the post-harvest season for more than 2 months in their accounts with PACS or CCBs/Banks/RRBs would automatically entitle them for a cash credit/overdraft facility of an equivalent amount in the first year, 50 per cent more in the second year and 100 per cent more in the third year onwards, provided there is no default meanwhile,

(b) allowing PACS, CCBs and RRBs to give :

- (i) higher interest rate upto 2 per cent over the standard savings bank rate on the minimum balances kept in deposits in their accounts for a period of at least 3 months, and
- (ii) a higher interest rate upto 2 per cent on fixed deposits over and above those applicable in the case of bank deposits of comparable maturities.

15.5.2 Payment of higher interest rate on deposits by PACS, CCBs and RRBs is justified on the ground that it will help these institutions to attract deposits. Moreover, their deposits will be utilised for lending in rural areas, which is not always the case with commercial banks.

15.5.3 Steps should be taken to ensure that there is no net outflow of funds from rural areas through the banking system. In fact, it should be the other way about, considering the capital requirements of the vast number of resource-poor farmers. Large inflow of funds from outside to the rural areas of Punjab and Haryana has been a key factor in their agricultural development. On the other hand, absentee landlords and traders have taken funds out of rural areas in Eastern India in the past, adversely affecting agricultural productivity. Commercial banks should help reverse that process.

15.6 *Interest Rate Structure*

15.6.1 At present, the rate of interest on medium and long-term loans to small and marginal farmers is 10 per cent, while for crop loans upto Rs. 5,000, it is 11.5 per cent per annum. Since crop loans involve only short-term maturities, it is logical that interest rates on crop loans are on par with medium-term and long-term loans.

15.6.2 In this context, we would urge the adoption of a rational interest rate policy instead of making *ad hoc* adjustments. One possible method is to link the interest rates for agricultural purposes with the Bank rate at the lower end and at roughly 2 or 3 per cent lower than the market rate at the upper end. For example, the rate of interest to small and marginal farmers may be charged at Bank rate (at present 10 per cent) and for other farmers for investments of Rs. 10,000/- and Rs. 20,000/- at approximately 11/10 or 12/10 of the Bank rate and for investments above Rs. 20,000/- at 12/10 or 13/10 of the Bank rate. For other agriculture-related loans, the rate may vary roughly between 13/10 and 16/10 of the Bank rate. Such linkage with the Bank rate will ensure prompt adjustment with the changing credit situation.

15.6.3 For helping needy farmers, greater use should be made of concessions in grace and repayment periods than in interest rate. Unduly low interest rate tends to be counter-productive in several ways. It leads to uneconomic use of capital, encourages corrupt practices in lending agencies, adversely affects deposit mobilisation and discourages flow of capital from non-agricultural to agricultural sectors.

15.6.4 Under the present multi-agency approach, uniform interest rates are prescribed on loans by commercial banks and co-operatives. The co-operatives may be allowed to charge a somewhat higher rate of interest on loans advanced by them, if found necessary, in view of the higher interest that they will offer on deposits. Further, in view of the proximate location of PACS and PLDBs and payment of dividends to members by these institutions, such higher interest rates should be justified. However, the differences in the interest rates should not be too wide to wean away farmers from co-operatives to commercial banks.

15.6.5 With a view to encouraging group loans, it is necessary to provide adequate incentives. At present, such incentives are confined to provision of some concessions in making down payments for availing term loans. This is not adequate. For encouraging farmers to go in for group loans, an interest concession of say 1/10 of Bank rate over that normally admissible both for short-term credit and term loans (but not below Bank rate) and/or concession in grace and repayment periods may be given in addition.

15.6.6 The policy changes in the structure of interest rates on advances and deposits outlined above would need a review at all-India level by GOI, RBI and NABARD.

15.7 *Margin and Security Norms:* During field visits, we found that many of the norms laid down relating to margin (down payments) and security are not adhered to in actual practice. RBI and NABARD should ensure that PACS/PLDBs/branches of LDB, commercial banks and RRBs conform to these norms.

15.8 *Policy Measures to Reduce Overdues*

15.8.1 The growing delinquency in the repayment of loans has assumed serious proportion in recent years. The high level of

overdues has choked the credit pipeline particularly in the co-operative sector and restricted the capacity of the co-operative credit institutions for recycling funds. As a result, sustained flow of credit for agricultural development is affected. There is, therefore, an urgent need for reversing the trend in the build-up of overdues. Our recommendations in this regard are given below.

- (i) State Co-operative Departments should arrange to undertake a case by case study of all defaults and classify them into (a) wilful default and (b) non-wilful default.
- (ii) Wilful defaulters may be asked to repay their dues within a stipulated period and provided they pay 30 per cent of the principal or 70 per cent of the interest due by the next harvest time, they may be allowed more time for full payment of the dues as such part payments would be an indication of their earnestness to repay loans within the given time. If no repayments are made even partly within the stipulated time, stern coercive action including penal measures, if necessary, should be taken by CCBs/PLDBs in consultation with the Registrar of Co-operative Societies. Suitable number of recovery officers should be posted and given police help, if needed.
- (iii) In case of non-wilful default, as a one shot affair, overdues may be transferred to a 'Blocked Account' repayable in 5 to 7 annual instalments. The State Governments should give a guarantee that any shortfall in the collection of such instalments would be made good by it to the credit institutions. A matching grant for the purpose may be made available by the Government of India to the State Governments.
- (iv) The present overdues ceiling of CCBs in Eastern India should be enhanced from 60 to 70 per cent of demand for the first three years of the Seventh Plan to facilitate the special programme for stepping up agricultural productivity in this region. Alternatively, the overdues ceiling of CCBs may be calculated with reference to the overdues of wilful defaulters only. For this purpose, all loanees who have paid a certain fraction (say 50 per cent) of their total dues and such others which the

Bank Manager may consider as belonging to "genuine hardship" cases may be classified as non-wilful defaulters and all others as wilful defaulters. Such an approach is necessary to clear the deck for providing the needed credit in Eastern India.

- (v) Similar action will have to be taken in the case of PLDBs so that their overdues are reduced suitably. The provision of the State Government contribution to the share capital of the PLDBs to reduce notionally the level of overdues should be applied. The necessary contribution for this purpose should be met by the State Government from its own resources.
- (vi) The 'overdues' position of all CCBs/PLDBs should be re-calculated on the basis of this exercise so that the co-operative credit structure may start with a better base in the Seventh Plan.

15.8.2 Improving Overdue Climate: The steps proposed above will not have a lasting effect, unless concerted efforts are made to improve the overdues climate and effect recoveries. The following steps are, therefore, recommended.

- (i) The Chief Ministers may make periodically policy statements deprecating wilful default and declaring that no waiver of dues would be permitted and stringent penal measures would be firmly imposed on defaulters in future.
- (ii) The Chief Ministers and the leaders of political parties should exhort the people to help strengthen the credit system and oppose all interference in loan collections.
- (iii) Arrangements for supervision and follow-up of loans disbursed and repayments by field level workers should be improved. Adequate staff should be posted at PACS/CCBs for the purpose. Constant effort to persuade the loanees to pay their interest and loan instalments in time is a key element in the strategy for preventing situations of mounting overdues, as faced in recent years.

- (iv) During the recovery season, a special drive should be launched jointly by CCBs and PACS in the case of short-term loans and by PLDBs and LDB in the case of long-term loans, with full support from the Registrar of Co-operative Societies and the District Collector. In cases when the loan recovery season and loan sanctions coincide, due to preoccupation of the staff with recovery, the loan sanctions get affected. In such a situation necessary staff for sanction of loans should be made available by the concerned credit institutions so that the flow of credit for the ensuing season does not suffer.
- (v) In the special drive for collection of overdues, services of local voluntary organizations may be mobilized and they may be paid a commission for the amount of overdues they help to recover.

15.8.3 *Sub-committee on Overdues:* The Sub-committee of the District Consultative Committee should send every quarter a report on the progress made in recoveries and steps needed to improve them to the State Level Committee of Secretaries proposed by us, with a copy to RBI and NABARD regional offices, for necessary follow-up action.

15.8.4 The State Level Standing Committee of Secretaries should arrange a workshop of all the District Collectors once in every 6 months to review the progress made in recoveries. This report should then be considered by the Ministerial Committee.

15.8.5 *Linking of Recovery with Procurement:* Linking of credit recovery with processing units like sugar factories or cotton processing units has proved to be fairly successful. A similar arrangement with suitable checks can be provided between co-operatives and procurement agencies. However, there are different problems in this regard for different commodities and regions which need to be studied and overcome.

15.9 *Organizational Improvements*

15.9.1 *District Central Co-operative Banks:* CCBs should make available loans to PACS for meeting credit requirements of non-defaulting members. CCBs eligible for refinance from NABARD

may obtain the needed resources from NABARD and lend them to PACS. CCBs not eligible for refinance from NABARD may finance such non-defaulting members from out of their own resources or approach NABARD for special limits.

15.9.2 CCBs, jointly with Apex Bank, may ascertain the constraints inhibiting the growth of loan business of PACS and assist them in overcoming them. For this purpose, CCBs may take up a phased programme of reorganisation of such PACS. This programme should be completed by the end of the Seventh Plan.

15.9.3 Whenever PACS are financially and managerially weak (despite the rehabilitation programme outlined in this Chapter) CCBs may take up direct financing of farmers until such time the PACS became viable units. This will ensure that agricultural production does not suffer for want of credit.

15.9.4 A Cell should be set up in each CCB with technical officers in disciplines which are predominant in the respective districts. The banks may avail of the facility for financial assistance provided by NABARD out of its R & D Fund.

15.9.5 Each CCB should set up a Special Fund to assist weak PACS by earmarking a part of the profits or by a charge on the Profit & Loss Account of CCB.

15.9.6 For assisting PACS in the preparation of the credit limit statements and recovery of dues, Supervisors/Inspectors should be made available by CCBs during the relevant period. Such Supervisors/Inspectors may be rotated among PACS as may be found necessary.

15.9.7 PACS: Societies with consistently bad performance for the last three years or more and where more than 80 per cent of members are defaulters may be wound up. Non-defaulting members may be encouraged to approach nearby rural banks or form an altogether new society of non-defaulters. Penal action should be taken by State Governments against the wilful defaulters.

15.9.8 For improving deposit mobilisation, the following steps may be taken.

- (i) The State Governments should participate in the deposit mobilisation campaigns and provide suitable incentives to PACS for deposit mobilisation.
- (ii) PACS should provide various types of banking services, such as cheque and remittance facilities and loans against deposits.
- (iii) The Registrar of Co-operative Societies, in consultation with the Apex Bank, should formulate various types of deposit schemes and rates of interest to be given by PACS.

15.9.9 While advancing term loans, proper care should be taken to ensure that loanees get adequate working capital. Otherwise the investment will be infructuous and not provide the expected benefit.

15.9.10 *Single Window Approach*: The need for a single window approach to cater to all short and long-term credit requirements of the farmer is now well recognised. However, under the present arrangements, PACS cater to short-term credit and PLDBs provide long-term credit. Realising the usefulness of the "one window" approach for agricultural credit, NABARD has advised the State Governments to select at least 5 to 10 viable PACS on a pilot basis for providing both short and long-term credit. PLDBs have also been permitted to give short-term loans to such members who have obtained long-term loans. The State Co-operative Departments should identify selected PACS/PLDBs for the purpose and introduce the "one-window" experiment in substantially larger number of PACS and PLDBs as expeditiously as possible.

15.9.11 *LAMPS*: LAMPS which have been organized in tribal areas have not been effective enough due mainly to the large area of their operations. They should, therefore, be reorganized with a smaller area of operations, wherever necessary. Steps should be taken to improve their credit and non-credit business and make them viable within a definite time-span, say 5 years. Until such time, they should be given managerial subsidy.

15.9.12 LAMPS may be supplied with motor vans (with four wheel drive for use in difficult terrain, where necessary), for providing better credit facilities and for transportation of goods to remote *haats* or villages.

15.9.13 A half-yearly seminar may be conducted at the State level in collaboration with the representatives of LAMPS, TDCCs, voluntary organizations, State Departments of Tribal Development and Co-operation, etc., for the purpose of identifying problems faced by LAMPS and suggesting appropriate remedial measures.

15.9.14 A Special Cell may be set up in the office of Registrar of Co-operative Societies to monitor the working of LAMPS.

15.9.15 Reports of seminars and of monitoring by the Special Cell for LAMPS referred to above should be submitted to the State Level Committee of Secretaries referred to in Chapter 7 for necessary follow-up action.

15.9.16 NABARD may undertake a fresh review of the working of LAMPS with a view to providing guidelines for reorganizing them as smaller units and improving their managerial competence.

15.9.17 *Staff Development*: There is an urgent need for improving the quality of field supervision. In Bihar, CCB's supervisors are under the administrative control of the State Co-operative Department. In U.P., they are appointed by the Co-operative Union and are not subject to the control of banks. As a result, CCBs are not able to exercise control over their supervisory staff. There is a strong case for building up separate cadres of co-operative bank supervisors for CCBs and PLDBs. The Registrar of Co-operative Societies, in consultation with SCBs and LDBs, may take the necessary lead in this matter. Until this is done, for staff taken on deputation from State Co-operative Department/Co-operative Union, the administrative control should vest with the banks to which they are attached and they should be responsible for recording their confidential reports.

15.9.18 CCBs and PLDBs should have adequate trained staff for appraisal, sanction and disbursement of loans and their effective supervision. The Registrar of Co-operative Societies should undertake a review of the norms per supervisor and in that light review

the staff requirements. This review should be completed by June 1985. On the basis of this review, the staff development programme should be formulated. If the resource position of CCBs and PLDBs does not permit augmentation of staff, necessary subsidy should be given by the State Governments for an initial period of 5 years, subject to a mid-term review after 2 years. NABARD should pursue with the State Governments that such a review is undertaken promptly so that necessary staff may be posted to CCBs and PLDBs early.

15.9.19 *Other Suggestions:* As per the recommendations of the Bhave Study Group of NABARD, PACS and CCBs should be assisted to acquire adequate facilities, office and image of an efficient small bank. This is important as otherwise they would not be able to attract deposits or adequately service their clients.

15.9.20 At each PLDB, there should be at least one technical officer, well acquainted with agriculture. The financial assistance available from NABARD's R & D Fund could be utilized for the purpose.

15.9.21 *Political Pressure and Quality of Lending:* Under political or local pressure, instances of misutilisation of loans and other irregularities have been noticed. RBI earlier and now NABARD have been bringing to the notice of the Registrar of Co-operative Societies many irregularities in loaning by co-operatives (e.g., misutilisation of loans, lack of proper follow-up, gross abuse of powers and finances by the management of societies. PLDBs and CCBs) on the basis of Inspection Reports. The response to this is unsatisfactory and often no remedial follow-up action is taken by the banks. NABARD may ensure that banks conform to the discipline laid down by it. Such banks which do not conform to the discipline may be rendered ineligible for refinance from NABARD and subjected to other disciplinary action.

15.9.22 There should be a convention that no MP or MLA or Chairman or Secretary of a political party should accept the position of President of a PACS/PLDB. Further, no person should be allowed to hold the office of President for more than three terms either in the same society or any other co-operative credit/marketing society during his life time.

15.10 *Commercial Banks and Regional Rural Banks*

15.10.1 The branch network of commercial banks should be strengthened in rural areas, particularly in areas where CCBs and PLDBs are weak. The staff position of banks should be augmented, where necessary. The Chairmen of commercial banks should undertake a review of manpower requirements of branches. This review should be completed by June 1985. On the basis of this review, suitable steps should be taken to post the necessary staff (both technical staff and field officers) to branches. RBI should ensure that this is being done as per a time-bound programme. The performance of bank managers should be judged not only by loans disbursed, but also by the level of recoveries effected. Recovery of overdues should be given special attention.

15.10.2 The current branch licensing policy of RBI is to encourage establishment and expansion of RRBs. The area of operation of each RRB is demarcated and is confined to one or two districts. In certain cases, however, it extends to more than 2 districts. RRBs should serve preferably one district or at the most two. If the RRB serves one district it may have a maximum of 100 branches. If it serves 2 districts, the maximum number of branches should be not more than 75 per district. RRBs should have adequate number of branches in each block. RRBs serving more than one district may be allowed to open branches for link/coordination purposes at the tehsil/district headquarters even if it is not a rural centre. In general, a 5 km distance may be maintained between branches of RRBs and commercial banks in rural areas. There need not be any area demarcation and the branches of both commercial banks and RRBs should be free to finance borrowers in their own areas subject only to the condition that RRB branches will confine themselves to the target group.

15.10.3 *Supervised Credit Window:* Each RRB should open a supervised credit window to cater to the needs of marginal farmers and agricultural labourers on the lines of Grameen Banks in Bangladesh. (A note on the working of Bangladesh Grameen Banks is given in Annexure 15.2) The objective of this window will be to build close contact with beneficiaries, provide loans at their doorstep and collect repayments at frequent intervals. To begin with, pilot efforts should be made by relatively strong RRBs during 1985-86. On the basis of experience gained, the setting up of a supervised

credit window by all RRBs should be taken up during the Seventh Plan. RBI jointly with NABARD should pursue this objective.

15.11 *Training*

15.11.1 A time-bound programme of training of staff at all levels in PACS, CCBs, PLDBs, commercial banks, and RRBs should be taken up by the Central Co-operative Training Committee, NABARD, State Governments and concerned institutions. The present efforts need to be intensified. The syllabus for training should be reoriented with due emphasis on supervision and follow-up functions of bank staff as well as agriculture in general. Special attention should be paid to understanding and overcoming the problems of resource-poor farmers. The obsession with target-oriented lending should be replaced step by step by productive lending-cum-supervision approach. The co-operative training colleges/centres run by the State co-operative unions should strengthen the facilities for training the staff of co-operative personnel in LDB, SCB, CCBs, PLDBs, PACS, FSS and LAMPS.

15.12 *Credit Extension*

15.12.1 The Vikas Volunteer Vahini (VVV) concept introduced by NABARD, after suitable review and modification, may be propagated in the region to help bring about awareness of use of credit for development and prompt repayment.

15.12.2 The Syndicate Bank sponsored in 1966 the Syndicate Agriculture Foundation to advise the bank on agricultural credit and to build up close rapport with the bank's clients availing agricultural credit by providing necessary technical guidance. The Foundation organised Farm Clinics in 1970s to serve as a link between the beneficiaries and the concerned agencies with the full financial support of Syndicate Bank (*vide* Annexure 15.3). We would suggest that Farm Clinic experiment of the Syndicate Bank may be emulated by other banks with appropriate modifications for spreading the banking habit and improving recovery climate in selected areas.

15.13 *Simplification of Procedures*

15.13.1 RBI, jointly with NABARD, should periodically review its rural credit policy and aim at simplification of rules and

procedures. During field visits, we noticed that many of the PACS/ PLDBs and branches of commercial banks and RRBs were not conversant with the various procedures laid down and concessions made available to beneficiaries. NABARD and RBI should bring out in a booklet form the procedures to be followed by the credit institutions at grass roots level in the disbursement of short, medium, and long-term loans, terms and conditions of such loans and reliefs/ concessions available, etc. The booklet should be in simple language and published in all regional languages so that both bank staff and intending beneficiaries may get acquainted with the rules and procedures of RBI and NABARD.

15.14 *Subsidy*

15.14.1 Subsidy should not be given as 'investment subsidy' as hitherto, but linked with performance. The subsidy amount may be initially given as loan on the understanding that it will be converted into a subsidy on prompt repayment of the loan. If, however, defaults arise on account of natural calamities or other factors beyond the control of beneficiaries, the subsidy should not be withheld. Otherwise, a defaulting beneficiary will have to forego the benefit of subsidy. Such a step of linking subsidy with repayment performance will reduce the scope for abuses noticed in some areas in the administration of subsidies.

15.14.2 There is also a strong case for gradually moving away from the system of general and continuing subsidy, to a system of "tapering" subsidy for limited periods of initiation, tailor-made for specific target groups of intended beneficiaries.

15.15 *Insurance*

15.15.1 The State Governments in consultation with GIC should introduce an insurance scheme for investment in productive assets such as tubewells, pumpsets, machinery, etc. For bank-financed and government programmes, such insurance should be made compulsory.

15.15.2 NABARD had framed some time back a "Failed Well Compensation Scheme". It may pursue this with the Government of India and State Governments, with such modification as may be found necessary.

15.15.3 *Crop Insurance*: The Deposit Insurance and Credit Guarantee Corporation provides insurance cover to banks and co-operatives against defaults by borrowers, but borrowers themselves do not have any insurance cover. Orissa introduced a crop insurance scheme in 1981. The coverage of the scheme increased from 15 blocks in *kharif* 1981 to 124 in *kharif* 1983. West Bengal Government has also introduced crop insurance scheme for *aus*, *aman* and *boro* paddy and potato. The insurance cover under the scheme is available for all farmers availing crop loans against losses sustained on account of vagaries of weather, attack of pests and diseases and other calamities. For small and marginal farmers and share croppers 50 per cent premium subsidy is made available. The scheme is voluntary and is linked with short-term loan disbursed by co-operatives and commercial banks.

15.15.4 There is a need to introduce crop insurance to cover both borrowers and non-borrowers. The premium should be kept low to induce farmers to avail of this facility. To begin with, crop insurance may be introduced in selected areas as a pilot scheme and gradually extended to other areas. The GIC may take up with the State Governments a programme for introduction of a crop insurance scheme and provide the necessary technical and financial help for the purpose.

15.16 *Role of NABARD*

15.16.1 NABARD, as an apex Agricultural Development Bank, has a key role to play in facilitating a greater flow of credit, both short-term and long-term, to agriculture in general and resource-poor farmers in particular in the eastern region. The refinance disbursed by NABARD in the region is relatively small. More and more new innovative schemes have to be taken up by NABARD, especially suited to the needs of small and marginal farmers and scheduled tribes. It should also take steps, jointly with the State Governments and RBI, to ensure prompt recoveries. It should further review periodically the procedures followed by credit institutions at grass roots level and ensure that the simplification of procedures and liberalisation of terms and conditions made by it are actually implemented. It should ensure that there is a greater collaboration in credit matters with the State Level Bankers' Consultative Committee and the State Level Standing Committees recommended by us.

15.16.2 If agricultural productivity of Eastern India per ha and per capita has to reach the levels envisaged by us during the Seventh and Eighth Plan periods, a very substantial flow of credit will be needed. The disbursement capacity of the credit institutions, absorptive as well as repayment capacity of the farmers and smooth flow of funds both ways have to be specially strengthened. NABARD may consider setting up a special Division for Eastern India under a very senior officer to coordinate and follow up all the special effort that will be needed for the region.

15.17 *Estimate of Credit Requirements*

15.17.1 An estimate of credit requirements (at 1983-84 prices) to support the programmes envisaged in our Report is given in Chapter 16.

Annexure 15.1

Report of Working Group appointed by the Government of India for evolving scientific method of assessing crop yield, July 1983**— Relevant Recommendations**

For developing a system of effective credit management which would, *inter alia*, include conversion of short-term credit into medium-term credit, which is the principal reference point for this Working Group and also simultaneously serving the related objectives of decentralised planning at sub-district levels, several measures are needed for improving the data base, monitoring crop prospects and arrangements for assessment of production. The following recommendations are made by the Working Group :

1. Various State Governments and Union Territory Administrations may be requested to review the present system of declaration of an area as drought affected or flood affected. The procedures for *annawari* or *paisewari* assessment should be streamlined. There should be a District Level Committee in each district headed by the Collector and Registrar of Co-operative Societies, Lead Banker and District Agricultural Officer as Members. The Committee should meet as soon as a natural calamity occurs and make a quick assessment of the crop condition and likely yield on the basis of available data on rainfall, pest attacks, hailstorms, etc., and send a report to the State Revenue Department, where final confirmation is to be obtained through crop-cutting experiments. Suitable advance planning should be made and crop-cutting experiments on the sample holdings completed as soon as the crop is ready for harvest. The transmission of the results of surveys or *paisewari* should be speedy and receive urgent attention of the District Level Committee and other authorities responsible for declaring certain areas as calamity affected.
2. In determining the crops for assessment of yields, the area concept should be followed, namely, the crops which covered 70 per cent of the normal cropped area in the district may be taken into account. The yields for the affected year should be compared with the average of the yields of the preceding five years. If, on the basis of comparison of the per hectare yield of crop/crops for the affected region, it is certified by the District

Level Committee that the yield has gone down by 60 per cent in the case of irrigated crop and by 50 per cent in the case of unirrigated crop, the Revenue Department should declare the *an-nawari* for these areas.

3. All State Governments should build up a system of agricultural statistics which should enable them to have estimates of area, production and yield at the levels of taluks and blocks at least in the case of major crop/crops accounting for 90 per cent of the cropped area. The average yield levels of different crops as indicated by the yield data over 5 to 7 years should be available at the taluka and block levels, and perhaps in due course even at *firqa* and village levels. For this purpose, the number of crop-cutting experiments in the country should be substantially increased from the present level of 250 thousand for all crops for the whole country. Over a period of time the number of crop-cutting experiments should be increased to 500 thousand.
4. In order to be better equipped for planning and implementation of development and for preparing contingency plans to counter the effects of calamities, the number of crop-cutting experiments in the areas usually prone to drought and floods should immediately be increased by 100 per cent to provide better data base for development and credit management.
5. Crop Weather Watch Groups have been set up at State and district levels in some of the States. Such groups should be set up in all the States. Each such group should have representatives of the Department of Agriculture, Revenue, Irrigation, Electricity and Co-operation and others concerned, namely, co-operative credit institutions and representatives of Indian Meteorological Department. These groups should undertake continuous monitoring of the weather and rainfall situation and its implications for crop production. The State level group should receive reports on weather and crop situation from the district level Weather Watch Groups wherever established as also from Agriculture and Revenue Officers. The group may also keep itself informed of the likely extent of crop losses in calamity affected blocks or villages and indicate the relief measures which may be needed including the conversion of short-term loans into medium/long-term loans. This informa-

tion can be used by the District Level Committees in addition to the results of crop-cutting experiments.

6. The Apex Co-operative Bank in each State should establish a special cell for keeping track of weather and crop situation in different parts of the State. The Apex Bank might also send its representative and appropriate officers of the Central Co-operative Bank to join with the officials of the Agriculture Department for a visual survey of the areas affected by calamity like drought or flood and the likely implications thereof in terms of credit management. Till such time the number of crop-cutting experiments is doubled, additional crop-cutting experiments may be specially planned and carried out in the affected areas to have a realistic estimate of loss. This may be done in the case of localised calamities in certain blocks.
7. Intensive agricultural development efforts, decentralisation of planning including formulation of plans at district and taluka levels, extension of new technology, specially increased use of modern inputs, provision of adequate and timely credit from institutional sources and arrangements for risk insurance are all closely linked to each other. Management of institutional credit supply has to be viewed in this context. It is, therefore, necessary that adequate data base and close monitoring of the use of agricultural credit and emerging crop situation and prospects are dealt with in an integrated manner. Institutional credit agencies which have provided credit support to production plans should be closely associated with State Governments and district level authorities in monitoring the crop situation and prospects with the object of taking appropriate decisions on credit management.

Grameen Bank of Bangladesh

The Grameen Bank of Bangladesh is a specialised credit institution for the rural landless and poor men and women. It was started as an action research project in an area near Chittagong University by Dr. M. Yunus, Professor of Economics with the objective of testing his hypothesis that 7 to 16 per cent of financial resources can be made available to the poor for a reasonable programme and they can generate productive self-employment without any external assistance. The need for a separate bank for the landless was felt in view of the limitations of the nationalised banks in providing petty credit and reaching the rural poor. The project, after three years experiment, was formally launched in November, 1979 in Tangail district with the support of Bangladesh Bank. A separate Grameen Bank was set up in Tangail. Encouraged by the success of this Grameen Bank, the programme has now been extended to Rangpur, Dhaka and Patuakhali. Where there is no branch of the bank, the Krishi Bank and other nationalised commercial banks will handle credit through their existing rural branches having special units attached to them. Any person belonging to a household owning upto 40 decimal of cultivable land is eligible for the loan. The banking services are brought to the doorsteps of the poor. The bank workers go to the village to help the loanees to form groups of five, trained in the rules and procedures of the Grameen Bank. A number of groups in the same area are federated into a centre and the elected Centre Chief conducts weekly meetings for considering loan proposals and assists the bank workers. Once the proposals are accepted, the bank workers disburse the credit in weekly meetings. The loanee is free to use the credit in any productive activity of his/her choice but must repay the loan at the rate of 2 per cent per week. The other conditions are that the group members save one taka every week and 5 per cent of the loan is deducted at the time of loan disbursement. This 5 per cent forms an emergency fund and the savings from this fund are used for meeting emergencies. The Bangladesh Institute of Development Studies conducted an evaluation study on the performance of the Grameen Bank. By the end of June 1983, nearly 8844 groups were formed in 1025 villages covering 43,792 members. Upto June 1983 about TK.132 million has been disbursed to 34,922 loanees. About 42 per cent of the loanees were females and

they received nearly 32 per cent of the total loans. The amount of new loans disbursed expanded rapidly from TK.17 million in 1980 to TK.42 million in 1982 and during the first six months of 1983 it was TK.36 million. The repayment performance is about 99 per cent. The Grameen Bank clients have so far been able to save TK.13 million in group and emergency funds. The average saving per loanee is TK.384 which is approximately 16 per cent of the per capita income in the country. Thus, the savings performance is impressive. The Grameen Bank loans are utilised in 100 diverse activities which may be grouped under 5 broad categories — agriculture and forestry, livestock and fisheries, processing and manufacturing, trading and shop-keeping and transport services. Of all these activities, trading accounts for 43 per cent of the loans disbursed. The number of female loanees is increasing. The project records 270 different activities for which loans were given.

Farm Clinics

1. *Introduction*

1.1 Syndicate Bank sponsored the establishment of the Syndicate Agriculture Foundation in 1966, with a view to keep in touch with the bank's clients availing agricultural credit by providing necessary technical guidance.

1.2 The objective of the Foundation was to promote and foster the development of agriculture, encourage research in agriculture and arrange for extension service to cultivators. In the initial stages, it concentrated its attention on educating the farmers in improved agricultural practices through 'Farm Information Exchange Clubs' in villages and 'Future Farmers' Clubs' in schools and colleges.

2. *Farm Information Exchange Club*

2.1 The Club is functioning at the village level. The membership of the club is open to about 40-50 farmers in a village. The Club would ascertain the problems of agriculture in the village and suggest appropriate measures to overcome them. Besides making an attempt to upgrade the existing stage of agriculture, it arranges for suitable extension education programme. This programme includes arranging seminars, expert lectures, field demonstrations, cattle shows, film shows, cattle fairs, group competitions, etc. These are being organized with the funds raised by local contributions and partly from the grant of Syndicate Agriculture Foundation. At the beginning of the year, each club would prepare calendar of activities for the year and get it approved by the Foundation.

2.2 To exchange information among different villages, inter-club meetings are being arranged on an annual basis.

3. *Future Farmers' Club*

3.1 These clubs are organized in high schools and junior colleges. The membership of these clubs is open to final year students or students in the penultimate school year. These clubs would meet

after class-hours and these meetings would be utilised to impart latest knowledge on agriculture and allied activities. Clubs are guided by the principals or volunteer teachers. The programme of these clubs is mainly to arrange lectures on agriculture and other allied activities. Field visits to farms of progressive farmers are arranged. Essay and elocution competitions are also arranged on the relative subjects. At the beginning of the year, these clubs also prepare calendar of activities for the year.

4. *Publications*

4.1 The Foundation is bringing out various publications and periodicals. Pamphlets on different crops, such as, rice, coconut, fodder crops, etc., and on plant protection measures are being brought out.

5. *Reward to the Outstanding Farmers*

5.1 The Foundation is selecting outstanding farmers every year and honouring them in public functions.

6. *Training*

6.1 The Foundation was arranging in the past training programme for rural youths in self-employment. At present, the training programme is being undertaken by a new organization called 'Rural Development and Self-employment Training Institute'.

7. *Farm Clinics*

7.1 Till 1973, the Syndicate Agriculture Foundation did not have village level functionaries to spread its message. Inspired by the concept of FSS suggested by NCA to provide both credit and non-credit services to farmers under one roof, the Foundation contemplated the setting up of Farm Clinics which will provide to the cultivators all the needed services from various institutions. The first Farm Clinic was organized at Barkur in Dakshina Kannada District of Karnataka State in 1973 with a field assistant at the village to provide integrated assistance to the poorest families in the village. The object of a clinic is that any family in the village should be able to seek and find all types of help from the clinic. The Farm Clinic is committed to make a farmer even with a smallest land

holding to become a viable unit. Farm Clinics are to function as a link between the beneficiaries on the one hand and all the concerned agencies on the other. In this process, the cultivators are enabled to get their credit and non-credit services from various agencies serving the villages. These Farm Clinics were functioning till 1980 in only 3 centres, 2 in the Dakshina Kannada District of Karnataka and one in the Cannanore District of Kerala State. In 1980 the Foundation reviewed the role played by the clinics in the above 3 centres and considered that such clinics would be useful in other areas also. As a result, by the end of 1983, 140 Farm Clinics were established in various States, viz., Karnataka, Kerala, Orissa, Tamilnadu, Andhra Pradesh, Madhya Pradesh, Maharashtra, Uttar Pradesh, Punjab and Haryana and Union Territory of Delhi.

7.2 *Functions*

Farm Clinics are opened in the areas of operation of the Syndicate Bank branches. The Branch Managers are free to select one or two most backward villages in their areas. Preliminary to the selection of the villages, bench-mark survey is done by the Rural Development Officer attached to the branch. After the survey and approval by the Foundation, a Field Assistant resident in the village is selected from among the panel of 3 youths recommended by the Branch Manager. While selecting a Field Assistant care is taken that he is normally an under-graduate. Field Assistant would initially identify the number of poor families in the village and compile information on the identified families. On this basis, the Field Assistant will prepare family development plan taking into account land holding, skills, etc., of the family. The family development plan would incorporate not only the programme for production but also such other requirements of the family as adult education, children education, improvement in health, hygiene, sanitation and housing.

7.3 Based on the family development plans, loan applications are prepared and submitted to the Syndicate Bank branches. Field Assistant will help families in procurement of the required inputs and services. He would also approach concerned departments for creation of infrastructural facilities such as village roads, electric supply, primary health centres, veterinary centres, primary schools, services, etc.

7.4 Farm Clinic is guided by a Council known as 'Village Development Council' consisting of Branch Manager, Rural Development Officer of the Branch, Field Assistant and a few representatives of the village. Activities of the Field Assistant are closely monitored by the Branch Manager through the Rural Development Officer. Field Assistant is under the administrative control of the Foundation. The Foundation would get a monthly report from the Field Assistant through the Branch Manager.

7.5 *Funds*: The establishment cost of Farm Clinic such as salary to the Field Assistant and rent is provided by the Syndicate Bank. The other activities undertaken by the Farm Clinic such as arranging seminars, lectures, film shows, etc., are being met partly from the voluntary collections received from the villagers and partly from the grant by the Foundation.

7.6 By the end of 1983, 140 Farm Clinics covered 89,758 families of whom 41,195 belonged to poorer sections. Employment opportunities through financing for productive economic activities have received top priority. All the loans sanctioned through the clinics are small loans and the clinics have been able to achieve a good recovery performance of 85 per cent.

7.7 Syndicate Bank has found that these clinics have been able to supervise satisfactorily the end-use of credit disbursed. Farm clinics have been able to organize services from various agencies for beneficiary families. Field Assistant being a resident at the village would be able to get information on the day-to-day progress of the economic activities undertaken by beneficiary families. Being in close touch with the farmers, a good working relationship was built up between the Field Assistant and the beneficiaries.

7.8 *Syndicate Bank vis-a-vis Farm Clinics*: Syndicate Bank branches oversee the working of Farm Clinics through the Rural Development Officer who would not only be in close touch with the Clinics in their day-to-day functioning but also evaluate their work at the end of the year. Evaluation reports are sent to the Bank and the Foundation. The Divisional Office of the bank monitors the working of the clinics within its jurisdiction. Annual meetings of the Field Assistants are conducted by the Divisional Office. Divisional Offices are also submitting quarterly reports on the Clinics to the Syndicate Bank/Foundation.

7.9 *Award Scheme for Farm Clinics:* The best Farm Clinic is honoured with the outstanding Farm Clinic Award. Certificates of Merit are given to the next four best Clinics.

7.10 Farm clinics have made a noticeable impact in areas where the villagers are illiterate and ignorant of institutional support available to them.

CHAPTER 16

INVESTMENT AND CREDIT REQUIREMENTS

16.1 Introduction

16.1.1 The public outlay on agriculture and related sectors and credit flow from the banking system would be substantially higher in the Seventh and Eighth Plan periods than in the Sixth Plan, if our strategy for accelerated agricultural development in Eastern India is to be implemented. We present in this Chapter rough estimates of public outlay and credit needed for the programmes recommended by us. These may be helpful as broad indication of the magnitude of effort needed by all concerned.

16.2 Investments

16.2.1 *Agriculture and Allied Services*: Public outlay on agriculture and allied services during the Seventh Plan is assumed by us to be roughly double the anticipated expenditure during the Sixth Plan. An increase of a similar order is envisaged for the Eighth Plan as may be seen below. (Table 16.1)

**Table 16.1. Public Outlays on Agriculture and Allied Services
(including Co-operation)**

State/Region	(Rs. crores)		
	Sixth Plan (Anticipated)	Seventh Plan (Estimate)	Eighth Plan (Estimate)
West Bengal	373*	780	1600
Orissa	285*	580	1150
Bihar	433*	930	1850
East U.P.	330@	700	1400
Eastern India	1421	2990	6000

* Includes actuals for 1980-81, 1981-82, 1982-83, anticipated expenditure for 1983-84 and Plan outlay for 1984-85.

@ Estimated, as no separate break-up for East U.P. is available. These account for 37 per cent of expenditure for U.P. as a whole.

16.2.2 *Major and Medium Irrigation Projects:* Public investment on irrigation which is additional to the above, cover expenditure on (i) major, medium and minor irrigation projects, (ii) flood control, (iii) drainage and (iv) command area development.

16.2.3 During the Seventh and Eighth Plan periods, no new major irrigation projects are proposed but all on-going projects will be completed. Some new medium irrigation projects will be taken-up. Besides, in East U.P., Bihar and West Bengal, the scope for tapping very deep aquifers (1500 metres or more) will be explored. Our estimate of additional potential that would be created under major and medium irrigation during the two Plan periods would be about 40 lakh ha. (Table 16.2). These projects should be carried out in suitable phases so that benefits can accrue from a phase completed earlier. The more economic and short gestation projects should be given priority and more costly projects staggered into the Ninth and subsequent Plans.

Table 16.2. Additional Potential under Major and Medium Irrigation Projects

(Lakh ha)

State/Region	During Seventh Plan	During Eighth Plan	Total
West Bengal	3.1	4.1	7.2
Orissa	3.3	3.3	6.6
Bihar	4.9	9.0	13.9
East U.P.	5.9	6.7	12.6
Total	17.2	23.1	40.3

16.2.4 *Minor Irrigation:* The identified minor irrigation potential in Eastern India is estimated at 179 lakh ha, of which about 90 lakh ha is likely to be utilised by the end of Sixth Plan. During the Seventh and Eighth Plans, it is proposed to utilise this source inten-

sively. Our estimate of additional area to be irrigated from minor irrigation mainly through groundwater exploitation, during the two Plan periods is about 80 lakh ha (Table 16.3).

Table 16.3. Additional Potential under Minor Irrigation
(Lakh ha)

State/Region	During Seventh Plan	During Eighth Plan	Total
West Bengal	7.2	11.8	19.0
Orissa	4.1	8.2	12.3
Bihar	10.9	17.4	28.3
East U.P. *	15.7	7.0	22.7
Eastern India	37.9	44.4	82.3

* By the end of the Seventh Plan a substantial part of known groundwater potential would be exploited leaving only a small amount to be exploited during the Eighth Plan period. Hence a lower order of potential during the Eighth Plan.

16.2.5 For achieving the above targets, substantial investments in sinking of tubewells, construction of dugwells and installation of pumpsets will be necessary. We have prepared two estimates: (i) Estimate I which we consider necessary and (ii) Estimate II, based on past performance. (Table 16.4).

Table 16.4. Minor Irrigation Programme*
(Lakh units)

Type of structure	Estimate I		Estimate II	
	Seventh Plan	Eighth Plan	Seventh Plan	Eighth Plan
Shallow tube-well bores	8.7	10.0	5.6	8.4
Shallow tube-wells with pumpsets	0.9	1.2	0.8	0.8
Medium/deep tubewells/riverlifts	0.2	0.2	0.1	0.2
Dugwells	1.6	3.9	1.2	3.7
Pumpsets	10.4	15.3	7.4	12.6

* Excluding investments in surface irrigation other than riverlifts.

16.2.6 The investments would be financed partly by Government and partly by co-operatives, commercial banks and RRBs with re-finance from NABARD. The Government contribution will consist of expenditure on sinking of tubewell bores (and electric connections in the case of electric pumpsets) and construction of dugwells under the Centrally Sponsored Scheme in selected areas recommended by us in Chapter 9, subsidies to small and marginal farmers and Government share of the cost of medium/deep tubewells and riverlifts. Our estimates of total outlay on minor irrigation structures (excluding minor surface irrigation other than riverlifts) referred to above would be about Rs. 1400 crores in the Seventh Plan and Rs. 1870 crores in the Eighth Plan as shown below (Table 16.5).

Table 16.5. Cost of Minor Irrigation Structures

(Rs. Crores)

	During Seventh Plan	During Eighth Plan
1. Government expenditure		
i) Under Centrally Sponsored Scheme for tubewell bores and dugwells	340	480
ii) Other expenditure	275	340
Sub-total	615	820
2. Bank credit and down payments by farmers	785	1050
Total	1400	1870

16.2.7 Provision also has to be made for extension of electric lines in the case of electric pumpsets. In the absence of this provision, the energisation of pumpsets will be seriously affected. We have assumed that 50 per cent of the pumpsets required under the Centrally Sponsored Scheme would be electrical. On this assumption, the total cost of energisation of such pumpsets which will also have to be met by the Central Government will be about Rs. 235 crores during the Seventh Plan and Rs. 300 crores during

the Eighth Plan. The total outlay on Centrally Sponsored Scheme, during the Seventh and Eighth Plan periods would thus be Rs. 1355 crores as shown below :

Table 16.6. Public Expenditure on Centrally Sponsored Schemes
(Rs. crores)

State/Region	Seventh Plan			Eighth Plan		
	For Tube-well bores and dugwells	For electrification	Total	For Tube-well bores and dugwells	For electrification	Total
West Bengal	80	60	140	130	100	230
Orissa	50	25	75	140	60	200
Bihar	110	75	185	160	110	270
East U.P.	100	75	175	50	30	80
Eastern India	340	235	575	480	300	780

16.2.8 The estimates given in paragraphs 16.2.5 and 16.2.6 represent the cost of investments we consider necessary to support the strategy outlined in our Report. In case it is not possible to come up to the expectations, the investment cost would be proportionately less.

16.2.9 On the basis of the above projections, the additional gross area that would be brought under major, medium and minor irrigation by the end of Eighth Plan period after allowing for some time lag in the utilisation of the potential created would range between 95 lakh and 115 lakh ha. By the end of Eighth Plan, nearly 70-75 per cent of irrigation potential would be utilised (Table 16.7).

Table 16.7. Projections of Additional Irrigated Area
(Lakh ha)

State/ Region	Estimate I			Estimate II			Percentage of utilisation of potential at the end of Eighth Plan	
	1989- 90	1994- 95	Total	1989- 90	1994- 95	Total		
							Esti- mate I	Esti- mate II
West								
Bengal	10.1	15.6	25.7	7.1	11.5	18.6	86.6	74.8
Orissa	7.3	11.5	18.8	5.3	10.3	15.6	63.4	60.0
Bihar	14.6	24.2	38.8	10.6	19.5	30.1	72.8	65.1
East								
U.P.	20.7	12.7	33.4	14.7	14.7	29.4	71.2	68.5
Eastern								
India	52.7	64.0	116.7	37.7	56.0	93.7	73.7	67.0

6.2.10 *Drainage*: Drainage problems are particularly acute in command areas of irrigation projects in Eastern India as well as in deltaic areas of Orissa and West Bengal. Further, in areas which receive heavy rainfall, arrangements are needed to take away excess water. The importance of drainage has not been fully recognised. The allocation of funds for this purpose has been inadequate. As a result, while additional irrigation potential is being created every year, some of the areas covered under the command areas of older irrigation projects are rendered unfit for cultivation due to waterlogging. Drainage needs to be given top priority in our strategy as explained in Chapter 9. We, therefore, suggest that, to start with, a lumpsum allocation of Rs. 600 crores during Seventh Plan and Rs. 700 crores during the Eighth Plan may be made in the Central Sector for drainage works to be taken up in terms of a comprehensive Master Plan for Eastern India, in areas affected by waterlogging and drainage congestion. This allocation will be over and above the cost of intermediate drainage works to be taken up for modernisation of old irrigation projects and field

drains to be constructed as part of OFD works. If additional funds are needed that may be provided.

Table 16.8. Investment on Drainage

(Rs. Crores)

State/Region	During Seventh Plan	During Eighth Plan
West Bengal	130	150
Orissa	130	150
Bihar	160	200
East U.P.	180	200
Total	600	700

16.2.11 The total investment outlay on major, medium and minor irrigation, drainage, CAD and flood control during the Seventh and Eighth Plan periods will be roughly, as shown below.

Table 16.9. Public Investment on Irrigation, Drainage and Flood Control

(Rs. crores)

Investment category	During Sixth Plan (Anti- cipated)	Seventh Plan (Estimate)	Eighth Plan (Estimate)
(1)	(2)	(3)	(4)
1. Major and Medium Irrigation Projects and Flood Control	1850	3000	5000
2. Drainage	—	600	700
3. CAD	58	120	160
4. Minor Irrigation *	445	1300	1570

* Includes in addition to the cost shown in Table 16.5, public investments in minor surface irrigation and Government contributions to Water Development/Minor Irrigation Corporations, etc.

16.2.12 In case of shortage of resources, drainage, minor irrigation and CAD should be given higher priority.

16.3 Rural Electrification

16.3.1 Investment on rural electrification covers (i) electrification of villages (ii) energisation of pumpsets and (iii) sub-transmission and energy conservation. It is assumed that out of the villages to be electrified, at least one-third will be electrified during the Seventh Plan and another one-third during the Eighth Plan. Priority should be given to compact areas selected for sinking "batteries" of tubewells. It is also assumed that out of the pumpsets to be installed, 50 per cent will be electrified and the balance will be diesel operated. The cost of electrification of electric pumpsets needed to be utilised on the bores sunk and dugwells constructed under Centrally Sponsored Schemes will be met by the Central Government. For the balance of electric pumpsets, a large part of the cost will be met by way of bank finance.

Table 16.10. Investment Cost of Rural Electrification

(Rs. crores)

State/Region	Sixth Plan (Anticipated)	Seventh Plan (Estimate)	Eighth Plan (Estimate)
West Bengal	N.A.	170 (60)	260 (100)
Orissa	67	130 (25)	260 (60)
Bihar	102	250 (75)	400 (110)
East U.P.	86*	220 (75)	200** (30)
Eastern India	N.A.	770 (235)	1120 (300)

* Estimate.

** The number of pumpsets to be energised during the Eighth Plan will be less than in the Seventh Plan.

Note: Figures in brackets represent investment cost to be met by way of central assistance by REC for energisation of pumpsets required for tubewell bores and dugwells under Centrally Sponsored Schemes proposed by us.

16.4 Rural Industry Centres

16.4.1 We have proposed setting up of rural industry centres in secondary markets and no-industry areas in Chapter 8. Provision has, therefore, been made for investment cost on infrastructure for this purpose and recurring cost for maintenance, etc. Our estimate of the cost during the Seventh Plan and Eighth Plan is Rs. 300 crores and Rs. 460 crores, respectively. It will, however, be desirable to provide substantially larger amounts for this purpose, if possible.

Table 16.11. Public outlay on Rural Industry Centres

State/Region	(Rs. crores)	
	Seventh Plan	Eighth Plan
West Bengal	70	140
Orissa	55	75
Bihar	70	105
East U.P.	105	140
Eastern India	300	460

16.5 Short-term Credit

16.5.1 The following assumptions have been made in estimating short-term credit requirements.

- (i) Production credit requirements are assumed at Rs. 1200 per ha for irrigated areas and Rs. 800 per ha for unirrigated areas (both at 1983-84 prices).
- (ii) An allowance of 15 per cent in irrigated areas and 5 per cent in unirrigated areas has also been provided for meeting cost of repairs to permanent assets.

16.5.2 It is assumed that farmers operating on 70 per cent of cropped area will only require credit and the remaining will either meet the requirements out of their own resources or from informal sources.

16.5.3 At present, the level of disbursement of credit is very low. Considering the present weaknesses in the credit structure in the flow of credit, which may not be easily got over, we have prepared two estimates:

- i) an estimate of credit needed by farmers operating on 70 per cent of cropped area;
- ii) an estimate on the assumption that farmers operating on 40 per cent of cropped area in Seventh Plan and 50 per cent in Eighth Plan would avail of credit.

Based on these assumptions and our projections on gross cropped area (*vide* Chapter 6), the following estimates of short-term credit have been prepared.

Table 16.12. Short-term Credit

(Rs. crores)

State/Region	Higher estimate		Lower estimate	
	1989-90	1994-95	1989-90	1994-95
West Bengal	650	740	370	530
Orissa	690	750	390	540
Bihar	1030	1170	670	830
East U.P.	790	870	450	620
Eastern India	3160	3530	1880	2520

16.5.4 The estimates given above, however, do not take into account production credit requirements of ancillary activities such as animal husbandry, fishery, rural industry centres, etc., for which suitable provision, in addition, will have to be made.

16.5.5 During 1982-83, PACS disbursed short-term credit of Rs. 32 crores in West Bengal, Rs. 58 crores in Orissa and Rs. 27 crores in Bihar. On the basis of recent trends in the disbursements of short-term credit by co-operatives and commercial banks, there will still be a credit gap even to achieve the lower estimate. This underscores the need for rehabilitation and strengthening of the banking system as envisaged in Chapter 15. The shortfall, if any, may have to be made good by the Government.

16.6 Medium and Long-term Loans

16.6.1 Term loans to be provided by co-operatives and commercial banks relate to financing of minor irrigation investments, land development, soil conservation and diversified investments. Our estimate of medium and long-term loans during Seventh and Eighth Plan periods are given below (Table 16.13).

Table 16.13. Estimate of Medium and Long-term Loans

(Rs. crores)

State/Region	Purpose	During Seventh Plan	During Eighth Plan
West Bengal			
	Minor Irrigation *	200	300
	Other purposes @	140	170
		340	470
Orissa			
	Minor Irrigation*	150	310
	Other purposes@	170	190
		320	500
Bihar			
	Minor Irrigation*	310	475
	Other purposes@	165	225
		475	700
East U.P.			
	Minor Irrigation*	350	200
	Other purposes@	150	170
		500	370
Eastern India			
	Minor Irrigation *	1010	1285
	Other purposes@	625	755
TOTAL :		1635	2040

* Includes loans to State Electricity Boards for energisation of pump-sets.

@ Covers land development, soil conservation, dry farming, animal husbandry, fisheries, forestry, farm mechanisation, storage and rural industry centres, etc.

16.6.2 We consider that the estimates given above are the minimum necessary to support the programmes indicated by us. Efforts should be made to provide larger credit as necessary in the light of experience.

16.7 *Need for Concerted Efforts*

16.7.1 Concerted efforts will be needed to achieve the projected level of disbursement. In the matter of short-term credit, steps should be taken to start with the lower estimate in the Seventh Plan and move gradually up to the higher estimate in the Eighth Plan. The targets have to be reviewed in the light of experience gained during mid-term appraisal of each Plan.

16.7.2 We may clarify that the investment and credit requirements given above relate only to the specific purposes indicated in this Report and are not comprehensive. They are substantially higher than the Sixth Plan provision. It will not be possible to accommodate them within the normal State Plan ceilings of the next two Plans, without very adversely affecting other priority sectors. The State Plans should seek to cover the same proportion as in the Sixth Plan. The balance should be provided partly through Centrally Sponsored Schemes or Central Sector Schemes as may be convenient and partly through special grants and loans over and above the standard formula for Central assistance for State Plans. If this is not done, the capital starved farm sector of Eastern India will never be able to achieve the production potential that it is capable of and the objective of converting this region into a new granary for the nation and providing reasonable employment and food for the people will remain a chimera.

CHAPTER 17

CONCLUSION

17.1.1 The basins of Ganga and Mahanadi and their tributaries, which comprise bulk of Eastern India are endowed with good soil, water and labour resources. Historically, their agricultural productivity had been among the highest in the country.

17.1.2 For institutional, technological, economic and other reasons, this pre-eminence started getting eroded in recent times. Since the introduction of the new HYV seed/fertilizer technology in the sixties, agricultural productivity in Northern and Southern Regions progressively surpassed that in Eastern Region. This was because the institutional, technological and economic situations were more favourable for the adoption of this technology in the first two regions than in the Eastern Region.

17.1.3 The spread of new technology also required massive effort on the part of the Government. It was primarily the Government which could have provided the infrastructure and brought the needed inputs within the easy reach of the cultivators. However, this did not happen partly because of deficiencies of administration and management in this region.

17.1.4 Rate of growth of agricultural productivity, therefore, continued to be significantly lower than that of rural population in Eastern India. Migration from rural to urban areas was relatively small as a result of inadequate growth of industries. The problem of rural unemployment and poverty became increasingly serious and further eroded the resource base of the bulk of farmers.

17.1.5 Development measures taken by the Government in recent years, although inadequate, have, however, helped to reduce a few of the many constraints which plague Eastern India. As a result agriculture in this region is now near, although not quite on, the threshold of accelerated progress. If a "big push", largely in terms of investment, management and policy, is given to overcome some of the more serious constraints, which are blocking the way, the threshold can be crossed.

17.1.6 A number of programmes, no doubt, need to be undertaken, as part of this push, in a planned and coordinated manner, as have been detailed in this Report.

17.1.7 But the spearheads have to be in terms of massive provision of tubewells, pumps, drainage, micro-watershed development, power, inputs, custom services, rural industries, investment and credit, as explained in earlier Chapters.

17.1.8 Once these spearheads are able to make an initial breakthrough, other programmes recommended by us will get a better chance to become increasingly more effective.

17.1.9 The resulting technological surge will also help weaken, if not remove, some of the institutional and structural barriers which have proved intractable so far.

17.1.10 Conditions will then be created for converting Eastern India into a granary that it was and which the country badly needs today.

17.1.11 The effort involved, however, is massive. Government has to play a key role in this. Therefore, efficient and well coordinated management and simplified procedures are preconditions for a rapid and extensive adoption of modern technology by farmers in this region.

17.1.12 Further, this cannot be done on the cheap. It will need a minimum critical investment in agriculture and related sectors in Eastern India during the Seventh and Eighth Plan periods as indicated by us.

17.1.13 *Prima facie*, the amount may appear disproportionately large. But it is really not so when one considers the magnitude of the task, along with the past neglect and future needs of the region.

17.1.14 If properly implemented, the net return accruing from the programmes recommended by us will fully justify the investment.

17.1.15 On the other hand, the loss incurred from non-implementation is bound to be ruinous from economic as well as political points of view.

17.1.16 The total outlay envisaged by us is not really so large as cannot be accommodated in the Plans by postponing, if necessary, some less urgent or long gestation projects.

17.1.17 The main consideration, we strongly feel, is not so much the resources as the political will and priority accorded to agricultural development.

S. R. Sen

Chairman

S. K. Mukherjee

Pradhan Hari Shankar Prasad

K. Ramamurthy

K. R. Hoila

Secretary

Harbans Singh

Members

December 30, 1984

New Delhi.

APPENDICES

APPENDIX 1

RBI Memorandum Dated March 10, 1983 on the setting up of the Committee on Agricultural Productivity in Eastern India

The Reserve Bank of India and National Bank for Agriculture and Rural Development have noted with concern the recent trends of agricultural production and productivity in Eastern India. They have, therefore, decided to appoint a Committee to study these trends and suggest measures with special reference to measures in the field of agricultural credit that may be adopted for realising as much of the production potential as possible before the close of the decade of the Eighties.

2. The Committee will consist of the following :

1. Dr. S. R. Sen : Chairman
Chairman
Board of Trustees
International Food Policy
Research Institute
Washington D.C.
2. Dr. S. K. Mukherjee : Member
Member
Planning Advisory Board
Government of West Bengal
Calcutta.
3. Prof. Pradhan Hari Shankar Prasad : Member
A. N. Sinha Institute
Patna.
4. Shri K. Ramamurthy : Member
Member
Board of Revenue
Government of Orissa
Bhubaneswar.
5. Shri Harbans Singh : Member
Agricultural Commissioner
Government of India
New Delhi.

3. Shri M. G. Gaitonde, Director, Department of Economic Analysis and Policy, Reserve Bank of India and Shri K. R. Holla, Manager, National Bank for Agriculture and Rural Development will function as Secretary and Joint Secretary respectively, of the Committee. The Secretariat will be located in Reserve Bank of India.

4. The terms of reference of the Committee will be as follows :

- (i) to review the trends of agricultural production and productivity in Bihar, West Bengal, Orissa and Eastern U.P., in recent years and compare with the potential of the area;
- (ii) to identify the various constraints in achieving the potential levels of production in the States mentioned above;
- (iii) to suggest measures, with particular reference to credit and investment, necessary for achieving as much of the potential as possible by the end of the decade viz. 1990.

5. The Committee will submit its report within six months.

6. The Committee will be free to decide its own procedure.

Sd/-

(MANMOHAN SINGH)
GOVERNOR

-
- Notes : 1. The term of the Committee was extended upto December 31, 1984.
 2. Shri M. G. Gaitonde, Secretary of the Committee resigned with effect from May 16, 1984 to take up a foreign assignment.
 3. Shri K. R. Holla came over from NABARD to RBI on July 26, 1983 and was appointed as Secretary with effect from May 17, 1984, consequent on the resignation of Shri M. G. Gaitonde. Shri M. P. Nair, Deputy Director, RBI was appointed as Joint Secretary of the Committee with effect from August 1, 1984.

APPENDIX 2

Terms of Reference of the Working Groups

Working Group on Structure and Organization at Grass Roots Levels and Supporting Institutions

(i) To review the structure and organization of decision-making at the grass roots level and suggest measures for strengthening the participation and involvement of local institutions like gram panchayat, zilla parishad, development block, staff of credit institutions and local administration, etc., in developmental activities;

(ii) To evaluate the role played by the voluntary agencies in agricultural and rural development and indicate the merits/demerits of involving these agencies in developmental activities, and possible ways of establishing more effective coordination of them with the administrative and credit institutions; and

(iii) To conduct some case studies in pairs of average and relatively developed villages for evaluating the role played by village leadership and governmental agencies in agricultural and rural development.

Working Group on Land Tenurial Status

(i) To review the current land tenurial status and examine the extent to which it is impeding sustained agricultural development; and

(ii) To suggest appropriate short and long-term measures within the given structural and land tenurial constraints for sustained agricultural development.

Working Group on Levels of Productivity under Different Agro-Climatic Zones

(i) To identify the ecological, technological and other constraints responsible for inter-district differentials in the levels of productivity;

(ii) To identify the factors behind slower rate of absorption of modern farm inputs and other technologies and relatively lower order of productivity responses to these factors; and

(iii) To explore the technological possibilities of raising the level of productivity through conjunctive use of rainfall, surface and groundwater, and crop pattern adjustments (including avoidance of unduly hazardous weather periods).

Working Group on Water Management (Surface and Ground-water and Drainage) and Command Area Development (including Consolidation of Holdings and Land Levelling)

(i) To assess the ultimate groundwater and surface water irrigation potential of each district and recommend the direction of approach for realization of the untapped potential at a faster rate;

(ii) To assess the technical possibilities of developing an appropriate irrigation and drainage system (including surface and groundwater) consistent with region-specific characteristics, particularly, topography, high and uneven seasonal distribution of rainfall, floods and waterlogging and the excessive fragmented nature of holdings;

(iii) To identify the technical and other factors responsible for under-utilization or malutilization of created irrigation facilities and suggest remedial measures for optimum utilization of the created irrigation potential; and

(iv) To identify the technical problems associated with the maintenance of existing irrigation and drainage facilities and suggest appropriate measures for improvement.

Working Group on Credit and Investment

(i) To examine the trends in the provision of credit (short-term, medium-term and long-term) in relation to requirements for the past 10 years or so and identify inter-district variations in the dispensation of credit and reasons therefor;

(ii) To assess the requirements of investment finance and bank credit for different types of investments (including those on drainage, pumps, tubewells) to achieve the agricultural production potential by the end of 1990;

(iii) To assess the requirements of production credit by different classes of farmers, particularly small and marginal farmers;

(iv) To identify districts/regions where special attention for banking development is needed and the approach to be followed;

(v) To assess the bottlenecks and constraints (institutional, physical, technology, social, economic, etc.) for the flow of adequate and timely credit and suggest measures necessary for the optimum utilization of investments for sustaining growth;

(vi) To examine the overdue situation for different categories of farmers, identify reasons thereof and suggest measures to improve the situation;

(vii) To assess adequacy of institutional structure (Primary co-operative credit societies, co-operative banks, RRBs, commercial banks, government agencies, etc.) for the provision of credit and suggest measures to improve their capabilities;

(viii) To review the role played by Reserve Bank of India and NABARD/State Governments in the financing of investments and provision of short-term credit, their policies towards branch expansion and supervision efforts for adequate provision of credit and its satisfactory end-use;

(ix) To suggest appropriate short-term and long-term measures (including package credit, instalment credit, supervised credit, etc.) to remove the constraints in the flow and repayment of credit so as to sustain agricultural development; and

(x) Any other aspects relevant to the terms of reference of the Committee.

APPENDIX 3

List of Persons Met by the Committee

State Governments

West Bengal

Shri Jyoti Basu, Chief Minister.
Shri B. R. Choudhari, Minister for Land and Land Reforms.
Shri Ashok Mitra, Minister for Finance.
Shri K. Bhowmik, Minister for Minor Irrigation.
Shri Kamal Guha, Minister for Agriculture.
Shri Nihar Basu, Minister for Co-operation.
Shri S. V. Krishnan, Chief Secretary.
Shri A. K. Ghosh, Vice-Chairman, State Planning Board.
Dr. K.R. Chakraborty, Member, State Planning Board.
Dr. A. Dasgupta, Member, State Planning Board.
Dr. P.V. Shenoi, Secretary, Agriculture.
Shri B. Mandal, Director of Agriculture.
Shri D. Mukherjee, Additional Director of Agriculture (Research) .
Shri J.R. Lahiri, Additional Director of Agriculture (Gen.) .
Shri Datta Gupta, Deputy Secretary, Agriculture.
Shri P.C. Banerjee, Member, Board of Revenue.
Shri S.L. Bose, Additional Member, Board of Revenue and
Secretary, Land and Land Reforms.
Shri P.K. Sarkar, Secretary, Finance.
Shri S.P. Sen, Engineer in Chief-cum-Ex Officio Secretary.
Shri S.K. Basu Rey, Special Secretary, Minor Irrigation.
Shri S.M. Deb, Chief Engineer.
Shri N.K. Bandopadhyay, Managing Director, State Minor Irriga-
tion Development Corporation.
Shri B.K. Bhattacharjee, Director, State Water Investigation
Directorate.
Shri S.S. Chattopadhyaya, Secretary. Institutional Finance.
Shri A. Deb, Registrar. Co-operative Societies.
Shri B.C. Sharma, Secretary, Fisheries Department.
Dr. S. Gupta, Additional Director, Animal Husbandry.
Dr. T.K. Ghosh. Director of Land Records and Surveys.
Shri S. Maitra, West Bengal Agro-Industries Corporation.
Shri P.S. Ingly, Managing Director, BENFED.

Orissa

Shri J.B. Patnaik, Chief Minister.
Shri Gyan Chand, Chief Secretary.

Shri R. Srinivasan, Commissioner-cum-Secretary, Agriculture and Co-operation.

Shri F.C. Panigrahi, Additional Secretary, Agriculture and Co-operation.

Dr. N.R. Panigrahi, Director of Agriculture and Food Production.

Dr. P.C. Ghosh, Additional Director of Agriculture.

Shri R. Satpathy, Director, Soil Conservation.

Shri S. Mishra, Deputy Secretary, Agriculture.

Shri H.P. Mohapatra, Deputy Secretary, Agriculture.

Dr. B. Mallick, Director of Horticulture.

Shri H.S. Sarkar, Director, Consolidation of Land Holdings.

Shri B. Das, Director, Bureau of Economics and Statistics.

Dr. S. Tripathy, Joint Director, Agricultural Census, Board of Revenue.

Shri D.P. Bagchi, Commissioner-cum-Registrar of Co-operative Societies.

Shri H.C. Hota, Director, Institutional Finance.

Shri S.M. Patnaik, Commissioner, Command Area Development.

Shri P.C. Hota, Secretary, Irrigation and Power.

Shri B.C. Patnaik, Chief Engineer, Minor Irrigation.

Shri D.P. Rath, Assistant Chief Engineer, Irrigation Department (Minor).

Shri R.C. Das, Superintending Engineer, Irrigation Department.

Shri G. Mahapatra, Senior Scientist, Directorate of Science and Technology.

Shri S.N. Pradhan, Managing Director, Orissa Lift Irrigation Corporation.

Shri U.C. Padhi, Managing Director, Orissa State Seeds Corporation.

Shri B.B. Roy, Managing Director, MARKFED.

Shri D.S. Tripathy, Managing Director, Orissa Agro-Industries Corporation.

Dr. R.N. Mohanty, Agriculturist.

Bihar

Shri Chandra Shekhar Singh, Chief Minister.

Shri Ram Jaipal Singh Yadav, Minister for Agriculture.

Shri Budhdev Singh, Minister for Co-operation.

Shri Krishnanand Jha, Minister of State for Irrigation.

Shri K.K. Srivastava, Chief Secretary.

Shri S.K. Srivastava, Agricultural Production Commissioner.

- Shri N.K. Prasad, Deputy Chairman, State Planning Board.
 Shri J.G. Kunti, Member Secretary, State Planning Board.
 Shri Mohinder Singh, Commissioner and Secretary, Co-operation Department.
 Dr. D.N. Ram, Director of Agriculture.
 Dr. A.K. Mukherjee, Special Secretary, Agriculture.
 Dr. K.S. Singh, Commissioner-cum-Secretary, Forest and Environment Department.
 Shri J.N. Pandey, Chief Conservator of Forests.
 Dr. J.C. Kundra, Development Commissioner, 20-Point Programme and Institutional Finance.
 Shri R.P. Singh, Engineer-in-Chief-cum-Additional Commissioner, Special Secretary (Irrigation Department).
 Shri P.K. Sinha, Commissioner, Minor Irrigation.
 Shri Rajiv Ranjan, Registrar of Co-operative Societies.
 Shri N.K. Das, Joint Director of Institutional Finance.
 Shri R.J. Singh, Commissioner, Animal Husbandry.
 Shri A.K. Verma, Managing Director, Bihar Water Development Corporation.
 Shri M.P. Sinha, Chief Engineer (P), Bihar Water Development Corporation.
 Shri A. Das Gupta, Development Commissioner, Gandak Command Area.
 Dr. M.P. Shukla, Joint Secretary, Agriculture.

Uttar Pradesh

- Shri N.D. Tiwari, Chief Minister.
 Shri Ram Singh Khanna, Minister for Planning.
 Shri S.D. Srivastava, Chief Secretary.
 Dr. J.P. Singh, Secretary, Planning.
 Shri Bhure Lal, Secretary, Agriculture.
 Shri L.K. Gaur, Staff Officer to Chief Engineer, Irrigation.
 Dr. B.N. Tyagi, Director of Agricultural Statistics.
 Shri S.N. Shukla, Secretary and Director, Institutional Finance.
 Shri Shajad Bahadur, Special Secretary, Planning.
 Shri K.B. Singh, Joint Director of Agriculture.
 Shri B.M. Joshi, Deputy Secretary, Planning.
 Shri B.N. Pandey, Additional Registrar, Co-operative Department, Government of U.P., Lucknow.
 Dr. J.C. Budhraj, Director, Area Planning Division, State Planning Institute.
 Shri S.P. Gaur, Joint Secretary, Coordination.

Central Government

Dr. B.D. Phatak, Chairman, Central Groundwater Board.

Shri S.S. Chauhan, Assistant Production Commissioner, Ministry of Agriculture, Government of India.

Shri H.L. Chawla, Economic and Statistical Adviser, Ministry of Agriculture, Government of India.

Shri M. C. Dhanrajani, Deputy Commissioner, Minor Irrigation, Government of India, New Delhi.

Dr. G.R. Bhatia, Marketing Adviser, Government of India, Faridabad.

Shri S.P. Dua, General Manager, Hindustan Fertilizer Corporation.

Shri K. Viswanathan, Manager, Central Warehousing Corporation.

Shri C.S.S. Rao, Joint Commissioner, Extension, Ministry of Agriculture, Government of India.

Shri S.K. Bhatia, Director, Water Utilization, Central Water Commission, New Delhi.

RBI/NABARD

Shri R.P. Satpute, Manager, Reserve Bank of India, Calcutta.

Shri M.L.T. Fernandes, Manager, Reserve Bank of India, New Delhi.

Shri S.S. Ranade, Manager, Reserve Bank of India, Patna.

Shri M. Subramanian, Manager, Reserve Bank of India, Kanpur.

Shri G. Ramakrishnan, Manager, Reserve Bank of India, Bhubaneswar.

Shri R.S. Awasthi, Deputy Manager, Reserve Bank of India, Lucknow.

Dr. M.V. Gadgil, Chief General Manager, NABARD, Bombay.

Shri Satish Kumar, Director-General, VVV, NABARD, New Delhi.

Shri R.N. Kaul, Deputy General Manager, NABARD, Calcutta.

Shri S. Ramamoorthy, Deputy General Manager, NABARD.

Shri Y.S. Punjavat, Deputy General Manager, NABARD, Patna.

Shri C. Vipinchandran, Deputy General Manager, NABARD, Lucknow.

Banks

Shri D.K. Banerjee, Managing Director, West Bengal State Co-operative Land Development Bank, Calcutta.

Shri A. Krishnan, General Manager, State Bank of India, Calcutta.

Shri R. Srinivasan, Chairman & Managing Director, Allahabad Bank, Calcutta.

- Shri A. Thiagarajan, Chief Officer, Central Bank of India, Regional Office, Calcutta.
- Shri S.D. Anklesaria, Assistant General Manager, Union Bank of India, Calcutta.
- Shri D.K. Mukherjee, Chief Officer, Farm Finance Division, United Bank of India, Calcutta.
- Dr. R.R. Chattopadhyay, Chief, Rural Credit, UCO Bank, Calcutta.
- Shri P. Bose, Deputy General Manager, United Industrial Bank, Calcutta.
- Shri R.N. Bose, Manager, Punjab National Bank, Zonal Office, Calcutta.
- Shri S.V. Ghosh, Deputy Development Manager, Bank of India, Zonal Office, Calcutta.
- Shri S.K. Mishra, Assistant Development Officer, Syndicate Bank, Calcutta.
- Shri B.K. Datta, Chairman, Howrah Grameen Bank, Howrah.
- Shri R.C. Pandey, Chairman, Bardhaman Grameen Bank.
- Shri B.B. Sinhabahu, Chairman, Mallabhum Grameen Bank.
- Shri S.N. Sanyal, Chairman, Nadia Grameen Bank.
- Shri N. Bisnal, Managing Director, Orissa State Co-operative Bank.
- Shri R. Patrao, General Manager, Orissa State Co-operative Bank.
- Shri Prem Prakash, Chief General Manager, State Bank of India, Bhubaneswar.
- Shri D.V. Raiyani, Zonal Manager, Bank of India, Bhubaneswar.
- Shri B. Ghosal, Chief Manager, Central Bank of India, Bhubaneswar.
- Shri P.K. Patnaik, Deputy Divisional Manager, Syndicate Bank, Bhubaneswar.
- Shri S. Samal, Regional Chief Officer, Andhra Bank, Bhubaneswar.
- Shri V. Adisheshaiah, Chief Officer, Bank of India, Bhubaneswar.
- Shri A.K. Ghosh, Regional Manager, Union Bank of India, Bhubaneswar.
- Shri S.R. Sivaswamy, Regional Manager, Indian Bank, Bhubaneswar.
- Shri B.B. Patnaik, Chairman, Dhenkanal Grameen Bank, Orissa.
- Shri H.C. Ray, Chairman, Kalahandi Grameen Bank, Orissa.
- Shri N. Roy, Chief General Manager, State Bank of India, Patna.
- Shri M.K. Kapur, Zonal Manager, UCO Bank, Patna.
- Shri M.L. Shah, Deputy Zonal Manager, Bank of India, Patna.
- Shri S.M. Mishra, Regional Manager, Allahabad Bank, Patna.
- Shri H.P. Sharma, Chief Divisional Manager, Central Bank of India, Patna.

Shri S.C. Basu, Regional Manager, United Bank of India, Patna.
 Shri G. Narayanan, Zonal Manager, Punjab National Bank, Patna.
 Shri R.K. Shukla, Chairman, Bhojpur Rohtas Grameen Bank, Bihar.
 Shri Subhash Chandra Chaturvedi, Managing Director, U.P. State Co-operative Land Development Bank, Lucknow.
 Shri O.P. Tyagi, Managing Director, U.P. State Co-operative Bank, Lucknow.
 Shri G.R. Rai, Assistant General Manager, Allahabad Bank, Lucknow.
 Shri Tandon, Regional Manager, Bank of Baroda, Lucknow.
 Shri D.C. Jauhari, Deputy Chief Officer, Central Bank of India, Gorakhpur.
 Shri Ramji Lal, Lead Bank Officer, State Bank of India, Gorakhpur.
 Shri S.C. Sabherwal, Lead Bank Officer, Bank of Baroda, Faizabad.

Universities and Research Institutions

Dr. B.D. Sharma, Vice-Chancellor, North-Eastern Hill University, Shillong.
 Shri Sen Gupta, Vice-Chancellor, Bidhan Chandra Krishi Viswa Vidyalaya, Calcutta.
 Shri A.N. Bose, Centre for Rural Development, Indian Institute of Technology, Kharagpur, West Bengal.
 Shri Nripen Bandopadhyay, Centre for Studies in Social Sciences, Calcutta.
 Shri R.K. Lahiri, Economic Research Unit, Indian Statistical Institute, Calcutta.
 Shri R.K. Sarkar, Institute of Applied Humanities, Calcutta.
 Dr. A. Halder, Institute of Applied Humanities, Calcutta.
 Shri B. Mishra, Vice-Chancellor, Orissa University of Agriculture and Technology, Bhubaneswar.
 Dr. R.C. Das, Dean, Extension Education and Professor of Horticulture, Orissa University of Agriculture and Technology, Bhubaneswar.
 Shri N. Panda, Professor, Soil Science, Orissa University of Agriculture and Technology, Bhubaneswar.
 Dr. J.K. Roy, Head, Plant Breeding and Genetics, Central Rice Research Institute (CRRI), Cuttack.
 Shri J.P. Kulsha, Head of Entomology Division, IRRI, Cuttack.
 Dr. K.K. Jha, Vice-Chancellor, Rajendra Agricultural University, Bihar.

- Dr. H.R. Mishra, Vice-Chancellor, Birsa Agricultural University, Ranchi, Bihar.
- Dr. M.A. Mohsin, Dean, Faculty of Agriculture, Birsa Agricultural University, Ranchi, Bihar.
- Shri S.P. Sinha, Professor of Economics, Pro Vice-Chancellor, Bihar University, Muzaffarpur.
- Shri S.K. Sinha, Professor of Finance, L.N. Mishra Institute of Economic Development and Social Change, Patna.
- Shri T. Prasad, Director, Water Resources Studies Programme, Bihar College of Engineering, Patna.
- Shri Ghulam Hussain, Vice-Chancellor, Narendra Dev University of Agriculture and Technology, Faizabad, U.P.
- Dr. Kirti Singh, Dean, Narendra Dev University of Agriculture and Technology, Faizabad, U.P.
- Dr. R.P. Singh, Director, Extension, Narendra Dev University of Agriculture and Technology, Faizabad, U.P.
- Dr. T.S. Papola, Director, Giri Institute of Development Studies, Lucknow.
- Dr. A.K. Singh, Department of Economics, Lucknow University.
- Dr. Y.R. Deshmukh, Adviser, Dundayat Research Institute, U.P.
- Dr. N.K. Bajpe, Adviser, Deendayal Research Institute, U.P.
- Dr. Mahatim Singh, Director, Institute of Agricultural Science, Banaras Hindu University, Varanasi.

Non-Officials

- Shri J. Sengupta, President, ASSOCHAM, Calcutta.
- Dr. Bhabatosh Datta, Calcutta.
- Shri P.K. Gupta, Calcutta.
- Dr. P.K. Mukherjee, Calcutta.
- Shri Bidhan Roy Chowdhury, Calcutta.
- Shri Krishna Sarkar, Belurghat, West Bengal.
- Shri K. Mukherjee, Retired Additional Director of Agriculture & Rural Development, Calcutta.
- Swami Athmsathananda, Ramakrishna Mission, Belur Mutt, Howrah, West Bengal.
- Dr. K.L. Bandopadhyay, Director, Krishi Vigyan Kendra, Ramakrishna Ashram, Nimpith, 24-Parganas, West Bengal.
- Dr. S. Chakraborty, Tagore Society for Rural Development.
- Shri S.K. Choudhary, Fertilizer Association of India, Calcutta.
- Shri M. Saha, President, Krishi Chamber of Commerce & Industry, Calcutta.

- Shri Kanai Lal Dey, President, Agro-Input Dealers' Association, Calcutta.
- Shri Satyabrata Mukherjee, Agro-Input Dealers' Association, Calcutta.
- Shri A.K. Das, Agro-Input Dealers' Association, Calcutta.
- Shri B. Bhanji, Agro-Input Dealers' Association, Calcutta.
- Shri P.K. Jalan, Hon. Secretary, West Bengal Pumpset Marketing Association, Calcutta.
- Shri Bakshi H.B. Singh, Divisional Manager, Eastern India Usha Corporation, Calcutta.
- Dr. Gopinath Mohanty, Social Worker, Bhubaneswar.
- Shri Uday Narayan Dev, M.L.A., Member, Agriculture and Forest Consultative Committee, Government of Orissa, Bhubaneswar.
- Dr. D.C. Misra, Ex Vice-Chancellor, Sambalpur University.
- Dr. D. Dehura, Retired Director of Agriculture, Cuttack.
- Shri R.K. Sahu, Retired Chief Engineer, Lift Irrigation.
- Shri S. Mohapatra, Senior Agronomist, Indo-British Fertilizer Education Project, Puri.
- Shri Prabir Pal, President, Orissa Pumpset & Agro-Machinery Marketing Association (OPAMMA).
- Shri Balakrishnan, Treasurer, OPAMMA.
- Fr. M.V. d. Bogart, S.J., Director, Xavier Institute of Social Service, Ranchi.
- Shri C.G. Mukherjee, Muzaffarpur.
- Shri M.P. Khema, Special Officer, Krishi Gram Vikas Kendra, Ranchi.
- Shri Mahesh Sharma, Secretary, Vikash Bharti, Bishnupur, Near Ranchi.
- Sister Vandana, Manager, Catholic Church, Sokho, Monghyr District, Bihar.
- Shri P.N. Tiwari, Secretary, Rajendra Smarak Gram Vikas Nidhi, Patna.
- Shri Bhagwan Prasad, Secretary, Bihar Vikas Mandal.
- Shri S.K. Sinha, Ex-Manager, Reserve Bank of India, Patna.
- Shri A.B. Kulkarni, Manager, Marketing, Kirloskar Oil Engines Ltd., Pune.
- Representatives of Pumpset Dealers at Patna and Lucknow.

Note: The Committee has met a number of persons during its visits to the States/Districts, including District Collectors/Magistrates, local officials, bankers, farmers, knowledgeable persons, etc. The list of persons given in this Appendix is not exhaustive.

APPENDIX 4

List of Persons who Submitted Notes to the Committee

- Shri J. Sengupta, President, ASSOCHAM, Calcutta.
- Dr. B.D. Sharma, Vice-Chancellor, North-Eastern Hill University, Shillong.
- Shri Laxmi Narayan, Director, Agricultural Economics Research Centre, Delhi.
- Dr. G.R. Bhatia, Marketing Adviser, Government of India, New Delhi.
- Shri K. Vishwanathan, Manager, Central Warehousing Corporation, Faridabad.
- Dr. H.K. Pande, Director, Central Rice Research Institute (CRRI), Cuttack.
- Dr. M. V. Rao, Head, Extension, Communication and Training, CRRI, Cuttack.
- Shri Sunil Sud, Director, (Machinery), Ministry of Agriculture, Government of India, New Delhi.
- Dr. R.P. Singh, Project Director, All-India Coordinated Research Project for Dryland Agriculture, Hyderabad.
- Dr. R.B. Prasad, Project Director, All-India Coordinated Research Project for Dryland Agriculture, Hyderabad.
- Shri Sant Dass, Managing Director, NABARD, Bombay.
- Dr. M.V. Gadgil, Chief General Manager, NABARD, Bombay.
- Shri Satish Kumar, Director-General, VVV, NABARD, New Delhi.
- Shri R.G. Dandekar, General Manager, NABARD, Bombay.
- Dr. B.S. Sathe, Deputy General Manager, NABARD, Bombay.
- Shri K. Viswanadha Rao, Deputy General Manager, NABARD, Hyderabad.
- Shri P.V.A. Rama Rao, Deputy General Manager, NABARD, Madras.
- Shri S. Ramamoorthy, Deputy General Manager, NABARD, Bhubaneswar.
- Dr. M.M. Mishra, Deputy Manager, NABARD, Patna.
- Shri K.B. Malkhade, Deputy Manager, NABARD, Bhopal.
- Dr. P.V. Shenoi, Secretary, Agriculture, Government of West Bengal.
- Dr. B. Mandal, Director, Agriculture, Government of West Bengal.

- Shri A.K. Chakraborty, Special Officer and Ex-Officio Secretary, Board of Revenue, Government of West Bengal.
- Shri M.B. Roy, Deputy Secretary, Department of Agriculture, Government of West Bengal.
- Shri S.S. Chattopadhyaya, Special Secretary, Finance Department, Government of West Bengal.
- Dr. S.K. Chakraborty, Tagore Society for Rural Development, Calcutta.
- S/Shri Siddishwar Panchadhayayi, Hashi Ghosh and B.L. Bose, Calcutta.
- Shri R. N. Das, Calcutta.
- Dr. D.K. Mukherjee, Former Additional Director of Agriculture, Government of West Bengal.
- Prof. B.K. Samanta, President, Amar Seva Sangha, Raine, District Midnapore, West Bengal.
- Shri B.C. Sharma, Secretary, Fisheries Department, Government of West Bengal.
- Shri B.P. Bhattacharjee, General Secretary, Paschim Banga Rajya Bhumi jibi Sangha, Calcutta.
- Shri Rama Kasinath, Senior Consultant, National Productivity Council, Regional Directorate, Calcutta.
- Shri T.C. Chaudhari, Project Manager, Tea Board, Darjeeling, West Bengal.
- Shri Arun Kumar Roy, Schooldanga, Bankura District, West Bengal.
- Shri Krishna Sarkar, Belurghat, Calcutta.
- Shri M.K. Sinha, Calcutta.
- Dr. D. Satpathy, Orissa University of Agriculture and Technology, Bhubaneswar.
- Shri S. Mahapatra, Senior Agronomist, Indo-British Fertilizer Education Project, Puri, Orissa.
- Shri R.K. Sahu, Retired Chief Engineer, Irrigation, Government of Orissa.
- Shri Niranjana Rath, Angul, Orissa.
- Shri Rama Prasad Dash, Puri, Orissa.
- State Planning Board, Patna.
- Dr. K.S. Singh, Commissioner-cum-Secretary, Forest and Environment Department, Government of Bihar, Patna.
- Prof. Anup Sarkar, Purulia, Bihar.
- Fr. M. V. d. Bogart, St. Xavier Institute of Social Service, Ranchi, Bihar.
- Shri B. Dayal, Soil Conservation Officer, Government of Bihar. Patna.

Shri R.N. Prasad, Ex-Deputy Director, Soil Conservation, South Chhotanagpur Range, Ranchi, Bihar.

Shri G. Mohiuddin, Superintending Engineer, Sone Command Area Development Authority, Patna.

Rajendra Agricultural University, Pusa, Samastipur District, Bihar.

Birsa Agricultural University, Kanke, Ranchi, Bihar.

Shri A.K. Mishra, Messina Beej (Pvt.) Ltd., Samastipur, Bihar.

Shri Rama Shankar Prasad, State Bank of India, Arrah, Bhojpur District, Bihar.

Shri Sarayu Prasad Modi, Secretary, Aramafala Sabji Udpadak Sahayog Samiti, Arama, Bihar.

Shri Gajadhar Sah, Pira Latif, Khajaria District, Bihar.

Shri Saryug Jha, Bahadurpur, Samastipur District, Bihar.

Shri Avinash Palwankar, Regional Manager, Regional Office, Kirolskar Oil Engines Ltd., Patna.

Dr. Mahatim Singh, Director, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, U.P.

Dr. B.N. Tyagi, Director of Agricultural Statistics, Government of U.P., Lucknow.

Dr. J.C. Budhraja, Director, Area Planning Division, State Planning Institute, Lucknow.

Dr. M.A.N. Moezuddin, UNCHWA, Gorakhpur, U.P.

APPENDIX 5

The Andhra Pradesh Irrigation Utilisation and Area Development Act, 1984 — Relevant Extracts

Constitution of the Command Area Development Authority and its Functions

(i) As soon as, may be after the commencement of this Act, the Government may by notification, constitute a Command Area Development Authority for the development of each command area or two or more command areas or any parts thereof, which shall consist of such members as may be specified therein;

(ii) The Command Area Development Authority shall be a body corporate by the name "Command Area Development Authority" of (name of the area to be specified), having power, subject to provisions of this Act, to acquire, hold and dispose of property, both movable and immovable, and to contract, and shall, by the said name, sue and be sued;

(iii) The Command Area Development Authority shall have the following functions, namely :

(a) to formulate and implement schemes for the comprehensive development of the command area or command areas;

(b) to ensure integrated utilisation of water flows;

(c) to coordinate work relating to command area development;

(d) to arrange systematic land development, including planning, construction and maintenance of field channels, field drains, farm roads and ayacut roads;

(e) to ensure propagation, demonstration and implementation of improved water management techniques and the education and training of farmers in irrigated agriculture;

(f) to enforce a proper system of rotational water supply as specified in Warabandi and fair distribution of water to individual fields;

(g) to formulate conjunctive use of surface and ground-water;

(h) to prevent land erosion and waterlogging;

(i) to select and introduce a suitable cropping pattern;

(j) to strengthen agricultural extension activities;

(k) to arrange agricultural credit facilities for systematic land development and agricultural production in the select command areas;

(l) to improve the supply of other agricultural inputs;

(m) to ensure creation and development of marketing, processing and warehousing facilities;

(n) to diversify agriculture and to develop activities, like animal husbandry and protein production;

(o) to lay out schemes for town-planning and development of growth centres;

(p) to receive, borrow and lend moneys by or on behalf of it, which are necessary for the due discharge of its functions, and also to recover moneys due to it or on its behalf;

(q) to determine the payment of amount as provided in sub-section (8) of section 13; and

(r) to do such other acts, not inconsistent with the provisions of this Act, as may be prescribed.

(iv) The Command Area Development Authority shall exercise such powers and control as it deems necessary, over the officers and authorities functioning within its jurisdiction, including the power to give directions for the purpose of carrying out the provisions of this Act, and every such officer or authority shall comply with all such directions.

Appointment of a Commissioner

(i) There shall be appointed by the Government by notification, a Commissioner of Command Area Development for the State of Andhra Pradesh to be in charge of Command Area Development in the whole of the State. The Government may, by notification, also appoint as many persons as they consider necessary to exercise the powers and perform the functions of the Commissioner under this Act in relation to such command areas as may be specified in the said notification.

(ii) The Commissioner shall exercise general control and superintendence over the Credit Officer, Irrigation Officer and Land Development Officer in the performance of their functions under this Act or the rules made thereunder.

Constitution of a Pipe Committee and its Functions

(i) There shall be a pipe committee for each pipe outlet consisting of a president, who shall be the chief executive authority of the pipe committee and such number of members as may be prescribed. The president and the members of each pipe committee shall be elected by the landholders under the pipe outlet from themselves in such manner as may be prescribed. The term of office of the members including the president of the pipe committee shall be one year from the date of assumption of their respective offices.

(ii) The procedure to be followed at the meetings of the pipe committee, the powers and duties of the president and the disqualifications and removal of the president and members thereof, shall be such as may be prescribed.

(iii) The pipe committee in which the power to administer and supervise the irrigation system under the pipe outlet concerned vests, shall be responsible to perform the following, among other functions, namely :

(a) the construction, maintenance, repair and upkeep of the irrigation system under the pipe outlet at the cost and expenses of the land holders;

(b) to carry out obligations on behalf of the land holders, if the land holders fail to do so, and recover costs thereof from them in such manner as may be prescribed;

(c) to enforce warabandi and to regulate supply of water for irrigation to each land holding by turns or rotation according to the time schedule approved by the Irrigation Officer;

(d) to regulate and control water supply for irrigation by volumetric measurement in the manner specified by the Irrigation Officer;

(e) to prevent unauthorised and unlawful use of water for irrigation;

(f) to supervise the irrigation system with a view to preventing waste of water and damage to the system; and

(g) to perform such other functions as may be prescribed.

Irrigation Officer to Carry out Works on Failure of Pipe Committee

If the pipe committee fails to carry out obligations on behalf of the land holders as required by or under this Act, the Irrigation Officer may, after giving notice to the pipe committee, carry out the said obligations and recover the costs thereof from the land holders in the manner provided in Section 5 of the Act.

The Government may, in order to carry out the purposes of this Act, by notification constitute such board, committee or other body for one or more command areas or any parts thereof as may be specified therein, and invest the board, committee or body so constituted with such powers and functions as they may deem fit.

Obligations of Landholder

(i) Every land holder under a pipe outlet shall be responsible

(a) to carry out systematic land development at his cost, according to the scheme formulated by the Land Development Officer;

(b) to maintain the irrigation system under the pipe outlet in good repair, at his cost, proportionately as prescribed;

(c) to use water for irrigation economically and without wastage by adopting such techniques and regime as may be prescribed.

(ii) It shall be the duty of land holder to take steps to maximise production from his land by adopting such scientific and modern techniques of farm management as may be notified from time to time by such authority, as may be prescribed.

(iii) Every land holder shall take such precautionary and preventive measures as may be necessary so as not to cause damage to the adjacent land holdings.

Systematic Land Development

(i) All lands comprising the command area under a pipe outlet shall form into a single unit for purposes of —

(a) systematic land development;

(b) maintenance and upkeep of irrigation system.

(ii) The Commissioner may, by notification, specify the command areas under his jurisdiction in which all or any of the works under systematic land development shall be taken up in one or more instalments and also specify the officers for command area development works in such command areas.

(iii) (a) Whenever it appears to the Government that the construction of field channels is expedient for the supply of water to the lands immediately after or simultaneously with the availability of water in the main irrigation system, the Government may, by notification, declare the command area under an irrigation system, or project or source for the purpose of applying the provisions of this section.

(b) On the issue of the notification, the Land Development Officer shall have power to enter upon any land and make survey of such land to determine the most suitable alignment for the field channel so as to convey water to every land under a pipe outlet and mark out the land which, in his opinion, is necessary for the construction of the field channel.

(c) The Land Development Officer shall thereupon publish a scheme in the prescribed manner giving details of the lands through which the field channel is proposed to be taken and specifying the areas and the names of persons likely to be affected.

(d) Every person likely to be affected may submit a petition to the Land Development Officer stating his objections, if any, to the proposed construction of the field channel within fifteen days of publication of the scheme. The Land Development Officer shall finalise the scheme after considering the objections, if any, and publish it in the manner prescribed. An appeal against an order of the Land Development Officer may be filed before the District Collector within fifteen days of the publication of the scheme.

(e) The Land Development Officer shall, after the expiry of the period of appeal, or where an appeal is filed before the District Collector, subject to the result of appeal, cause the field channel to be constructed so as to convey water to every land under a pipe outlet.

(f) Notwithstanding anything in the Land Acquisition Act, 1894, it shall be lawful for the Land Development Officer to enter upon lands required for the construction of field channel and to cause construction of the field channel as if a declaration had been made by the State Government for the acquisition thereof under section 6 of that Act and as if the State Government had thereupon directed the Collector to take order for the acquisition of such land under section 7 of the said Act and as if the State Government had issued orders for immediate possession being taken under section 17 of the said Act.

(g) The Land Development Officer shall, after the construction of the field channel, fix the boundary marks in the prescribed manner and thereupon the ownership of such land shall vest in the Government.

(h) When the land through which the field channel passes is not benefited therefrom, the owner of such land shall be paid an amount calculated at the rate at which the land required for construction of field channel at the nearest point from which the pipe outlet has been taken, has been acquired :

Provided that where question arises as to whether the amount payable under this sub-section corresponds to the market value of the land, it shall be referred to the District Collector, whose decision thereon shall be final.

(i) Notwithstanding that the cost of construction of the field channel is met by the Government, the responsibility for maintenance of the field channel shall vest with the pipe committee and the beneficiaries of the field channel shall not acquire any right other than that of user only.

(j) Any person, resisting the exercise of the powers, or having control over the property fails to give all facilities for their being exercised, shall be deemed to have committed an offence under Section 188 of the Indian Penal Code, 1860.

Power to enter and Survey, etc.

(i) The Land Development Officer, or any person authorised by him in this behalf may

(a) enter upon any land in the command area of an irrigation system or lands adjacent thereto and undertake survey or take levels thereon for preparing scheme for systematic land development;

(b) dig and bore into top-soil or sub-soil and collect soil samples for technical investigation;

(c) make and set up suitable land marks and level marks for the said purpose;

(d) do all other acts necessary for the proper conduct of any inquiry or investigation relating to any existing or proposed scheme for comprehensive command area development;

(e) enter upon any land or building and cut down and clear away jungle, fence or any part of standing crop or other obstruction for the purpose of regulating the use of water supplied or inspection or measurement of the lands irrigated thereby and of doing all things necessary for the proper regulation and management of land and water :

Provided that if the Land Development Officer or other person authorised proposes to enter into any building or any enclosed court-yard attached to a dwelling house, he shall give the occupier of such building or court-yard at least, a day's notice in writing of his intention to do so, if the occupier denies entry on oral request.

(ii) Save as otherwise provided by the rules made in this behalf, no person shall be entitled to any compensation for loss or damage sustained by him by reason of any action taken by the Land Development Officer or other person authorised in pursuance of his powers under this section.

Preparation of Scheme for Systematic Land Development

(i) The Land Development Officer shall, as soon as may be after the issue of notification under the Act hold a meeting of land holders in the unit and after hearing their views, cause the preparation of a suitable scheme for systematic land development.

(ii) Any scheme so prepared shall amongst other matters, set out the estimated cost of the scheme a sketch plan of the area proposed to be covered under the scheme and the particulars of the site of the pipe outlet re-localisation or re-alignment of the pipe outlet and re-alignment of the existing irrigation system, survey numbers covered, field boundaries, as existing and as proposed, the extent required for the irrigation system and the land holders to be benefited and other persons affected thereby.

Implementation of Systematic Land Development Scheme

(i) After the approved scheme has been published by the Land Development Officer, or where proceeding is pending before the District Collector after it has been disposed of, the Land Development Officer shall give notice in such manner as may be prescribed; that the works in the approved scheme shall be executed within such time and through such agency appointed by him, as may be specified therein.

(ii) As soon as may be after the notice is given under subsection (1), the Land Development Officer shall call upon every

land holder, whose land is likely to be benefited by the approved scheme, by an order made in this behalf, to deposit, within, one month from the date of the order, his share of the estimated cost of the work in the approved scheme with the Land Development Officer for executing the scheme; and every such land holder shall deposit the same within the period specified therefor. The Land Development Officer shall thereupon take up the work according to the approved scheme.

(iii) On completion of the work, the Land Development Officer shall give to the land holder notice of completion of the work and the cost of execution of the work according to the approved scheme, and demand the deposit of such further sum, if any, as may be payable by the land holder with the Land Development Officer.

Acquisition of Land for Irrigation System under a Pipe Outlet

(i) Notwithstanding anything to the contrary in any law for the time being in force, it shall be lawful for the land holders under a pipe outlet to agree —

(a) to establish an irrigation system on their lands without payment of compensation for the land occupied by such a system; or

(b) to bear a cut in their holdings in proportion to the extent of their holdings in lieu of the amount fixed for the land occupied by the irrigation system, by readjustment of field boundaries.

(c) Where the land holders under a pipe outlet do not so agree to part with their lands required for the irrigation system without payment in cash the Land Development Officer may fix the amount payable for such lands, and the amount so fixed shall form part of the estimated cost of the approved scheme and be paid to the affected land holders according to the area occupied by the irrigation system.

(d) Any person aggrieved by the amount fixed by the Land Development Officer may prefer an appeal, within fifteen days from the date of communication of an order in that behalf, to the

District Collector. A second appeal against an order of the District Collector may be filed before the Commissioner within fifteen days from the date of such order.

Preparation of Records after Systematic Land Development

(i) The Land Development Officer shall prepare in the prescribed manner a record containing particulars as to the irrigation system and the adjusted boundaries of land holdings under a pipe outlet after execution of the systematic land development scheme and cause the same to be published in such manner as may be prescribed.

(ii) The District Collector shall have the power to correct any error or rectify any mistake in the particulars contained in the said record.

(iii) Every particular in the said record shall be evidence of the matter referred to therein and shall be presumed to be correct until the contrary is proved or until a new particular is entered in the said record in accordance with the provisions of this Act or any other law for the time being in force.

Power of Irrigation Officer to Regulate Irrigation System

(i) The Irrigation Officer shall, having regard to the availability of water and other factors have power to regulate the supply of water from an irrigation system upto and below a pipe outlet and specify :

- (a) the time for letting out water for irrigation;
- (b) the duration of supply;
- (c) the quantity of supply; and
- (d) the different areas to be supplied at different times.

Explanation : Water shall be deemed to have been supplied if it is made available, whether or not it is used for irrigation of land under a pipe outlet.

Liability for Unlawful use of Water or when Water Runs to Waste

(i) If water supplied from an irrigation system is put to unauthorised or unlawful use, the person by whose act or negligence such use has occurred, or if such a person cannot be identified, the person or all the persons on whose land water has flowed and the land is benefited therefrom, or the person or all the persons chargeable in respect of the water supplied from such irrigation system, shall be liable, severally or jointly as the case may be, for the imposition of such charge as may be levied by the competent authority therefor under the relevant law for the time being in force.

Explanation : For the purpose of this section, the use of water for irrigating an area in the following manner shall constitute unauthorised or unlawful use, namely :

- (a) when an area is not localised under an irrigation system;
- (b) when an area which is localised as irrigated dry, is irrigated as wet;
- (c) when an area localised for a single crop is irrigated for a double crop;
- (d) when an area which is localised for one particular season is irrigated in the season for which it is not so localised;
- (e) when an area is irrigated unauthorisedly by breaching or cross bunding an irrigation system;
- (f) when an area is irrigated by pumping water without prior permission of the Irrigation Officer;
- (g) when an area is irrigated with a crop in contravention of cropping pattern specified;
- (h) When an area is irrigated otherwise than in accordance with the schedule of water distribution.

(ii) Where water supplied through a field channel is allowed by person to run to waste, the person by whose act or negligence such water was allowed to run to waste, or if, after inquiry such

person cannot be found, the person or all the persons chargeable in respect of the water supplied from such irrigation system, shall be liable, severally or jointly, as the case may be, for the imposition of a charge which shall be made in the prescribed manner in respect of the water so wasted.

(iii) The levy of charges for unauthorised or unlawful use of or wastage of water shall not be a bar for launching prosecution for any offence connected with such use or waste.

(iv) All charges for the unauthorised or unlawful use or for waste of water may be recovered as water rates, in addition to the penalties imposed on account of such use or for waste of water.

(v) Any question arising under this section shall be decided by the Irrigation Officer and any person aggrieved by the order of the Irrigation Officer may prefer an appeal to the District Collector within fifteen days from the date of making of the order. A second appeal against an order of the District Collector may be filed before the Commissioner within fifteen days from the date of such order.

Stoppage of Water Supply

(i) It shall be lawful for the Government or any officer authorised by them in this behalf to stop the supply of water to any land holding or field channel or to any person who is entitled to such supply under all or any of the following circumstances, namely :

(a) whenever and so long as it is necessary to stop such supply for the purpose of executing any work ordered by the competent authority;

(b) whenever and so long as any field channel by which such supply is received is not maintained in such repair as to prevent the wasteful escape of water thereof;

(c) whenever and so long as it may be necessary to do so in order to prevent the wastage or misuse of water;

(d) during the periods fixed, from time to time, by the Irrigation Officer of which due notice has been given;

(e) whenever there is diminution in the supply of water in the irrigation system due to any natural or seasonal causes and thereby so long as it is necessary to do so;

(f) whenever there are floods or heavy rains in the command area and thereby so long as it is necessary to do so.

(ii) No claim shall be allowed against the Government for compensation in respect of any damage arising out of :

(a) deterioration in climate or soil; or

(b) stoppage or diminution of the supply of water where such stoppage or diminution is due to —

any cause beyond the control of the authority in charge of the irrigation system;

the execution of any repairs, alterations or additions to the irrigation system;

any measures considered necessary by the Irrigation Officer for regulating the proper flow of water in the field channel or for maintaining the established course of irrigation; or

circumstances mentioned in clauses (a) to (f) of subsection (1).

Supply of Water for Irrigation of One or More Crops

Where water from an irrigation system is supplied for the irrigation of one or more crops specified by the Irrigation Officer, the right to use such water shall be deemed to continue only until such crop or crops shall come into maturity, and to be lawful only in respect of such crop or crops.

Settlement of Disputes Regarding Distribution of Water

(i) Whenever a dispute arises between two or more land holders in regard to their natural rights or liabilities in respect of the use or maintenance of the field channels, any such land holders may apply in writing to the pipe committee stating the matter in dispute.

(ii) On receipt of an application under sub-section (1), the pipe committee shall give notice to the other persons interested to appear before it on a day to be specified in such notice, and shall proceed to enquire into such matter, and after the enquiry, the pipe committee may try to bring between the parties and if such compromise could not be brought, it shall, after hearing the parties concerned pass such order as it deems fit.

Provided that if any dispute arises between the land holders and the pipe committee regarding the sharing of costs to be borne by one or more land holders, any such land holder may, after paying the costs apportioned to him by the pipe committee, prefer an appeal to the Irrigation Officer within seven days of such payment, and the Irrigation Officer shall after giving an opportunity to the aggrieved land holders, decide the pro-rata sharing of expenses between the land holders and his decision thereon shall be final and binding on all the land holders.

(iii) The Irrigation Officer within whose jurisdiction the pipe outlet is situated, may *suo-motu* or on an application made in this behalf by an aggrieved person within fifteen days from the date of the order passed by the pipe committee under sub-section (2) revise such order.

Provided that where the pipe committee does not pass an order within fifteen days from the date of receipt of an application under sub-section (1), the Irrigation Officer may himself pass an order on the matter in dispute.

Localisation of Command Areas and Regulation of Cropping Pattern therein, etc.

(i) Subject to such rules as may be made in this behalf, the Government may, having regard to resources of land and water, nature of soil, climate and other technical considerations, by an order, specify for each command area principles of localisation for the purpose of irrigation.

(ii) The Government may, having regard to the advancement in technology of land and water management and other agronomic practices, alter, from time to time by an order, the principles of localisation so specified for any command area.

Explanation : The term 'principles of localisation' shall include the prescription of season of the irrigation, the type of irrigation, such as wet, irrigated dry, double crop, or single crop, or perennial irrigation.

Subject to such directions as may be issued from time to time by the Government, the District Collector, may, in any year, having regard to the quantity of water available in any irrigation system within his jurisdiction, classify, by an order, within such time and in such manner as may be prescribed, lands under the said irrigation system for the purpose of raising such kind of crops on each class of land as may be specified in the order, and regulate the supply of water for irrigation accordingly.

Power to Prohibit Growing of Certain Kinds of Crops and to Regulate the Period of Sowing and Duration of Crops

(i) Whenever the Government are satisfied that for the better cultivation of land and the optimum utilisation of water resources of an irrigation system or for accelerated land development or for any other reasons, it is expedient in public interest to regulate the cropping pattern, the period of sowing and the duration of crop, they, may, by notification, make a declaration to that effect :

Provided that such person may grow any crop other than the crop prohibited under this section with the utilisation of water from his own source subject to such conditions and restrictions as may be prescribed.

(ii) On the making of a declaration under sub-section (1), the Director of Agriculture may specify by notification published in such manner as may be prescribed, the kinds of crops that shall not be grown on any land under such irrigation system and the periods of sowing and duration in respect of non-prohibited crops thereof.

(iii) On the publication of a notification under sub-section (2), no person shall grow any such crop as is prohibited by the notification on any land under such irrigation system and no person shall sow or plant any other crop at any period or allow such crop to remain beyond the duration, specified in respect thereof in such notification.

Power to Levy and Collect Road Cess

(i) For the purpose of laying out the roads within the command area and their proper upkeep and maintenance, it shall be lawful for the Government to levy and collect road cess in the form of a tax on lands in the command area from the land holders who, in their opinion, are benefited or are capable of being benefited by any scheme undertaken under this Act.

(ii) The rate at which the road cess shall be levied, the manner of assessment and realisation of road cess and the utilisation of such road cess shall be such as may be prescribed :

Provided that such rate of road cess shall not exceed rupees twelve and paise thirty five per hectare of land in the command area.

Credit Facilities

Any land holder included in the scheme for systematic land development may apply to financing agency selected by the Credit Officer to provide credit facility to the land holder and the said financing agency may advance loans to the land holder through the Command Area Development Authority or its nominee, for executing the scheme for systematic land development.

Loans to Ineligible and Recalcitrant Land Holders

(i) Where a land holder is ineligible to obtain credit under the normal rules of the financing agency relating to advancing of loans, the Credit Officer shall arrange for the grant of special loan to such ineligible land holders by such agency as may be selected by him.

(ii) The said agency shall advance special loans to the ineligible land holders through the Command Area Development Authority or its nominee, for executing the scheme for systematic land development, from out of the fund created by the Government for the purpose.

(iii) Where any land holder included, in the scheme for systematic land development is unwilling either to deposit the money as required under sub-section (2) of Section 16 of the Act or to incur

the expenditure by himself, or to obtain credit facility under Section 28 or sub-section (1) of this Section, for the systematic development of his land, the Credit Officer shall select a financing agency, or any other agency, for the purpose of advancing such amount as may be required towards the cost thereof to the Command Area Development Authority which shall be treated as the borrower. The Land Development Officer or the nominee of the Command Area Development Authority shall receive the said amount on its behalf for the development of the lands of such land holder and the said amount shall, notwithstanding anything in any other law for the time being in force, be deemed to have been advanced as a loan or special loan by the aforesaid agency to the land holder concerned, as if he had applied for such loan.

Provided that where the aforesaid agency is the Co-operative Agricultural Development Bank, the said amount shall be deemed to have been advanced as a loan by the said bank to the land holder concerned, as if he were a member eligible for such loan.

Creation of Charge on Land

(i) Notwithstanding anything in any other law for the time being in force, where a financing agency or other selected agency, as the case may be, advances a loan or a special loan or such loan is deemed to have been so advanced, such loan or special loan shall, subject to any claim of the Government in respect of land revenue have a first charge on the land included in the scheme for systematic land development for the purpose of recovery of such loan and where the aforesaid agency is the Co-operative Agricultural Development Bank, the loan amount may be recoverable in the manner provided by Sections 101 to 106 of the Andhra Pradesh Co-operative Societies Act, 1964.

(ii) Where on the implementation of the scheme for systematic land development, the extent or the boundaries of the land under any mortgage gets altered, such altered land shall alone form the substituted security for the land mortgaged.

(iii) If, in the opinion of the Government, it is necessary in the public interest so to do, they may, by notification and subject to such restrictions and conditions as may be specified in such notification, reduce or exempt in respect of any financing agency or

of such institution or person as may be notified by the Government in this behalf

(a) the stamp duty with which, under any law for the time being in force, instruments executed by or on behalf of a financing agency or the institution or person aforesaid pertaining to the business of such financing agency, institution or person in so far as it relates to matters provided under this Act or any clause of such instruments, are respectively chargeable; and

(b) any fee payable under the law relating to registration for the time being in force or court fees.

Registration of Document Executed on Behalf of a Financing Agency, etc.

(i) Notwithstanding anything in the Registration Act, 1908, it shall not be necessary for any officer of a financing agency or any institution, or person referred to in Section 32 of the Act to appear in person or by agent at any registration office in any proceedings connected with the registration of any instrument executed by him in his official capacity pertaining to the business of such financing agency, institution or person in so far as it relates to matters provided under this Act, or to sign as provided in Section 58 of that Act.

(ii) Where any instrument is so executed, the registering officer to whom such instrument is presented for registration may if he thinks fit, refer to such officer as is referred to in sub-section (1), for information in regard thereto, and on being satisfied of the execution thereof, shall register the instrument.

Offences and Penalties

(i) Whoever, voluntarily and without proper authority, does any of the following acts, that is to say :

(a) damages, alters, enlarges, or obstructs any irrigation system;

(b) interferes with, increases, or diminishes the water supply in, or the flow of water from, through, over or under any irrigation system;

(c) being responsible for the maintenance of the irrigation system under a pipe outlet neglects to take proper precautions for the prevention of wastage of the water thereof or interferes with the authorised distribution of water therefrom or uses water in an unauthorised manner, or in such manner as to cause damage to the adjacent land holdings;

(d) corrupts or fouls, water of any irrigation system so as to render it less fit for the purposes for which it is ordinarily used;

(e) obstructs or removes any level marks or water guage or any other mark or sign fixed by the authority or a public servant;

(f) opens, shuts, or obstructs or attempts to open, shut or obstruct any sluice or outlet or any other similar contrivance in any irrigation system;

(g) uses water unlawfully or unauthorisedly or agrees or allows to grow any crop in contravention of any notification under this Act, shall be liable for conviction before a Magistrate.

(2) Any person who is convicted for the offences under subsection (1) shall —

(i) for the first offence, be punished with fine which may extend to five hundred rupees

(ii) for a second or subsequent offence, be punished with imprisonment for a term which may extend to three months or with fine which shall not be less than two hundred rupees, but may extend to one thousand rupees or with both.

(3) Whoever contravenes any of the provisions of Section 8 or Section 9 or Section 10 shall be liable for conviction before a Magistrate and shall be punished with a fine which may extend to five hundred rupees.

(4) In case of continuing offence, a fine not exceeding fifty rupees per day shall be imposed during the period of continuance of the offence.

Obligation of Landholders of Land Adjacent to Notified Command Area

Where, for safety of an irrigation system in the notified command area and for other technical reasons, it is considered necessary to take any soil conservation measures, like contour bunding and trenching, in lands adjacent to the lands under the notified command area, the Land Development Officer shall have and exercise all the powers under the Andhra Pradesh (Andhra Area) Land Improvement Schemes (Contour Bunding and Contour Trenching) Act, 1949 and the Andhra Pradesh (Telangana Area) Land Improvement Act, 1953, or any other similar law for the time being in force in respect of soil conservation measures required to be taken therein.

Recovery of Dues as Arrears of Land Revenue

Whenever any sum is due to be paid by any person under this Act and the sum has not been paid within the time specified for such payment, it shall be recoverable with interest at such rate as may be prescribed, as an arrear of land revenue.

APPENDIX 6

The West Bengal Inland Fisheries Act, 1984 — Relevant Extracts

Conservation and Propagation

1. (i) The State Government may, for the purpose of conservation and propagation of fish, by notification restrict, for any specified area and for a specified period, fishing of specified size, group or species of fish, and may by rules regulate the conservation and propagation of fish including the following :

- (a) the erection or use of fixed engine;
- (b) the construction, temporary or permanent, of any weir, dam or bundh; and
- (c) the dimension and kind of any net or size of any mesh or any other fishing contrivance, and the mode of using them.

(ii) No person shall construct any dam, barrage, bundh or barrier of any kind whatsoever on a flowing river without making provision for fish-pass or fish ladder of such description and in such manner as may be directed by the competent authority.

2. No person shall, without obtaining permission from the competent authority, catch fish by angling in such area as the State Government may by notification specify.

3. If any person uses any dynamite or other explosive substance or puts any poison, lime or noxious material in any fishery or other water area with intent to catch or destroy any fish therein, he shall be punished with imprisonment for a term which may extend to six months, or with fine which may extend to two thousand rupees, or with both.

Protection of Fish

4. (i) No person shall discharge into any flowing water or any confined water area any industrial waste, sewage or other polluting substance that may affect the health or life of fish or cause

destruction of fish, or act in contravention of any rules regulating the protection of fish.

(ii) Any person causing pollution of any flowing water or any confined water area in contravention of the provisions of sub-section (1) shall be directed by the State Government for the prevention of such pollution within a specified time, failing which the State Government shall take such measures as it may think fit for the prevention of such pollution, and the entire cost in this behalf or any part thereof shall be recovered from such person.

(iii) Without prejudice to the provisions of the foregoing sub-section, any person causing pollution of any flowing water or any confined water area may also be prosecuted and shall, on conviction, be punished with imprisonment for a term which may extend to six months, or with fine which may extend to ten thousand rupees, or with both.

Breed Fish Management

5. The State Government may prescribe by rules the minimum age, length and weight of fish that shall be used for induced breeding for any purpose other than scientific research.

Proper Utilization of Multi-ownership or Other Tanks for Pisciculture

6. (i) If the competent authority, on receipt of an information or on his own motion or otherwise, is satisfied that a multi-ownership tank is not utilized in accordance with the prevailing norms of pisciculture and that it is necessary for any public purpose so to do, he may, after giving one month's notice to the owner and the possessor of such tank, by order in writing take over the management and control of such tank.

(ii) The management and control of such tank may be transferred by the competent authority to any person for proper utilization of such tank in such manner as may be prescribed.

(iii) Every co-sharer or co-owner of a multi-ownership tank shall be entitled to receive rent for taking over the management and control of such tank by the competent authority at such rate as may be determined by that authority in a manner prescribed.

(iv) The management and control of a multi-ownership tank may be taken over under sub-section (1) for the period not exceeding 15 years or transferred to any person under sub-section (2) for a period not exceeding 10 years at a time.

(v) If the person referred to in sub-section (ii) fails to utilize the multi-ownership tank in accordance with the prevailing norms of pisciculture, the competent authority may, after giving notice to such person, resume the management and control of such tank without payment of any rent or compensation to such person, and such tank may thereafter be managed by the competent authority or transferred to some other person for pisciculture.

(vi) The provisions of this section shall apply, *mutatis mutandis*, to any tank owned or possessed by a single person, or a tank owned by the State Government jointly with other person or persons.

Distribution of Sewage Water

7. (i) The State Government may, for the purpose of making an equitable distribution of sewage water for the sewage-fed fisheries, set up a committee with such members as may be prescribed.

(ii) The committee shall exercise such powers as may be prescribed.

Fish Production Group

8. A cluster of fishermen or other persons or both may, for the purpose of efficient production and sale of fish in a collective way, form and register a fish production group in such manner as may be prescribed.

West Bengal Act XXXVIII of 1973

9. Provided that no person who is a member of any fishermen's co-operative society, registered or deemed to be registered under the West Bengal Co-operative Societies Act, 1973, shall be a member of a fish production group.

Building up of Buffer Stock and Levy of Fish

10. (i) The State Government may, if it thinks fit so to do, build up a buffer stock of fish for the purpose of ensuring a steady supply to consumers.

(ii) For the purpose mentioned in sub-section (1) State Government may impose a levy on producers and wholesale dealers of fish at such scale and in such manner as may be prescribed :

Provided that such imposition of levy shall come into force in such areas and in respect of such species of fish as the State Government may by notification specify.

APPENDIX 7

Report of the National Commission on Agriculture (Final Report) — Relevant Recommendations

Re-orientation of Cropping System

1. Appropriate research organisation is required to evolve diversified cropping systems in heavy rainfall areas instead of the mainly mono-cropping system with paddy that exists at present. Allied socio-economic problems and problems relating to soil conservation and maintenance of soil fertility will also have to be studied. (Rec. No. 1).
2. In order to ward off the danger of water scarcity for irrigation of paddy during prolonged spells of drought, shallow wells may be dug in every paddy field in heavy rainfall areas. (Rec. No. 3).
3. Implements and machinery particularly suited to high rainfall areas will also have to be developed. (Rec. No. 5).
4. A farming system designed to cultivate crops in flood-free periods has to be developed for Bihar. The *kharif* crops of rice and jute must be either sown early in order to escape/withstand damage or the varieties should be such as to endure flooding, e.g., deep water rice. (Rec. No. 6).
5. In recognition of the importance of detailed crop planning in meeting the challenge of aberrant weather, as illustrated in the case studies mentioned in the text, similar analysis and contingent cropping plans should be developed for all the 72 drought-prone districts in the country and implemented as farmers' programmes for drought proofing of the areas. (Rec. No. 8).
6. Cultivation of pulses/leguminous crops in rotation or as inter-crops is recommended in canal irrigated tracts for purposes of green manuring and maintenance of soil fertility. (Rec. No. 11).
7. Weed and disease-pest control measures are specially needed to be developed for irrigated conditions and heavy rainfall areas. (Rec. No. 12).

8. Riverbed farming has to be developed as a distinct way of cultivation, specially for vegetables and melons. This has been neglected sphere and, therefore, requires the attention of the scientists and developmental authorities alike. (Rec. No. 13).

9. Scientific investigations into the subject of multiple cropping and crop rotation in various parts of the country have yielded valuable data on new patterns of cropping suitable to the respective areas. There is now a pressing need to make a reappraisal of the various possibilities to evolve cropping systems for covering all kinds of soil, rainfall and irrigation conditions as obtained in every taluk. The cropping systems so determined should be put into operation through active extension efforts and there should be a machinery to assess the progress to effect mid-course alterations according to need. (Rec. No. 15).

Foodgrain Crops

10. Possibilities of cultivation of barley on saline and alkaline lands and *rabi* fallows in Uttar Pradesh and Bihar, need to be explored. (Rec. No. 1).

11. In rice, area should be withdrawn from uplands or other unfavourable situations where irrigation water cannot be provided easily to supplement rain water. (Rec. No. 2).

12. For increasing area under miscellaneous pulses, due consideration should be given to multiple cropping. Offseason cropping in April to June periods in riverbeds and tankbeds should also be given a trial wherever feasible. (Rec. No. 3).

13. There is a need to make a realistic distinction in crop research relating to irrigated and rainfed conditions proportionate to the area obtainable under each condition. For example, a crop like maize requires emphasis on rainfed conditions whereas the emphasis has usually been for irrigated conditions. For wheat, the efforts are also required to be directed towards successful rainfed crop raising, whereas the attention has been mostly given to irrigated crop so far. Crops like barley, jowar and pulses also require attention in research on rainfed conditions. (Rec. No. 21.6.2(1)).

14. Breeders have to provide ample choice with maximum possible diversification of genotypes in the case of wheat in order to

avoid disadvantages of a narrow genetic base throughout the length and breadth of the country and extension workers have to ensure that only a couple of varieties do not catch the fancy of the farmers. (Rec. No. 21.6.2(6)).

15. Rice varieties for the summer sown crop (Feb-May) have to be of early duration, say within 90 days, so that these could finish their life cycle before the onset of South West monsoon. Those for the monsoon crop could have a duration of 90-120 days and October-January sown crop could be even 150-160 days long. Breeders should provide the information regarding the correct yield potential of varieties, when they release the varieties. (Rec. No. 21.6.2.(13)).

16. If irrigation could be assured in the clear season in West Bengal and Orissa, the area under different rice crops could be readjusted giving more weightage to October-January sown crop than at present. (Rec. No. 21.6.2(15)).

17. The main research problems which call for special attention in the case of rice are (a) to fit the varieties as well as agronomic practices to local rainfall rhythm of different parts, (b) water and soil management under excess as well as deficient rainfall conditions and (c) finding suitable varieties for different situations (hills, valleys, plains, etc.) and for different crop seasons. (Rec. No. 27.6.2(17)).

18. It is desirable to improve drainage of maize fields through cultural practices in order to avoid damage due to waterlogging. (Rec. No. 21.6.2(18)).

19. The existing drawback in maize is that the early varieties are low yielders and the high yielding hybrids are too late for the *rabi* crops to be sown in time. This drawback is to be removed through persistent breeding efforts. Response to high population stress and resistance to borers are the other characteristics which have to be kept in view in breeding work. (Rec. No. 21.6.2(a)).

20. Improvement of yield in gram can be achieved by breeding significantly better varieties of this crop and provision of at least one irrigation between sowing time and flowering date according to the exigencies. (Rec. No. 21.6.2(24)).

21. In the case of pigeon pea (arhar or tur), attempts have to be continued to seek for medium duration single season high yielding varieties suitable for different parts and for frost as well as wild resistance. (Rec. No. 21.6.2(25)).

22. Due attention is required to be given to blackgram, greengram, horsegram, moth and many others like cowpea, french bean, dolichos, lablab in order that different conditions of rainfall and soil could be met successfully in different parts. The agricultural universities and State Departments of Agriculture will have to draw up their own strategies concerning typical problems in regard to pulses of their regions. Coordination could be broadly arranged for the peninsula, northern plains, hills and eastern parts. The extension machinery should be made to give top priority to make available to farmers the existing know-how and associated inputs. (Rec. No. 21.6.2.(27)).

Commercial Crops

23. Fifty per cent of the total proposed area for *brassicas* (rapeseed and mustard) should come under irrigation. The crop in Uttar Pradesh should get utmost attention in this respect. (Rec. No. 22.6.1(iv)).

24. Safflower can suit paddy fallows in majority of the paddy growing areas. It can be a fit substitute for lathyrus in Bihar and West Bengal. (Rec. No. 22.6.1(iv)).

25. Soyabean can be considered as one of the substitute crops in such areas where rainfall, though high, is not adequate for paddy all through. It can be considered with irrigation even in other situations in preference to pulses like horsegram. (Rec. No. 22.6.1(vi)).

26. Cotton growing may be encouraged in West Bengal, Bihar and Orissa. In these parts, the crop can be taken during the period December to April and, therefore, can be easily fitted into the paddy fallows. (Rec. No. 22.6.1(x)).

27. Irrigation is at present the most important factor for increasing jute yields and eighty per cent of the proposed jute area is, therefore, recommended to be irrigated. Further, out of the remaining about 50 per cent may be brought within a more assured rain-

fall distribution which in practice involves a showing date not later than the 15th of May. This may be tried on an experimental basis, and for this purpose early maturing varieties may be used. (Rec. No. 22.6.1 (xi)).

Horticulture Crops

28. The imposition of land ceilings would necessitate making available data collected through scientifically conducted experiments with regard to the minimum economic size of an orchard and also with regard to the comparative economics of raising a food or commercial crop as against fruit crops in order to help the farmers determine the proportion of area which they would like to put under fruits. It might also be necessary to give special loans for inducing farmers to go in for fruit cultivation. (Rec. No. 23.9.1(ii)).

29. Orchards of grafted mango can be favoured in all such areas which are easily commanded by the markets, whereas seedling mangoes could predominate in the interior. (Rec. No. 23.9.1(iv)).

30. Besides many other situations, community lands like those of the panchayats and the areas released from shifting cultivation in the States of Bihar (South) and the adjoining areas in Orissa could also be considered for mango planting. Road and canal sides also afford possibilities for this purpose. A study is needed to determine the relative feasibilities and proportion of planting road and canal sides with mango and other kinds of trees. (Rec. No. 23.9.1.(v)).

31. Besides the need for area increase through new plantations, there is urgent need for replacing the non-descript or disease ridden trees in many of the fruit crops through interplanting with the better material and then removing the old ones at an appropriate stage. This specially applies to mango and citrus. (Rec. No. 23.9.1 (xii)).

32. Production of vegetables needs to be undertaken in (a) belts around towns and cities, (b) hills (c) along tanks, lakes, rivers and canals and (d) kitchen gardens in the interior villages and towns and cities. Kitchen gardens in cities and towns could be developed simultaneously with the necessary promotional activities pertaining to vegetable production. (Rec. No. 23.9.1(xv)).

33. Model orchards are required to be established in every district in order to determine the economics of fruit production. These orchards should also be used as centre of practical demonstration in better methods of cultivation. Research work should be intensified in agricultural universities. Establishment of progeny orchards and supply of genetically uniform nursery stock is of utmost importance on the development side. (Rec. No. 23.9.1 (xxvi)).

34. The varieties and seasons of various minor crops like onion, garlic, vegetables, ginger, turmeric and chillies vary from place to place. Hence the research and development work on these crops should be the responsibility of the State Governments. Besides, individual States looking after their own problems, contiguous States can set up suitable inter-State machinery for mutual benefit. (Rec. No. 23.9.3(ii)).

35. Diseases take a heavy toll of chillies and coriander. Therefore, breeding for disease resistance and developing suitable agronomic and plant protection schedules for combating the menace needs to be given special place in research programmes. (Rec. No. 23.9.3 (iii)).

36. In order that seed, fertilizers and plant protection chemicals become available within the financial capacity of small growers, the sale of such inputs in mini-kits should be popularised in the case of vegetables and floriculture. (Rec. No. 23.9.3(iv)).

37. The programme for increased potato production must be accompanied by effective marketing system whereby it becomes possible to distribute the produce to different consuming centres throughout the country in order to avoid gluts in the producing area. It is also necessary to have adequate cold storage facilities for accommodating surpluses which might still remain. (Rec. No. 23.9.4(ii)).

38. Organising the vegetable holdings in a collective manner for making possible large scale mechanised tillage as well as plant protection operations should be the responsibility of the Department of Agriculture/Horticulture. The Government has to assume responsibility for establishing custom services for various kinds of operations either through co-operatives or governmental organisations. Ensuring to individuals the facility of irrigation should

also be the responsibility of the Government. The individual growers should be encouraged to sink wells on joint ownership basis. All possible guidance and assistance in material or finance should also be provided to them. (Rec. No. 23.9.4(xi)).

39. Crop rotations and companion cropping beneficial from the soil point of view could be introduced in vegetable cultivation and in this respect, short statured beans or fodder legumes like bar-seem and lucerne could prove very useful. (Rec. No. 23.9.4(xii)).

Plantation Crops

40. It is possible to increase the area under cashewnut in Orissa. Besides thinking of absolutely new areas for this crop, the plantations from the existing unproductive sites should also be shifted to highly promising ones, both in private as well as in forest lands. Insofar as private lands are concerned, certain incentives like the replanting subsidies, as in the case of rubber, could be given for this crop too. (Rec. No. 24.9.1(ii)).

41. It is worthwhile to examine whether cacao plantations could be established in Orissa. (Rec. No. 24.9.1(v)).

Fodder Crops

42. A systematic survey of waste lands and village common lands should be made to prepare a land use plan as part of social forestry incorporating therein programmes of development of fodders and grasses. The waste lands not covered under social forestry programmes should be developed by the Animal Husbandry Department for additional grazing and production of hay. (Rec. No. 21).

43. While formulating programmes of social forestry on lands on the sides of roads, canal banks and railway lines due regard should be given to the growing of grasses and fodder along with trees. (Rec. No. 22).

44. The existing fodder crop seed promotion farms should be provided with necessary inputs like machinery, equipment, staff, etc., so that maximum production could be achieved. (Rec. No. 35).

45. As the requirement of improved fodder seed is very large, additional fodder seed production farms should be established. A

regular and constant demand for quality seed should be created among cultivators through extension and holding demonstrations on the farmer's field. (Rec. No. 36).

46. Minikit demonstration programme on fodder crops should be initiated on the basis of 'Rice Minikit Programme'. (Rec. No. 37).

47. Agricultural Universities should have separate departments or units devoted to cultivated fodders and pasture grasses. (Rec. No. 39).

48. To achieve the targeted production of fodder, a strong base for undertaking massive extension programme should be created. (Rec. No. 41).

49. In every state, where there are large areas under grasslands and waterlands outside the programme taken up by the Forest Department, the Department of Animal Husbandry should create a separate wing for their development. (Rec. No. 43).

50. Every State should constitute Standing Committees both at the State and district levels for coordination in planning and execution of fodder and grasslands development programme. (Rec. No. 45).

Sericulture

51. Moriculture should be studied for adoption wherever possible in the States of Uttar Pradesh, Bihar and Orissa. Eriiculture should be tried in the States of Bihar, Orissa and Uttar Pradesh. (Rec. No. 1).

52. The agricultural universities should start research, teaching and extension activities in sericulture. It will be necessary to start a sericulture unit for this purpose. This unit may take the form of a full-fledged Division in major sericultural States or it may just be a sub-division of Entomology Division in the other States. (Rec. No. 11).

Apiculture

53. The infrastructure and expertise available with the All-India Khadi and Village Industries Commission and similar State

Boards have to be fully utilised for the production, collection and marketing of honey and honey products. However, the Departments of Agriculture at the Centre and States have to participate with or support fully the Khadi Commission in all the developmental and extension activities relating to apiculture. They should introduce this activity in their set-up. The Departments of Horticulture (wherever they exist separately from Agriculture) and those of Forests will also have to work in collaboration with the Khadi Commission for planning of orchards and forest trees respectively in the interest of bee fauna. Forest Departments have a significant role in the protection of honey bees in the forest areas. (Rec. No. 3).

54. Besides the Central Bee Research Institute, the agricultural universities will have to strengthen research on the subject. Apiculture education and training needs would also increase in future. For research, education and training it will be desirable to develop a section on apiculture under the entomology division of every university. The divisions of plant breeding and agronomy should take due interest in the concerned aspects. (Rec. No. 5).

55. One queenbee multiplication station is required to be established for every 5,000 villages. It is also necessary that such stations associate with their multiplication work the progressive bee keepers and their recognised co-operative societies. Whereas the stations could conveniently work under the universities concerned, a working relationship should be established between the Central Institute and the agricultural universities so that the facilities available at the multiplication stations are also available to the Institute and the Institute is also in a position to exercise control on the methods and quality of queenbee production. Participation of Forest Research Institute is also necessary. It could indicate specifically which type of vegetation should be introduced for the bee fauna in different types of forests including the lands which are going to be under social and production forestry and roadside plantations. (Rec. No. 6).

Research

56. Agricultural Universities shall be fully responsible for basic and applied research in agriculture, animal husbandry and related services and the universities must be given adequate facilities and funds for discharging their obligations as the scientific consul-

tant and adviser to the Department of Agriculture, Animal husbandry, etc. The State Departments should confine themselves only to adaptive research such as varietal testing, fertiliser recommendation based on soil analysis, water duties, etc. and must not use their freedom to develop parallel research organisation in competition with the universities. (Rec. No. 4).

57. Some of the State regional research stations should be placed at the disposal of Universities in such a manner that they have at least one such station for each type of climatic region. (Rec. No. 5).

58. State experimental farms which are meant for demonstration work and for raising seeds, etc. should be exclusively under the control of State Departments, which can utilise them for adaptive research and extension work. But agricultural universities should not be precluded from using them. (Rec. No. 7).

59. The agricultural and general universities and especially the former are entitled to a larger share of research grants in those subjects in which they are still deficient. Attempts should be made to sponsor a large number of research schemes on those subjects. (Rec. No. 10).

60. The research activities in universities which are unable to finance from their own resources are on a low key. In spite of the increasing importance of coordinated projects the ad hoc research schemes coming especially from the universities should be liberally funded. (Rec. No. 13).

61. A large part of the research work in agriculture should be conducted outside the purview of the coordinated projects under the coordinated and individual programmes. (Rec. No. 19).

62. As the workshop is the forum to consider the various problems arising from the researches carried out under the projects and as field acceptability is of great importance in the system of research, it would be desirable to associate the farmers, extension personnel, users and the industry also in the deliberations of the workshops at suitable intervals so as to get a feel of the field problems. (Rec. No. 22).

63. Simple and speedier procedures should be evolved for the sanctioning of the projects especially at the State Department/

agricultural universities level. In addition to the necessity of some flexibility in the allocation of funds, there should be a small grant at the disposal of the project coordinator which could be utilised for unforeseen items of expenditure. (Rec. No. 28).

64. Large scale testing in our view forms part of applied research which should be taken up by the agricultural universities, central research institutes on suitable problems of relevance to the areas in which they are located in close coordination and collaboration with the development agencies. Funding and execution of research problems which are strictly of local nature should be the responsibility of the agricultural universities and State Governments. (Rec. No. 29).

65. Research stations should spread evenly over the different agro-climatic regions. For this purpose they should preferably be of small and medium size having more specific and restricted objectives so that manageability and viability are assured. (Rec. No. 31).

66. The agricultural universities should take up in their stride for carrying out research work, more and more of basic research related to agriculture and formulation of such projects as part of their own research programmes. (Rec. No. 48).

67. A competent administrator should see that men capable of contributing fundamental knowledge are given opportunity and freedom. "Research originating in the minds of scientists" should form an equally important component of the total research effort. (Rec. No. 65).

68. On the one hand, the status and prestige of extension workers should be raised, on the other hand, the research workers must compulsorily go to the field and join hands with the extension workers and see that his research findings are properly applied. (Rec. No. 67).

69. The research council of the agricultural university and the adaptive research council of the State Government should identify the priority areas of basic and long term applied researches which are of importance to the development of agriculture to the State and draw up relevant projects and programmes. The latter

being of direct significance in agricultural development of the state, the State Government should finance them entirely. The two councils should jointly decide upon the more essential programmes and projects and allocate funds accordingly in case of financial constraints. (Rec. No. 70).

70. Considering the importance of contributions the agricultural universities can make towards the upliftment of country's agriculture, the Central Government should give such grants to the agricultural universities as would enable them to establish solid research foundations. As the different agricultural universities are at various levels of research achievement, it would not be desirable to allot them funds on a pro-rata basis. Instead the grants should have to be determined by the individual requirements so that all the agricultural universities come upto a desired level. (Rec. No. 71).

71. One of the ICAR's objectives being to promote agricultural research, it should identify with the help of experts, gaps in knowledge and scope of research in relevant fields and find institutions and scientists competent to take up the needed research work. (Rec. No. 72).

72. Future research efforts should be directed more specifically to:

- (i) varieties of improved crops requiring intermediate doses of inputs for optimisation of yield;
- (ii) dry farming based on optimum water use;
- (iii) pulses, oilseeds, coarse millets, fodder, medicinal plants, vegetables and fruits;
- (iv) mixed farming and use of a suitable mix of animal and mechanical/electrical power, keeping small size of farm in view;
- (v) development of intermediate technologies; and
- (vi) area development programmes, etc. (Rec. No. 77).

Extension.

73. The operational procedure of National Demonstration Programme needs to be streamlined. The staff located at each of the research stations of the agricultural university should be encouraged to conduct the national demonstrations around research stations rather than establishing a separate team of national demonstration specialists in a few selected districts. (Rec. No. 1).

74. The demonstration plots should be within easy reach of the farmers who are expected to benefit by them. There is also need for taking up more of commercial crops in various rotations on demonstration plots so as to meet the needs of different categories of farmers. (Rec. No. 2).

75. Suitable national demonstration programme should be developed for new programmes such as dry farming, fodder development, horticulture and plantation crops which should be the responsibility of the research organisations and the technical experts under the State administration. (Rec. No. 4).

76. The aspects relating to water management technology should form part of the national demonstration programmes. (Rec. No. 6).

77. Greater emphasis is required on systematic test demonstrations or adaptive trials on the farmers' fields in different areas. (Rec. No. 7).

78. It is desirable to have adequately large number of demonstrations to ensure sufficient positive results to change people's minds. There should be greater emphasis on intensive motivational approach while organising these demonstrations through the educational process rather than through subsidies. (Rec. No. 9).

79. Extension workers should be encouraged to organise village meetings and discuss the advantages of new practices in order to motivate the local community. Greater attention should be given to increasing achievement motivation of farmers. (Rec. No. 10).

80. There should be close coordination between extension efforts and the availability of agricultural support activities for the rapid transfer of agricultural technology. (Rec. No. 11).

81. The films should be topical and of immediate interest and should be properly dubbed in the local language. Films and magic lantern shows should be tuned to the local conditions and requirements. (Rec. No. 14).

82. It is necessary that the farmers trained under Farmers' Education and Training Programme are involved in the extension process. (Rec. No. 16).

83. The farmers' training centres and the gramsevak training centres should as far as possible be located on the same campus and a senior officer should be incharge for coordinating the activities of the training centres and production programmes in the district. (Rec. No. 17).

84. In the farmers' training centres in districts where intensive cattle development projects and dairy schemes and poultry and sheep development projects are in operation, special facilities should be created to train farmers in these specific fields. (Rec. No. 18).

85. There is immediate need to train farmers and members of farm families to improve their competence in the profitable process of livestock products. (Rec. No. 19).

86. The farmers' training should embrace the farmers at the lower socio-economic levels. The scope and concept of farmers' training should be expanded to cater to the needs of different types of farming activities characteristic of a particular area. (Rec. No. 27).

87. Farmers' discussion groups should be formed in as many villages as possible. (Rec. No. 29).

88. The allotment of farmers' training centres should be by the number of blocks. For the present there should be at least one farmers' training centre for every 15 blocks irrespective of the size of the district. (Rec. No. 30).

89. It is necessary to bring the VLWs to the training centres at least once in three years for practical training on new methods and techniques of agriculture. (Rec. No. 31).

90. Every effort should be made to have proper coordination and integration among the various agencies of extension, i.e., normal block agency, extension staff under special programme, farmers' training centres, national demonstrations and the agricultural universities, so that the farmer is able to take full advantage of them and multiplicity of agencies is avoided. (Rec. No. 37).

91. The role of the agricultural universities in extension should be confined to conducting field trials for testing the research findings, development of agricultural technology and demonstrating its practical utility, provision of farm advisory service upto the district level, functioning as a source of agricultural information, development of effective communication media, participation in training programmes, etc. (Rec. No. 41).

92. The Departments of Agriculture/Animal Husbandry/Fisheries at the State level should have overall responsibility for extension work and should also be responsible for suggesting field problems and formulating new farm technology, conducting field trials and demonstrations, a common information cell along with the agricultural university, organisation of training programme, etc. (Rec. No. 42).

APPENDIX 8

Report of the National Committee on the Development of Backward Areas on Drought-Prone Areas and Desert Areas --- Relevant Recommendations

The present approach is mainly confined to development of agriculture and allied sectors with its major focus on restoration of the ecological balance. But for an integrated development of any area, agricultural sector alone cannot help to achieve the desired objectives. One of the major reasons for deterioration in ecological balance in these areas is the excessive pressure of population on land. Without providing alternative sources of income, any attempt to promote optimum use of land and water cannot succeed inspite of the improved dry land agricultural practices. (Rec. No. 7).

2. Comprehensive planning aiming at allround development of the area has yet to be taken up. Even the basic survey of existing resources has not been completed and there has been lack of co-ordination between various agencies and programmes in the district for development. (Rec. No. 8).

3. There is now sufficient technology available for increasing productivity in the drought-prone areas of the country except in extremely difficult land and water situations. What is lacking, however, is an aggressive adaptive research and technological transfer programme through a proper extension machinery. (Rec. No. 13).

4. The whole country has been covered by aerial photography and this is to be repeated at an interval of 5 to 10 years. The Survey of India gets the areas photographed and the photo-interpretation techniques have been very well developed. We can interpret the photographs in terms of geology, geomorphology, geohydrology, land use, soils and forestry and they give us very specific information and detailed maps be prepared covering all these aspects. Combining all the data and maps available with suitable ground level, we can prepare optimal land use and land capability maps, which

would provide the basic guidelines for planning for agricultural and other developments. This technique can be used on a large scale, districtwise, regionwise and basinwise to study in a scientific manner, our renewable resources for a proper land, soil, water management. (Rec. No. 22).

5. The effect of drought is a lack of water balance which involves the soil structure, evapotranspiration conditions of the various crops of the area and the rainfall pattern during the main rainfall season. This requires a much more detailed analysis of the environmental conditions for proper guidance on the types of crops and their varieties to be grown, proper land use in utilising pasture development, horticulture, plantations and forestry to make maximum use of the environmental conditions and land quality available. Utilising the macro guidance given by the studies on the lines done by the Central Arid Zone Research Institute, Jodhpur (CAZRI) for districts in Rajasthan, the position will have to be refined for each block by suitably constituted inter-departmental groups, which will after local check of the various parameters and the scientific knowledge available, guide the extension workers in the types of land use that can be introduced with profit. (Rec. No. 23).

6. The CAZRI may train state level teams to carry out macro surveys in the drought-prone areas as has been done by them in Rajasthan. These State level teams must have the necessary technical expertise to further refine the macro studies and to give recommendations at the block level for extension purposes. The Ministry of Agriculture may form a Working Group to develop this concept of a technical study team at the State level to perform this necessary function for drought-prone area development. This Working Group may also go into the adaptive research work that will be necessary in each stage to refine the macro research conclusions on a location specific basis for the drought-prone areas and identify the farms and the groups that will do the necessary adaptive research. (Rec. No. 24).

7. The States had been advised to form Land Use Boards which would undertake this work in the State. The Ministry of Agriculture is at present performing the functions of coordinating this work at the Central level. It was envisaged that a proper Land Use Board will be constituted at the centre. The Committee places

great reliance on a proper land use capability survey, particularly in the drought-prone areas, for maximising productivity of land under the hostile environment. (Rec. No. 25).

8. The basic fear dominating the farm population is the possibility of drought and the famine, forcing it to produce as much as possible in a normal year not only for the home consumption but also as carry over for the next year when the food crops may fail. If the farm population is to be brought out of this fear complex and persuaded to grow more valuable cash crops on that land, which is now in a position to give this guarantee provided the requirements are estimated in detail at the block level, adjusting requirement to the changes in cropping that have taken place and providing the necessary foodgrains through the season at nearby fair price shops. The Committee would specially draw attention to this support for a proper land use strategy. (Rec. No. 26).

9. There are lot of research findings available in the All-India Coordinated Research Project for Dryland Agriculture. A continuous up-dating of the technology has to be done in order to refine the field level advice to the extension organization. (Rec. No. 27).

10. Undisciplinary research now generally prevalent in the Agricultural University and parallel research being carried on in various institutions-Central and State-in various aspects of the sciences have to be brought together in a multi-disciplinary applied research programme in order to solve the specific problems of drought-prone areas. (Rec. No. 28).

11. A joint team of the ICAR and the World Bank had recommended the constitution of regional research centres on a multi-disciplinary basis by Agricultural Universities in the country to deal specifically with a multi-disciplinary approach to regional programmes including crop husbandry, animal husbandry, forestry, horticulture and fisheries. The Committee will strongly recommend that this concept already enshrined in the reports of the Joint Committee be translated into effect by ICAR whether the World Bank is financing the same or not. Such multi-disciplinary regional research centres in each of many different regions of drought are vital to support the drought-prone areas amelioration programme. (Rec. No. 29).

12. Whereas a lot can still be done by tapping available surface and groundwater resources in the drought-prone districts it has long ago been realised that amelioration of drought-prone districts can only be carried on effectively by transfer of water from more richly endowed basins to the drought-prone areas. In future planning, the strategy will have to be to ensure that inter-basin transfers are systematically developed and relief given to drought-prone areas, particularly those which do not have much of natural precipitation. (Rec. No. 30).

13. Crops give maximum return when the evapotranspiration balance is maintained during the crucial periods of crop growth. In other periods, slight stress can be stood by the crops without serious damage. A little underwatering in the other period is not a serious constraint. On the other hand, sufficiency of water leads to too much watering throughout the season in order to save productivity. There is a need for the laboratory to get close to the land in translating the principle of proper and economic water use. (Rec. No. 31).

14. Groundwater exploitation and conjunctive use of ground and surface water will be an essential ingredient in agricultural development of drought-prone areas. In some of the arid and semi-arid areas the ground water is saline. In such specially difficult areas, a proper planning of conjunctive use of saline and fresh water and suitable agronomic practices and selection of cultivars tolerating levels of salinity, will all have to be filled into the programme. The objective is maximum use of whatever water is available. In this context the large scale experimentation by Haryana of utilising saline groundwater in the canal system is worth looking into. (Rec. No. 36).

15. The Committee recommends that immediately the present stage of use of the reservoirs in the various drought-prone areas, the system of reclamation and the cropping pattern may be investigated quickly and at least within the next year a proper plan of maximising the use of such water drawn up. (Rec. No. 37).

16. As a majority of the population in the drought-prone areas depend on land based activities like crop farming and animal husbandry, the core task for development will be to promote rational utilisation of land and available water. The research

institutions working in agriculture and allied sectors have evolved considerable amount of technology for improving and stabilising the economy of watersheds in the drought-prone areas. The major task now is its transfer, in a package, to the people residing in these watersheds. (Rec. No. 38).

17. The Task Force on Rural Development as well as the National Commission on Agriculture have, therefore, rightly stressed that the strategy for development of drought-prone areas has necessarily to be built mainly around animal husbandry. Animal husbandry in conjunction with dairying is considered to offer a more stable base than crop farming for sustained income for the rural households in these areas. (Rec. No. 39).

18. Notwithstanding the land resources constraints, these areas do offer considerable scope for pasture and fodder development on the available areas, if the latest technology for fodder crop and pasture development evolved in the CAZRI, the Indian Fodder and Grasslands Research Institute, Jhansi and other plains is adopted appropriately. (Rec. No. 40).

19. As development takes place along the desired lines, many agricultural commodities for local processing and semi-processing will be available. Extraction of sunflower oil, milk processing, wool grading and preliminary processing are instances. The scope for such economic activity needs to be assessed in each area and processing units located, where feasible. (Rec. No. 48).

20. For maximising the utilisation of the scanty rain water, suitable water conservation techniques like *khadnis*, *bandhis* and *alhandhis* will have to be adopted on a larger scale. (Rec. No. 51).

21. In the early stages of development of the canal command areas, there will be water to spare in the canals. This opportunity needs to be utilised. As water becomes available in an area, a large scale programme of tree plantation, raising of shelter belts and wind breaks and rejuvenation of vegetable cover will have to be undertaken. This programme will arrest wind erosion, sand blowing and sand casting on arable fields and also return the desiccating effect of hot winds on crops. (Rec. No. 52).

22. In canal command areas dairy development and milk chilling centres and milk products factories should be undertaken. (Rec. No. 54).

23. In the arid areas, the major emphasis has to be on sheep development. The good breeds of sheep available in the region can be further improved both for wool and mutton. (Rec. No. 55).

24. For a complete watershed approach one has to bring soil conservation measures, water conservation and storage measures, dryland farming, animal husbandry, afforestation and minor irrigation as the minimum number of disciplines under a coordinated approach. At present the watershed approach in the DPAP is one of the many programmes that the district carries under DPAP. It is taken as a separate programme by itself with a coordinated approach limited to few watersheds taken up under the programme. The Committee would, therefore, suggest that if the sub-Plan approach that the Committee has recommended for all backward areas development programmes in its report on 'Organization of Administrative and Financial Structure for Backward Area Development' is now brought into effect in the DPAP district, this scattered handling of programmes should be brought together for maximum benefit. (Rec. No. 59).

25. As the funds for area development would naturally be limited, some priority in action will have to be brought in the planning. Where general deterioration has to be stopped and areas rehabilitated, the programmes would generally be soil conservation and afforestation including pasture development. For this purpose, the watershed in the project area will have to be analysed for identifying main watersheds, falling under the following three classes :

- (i) substantial deterioration areas needing prompt action;
- (ii) moderate deterioration areas where investments can be spread over a longer time; and
- (iii) reasonably less deterioration areas which can be improved by mere human action in utilisation of the land and resources. The large soil conservation programmes that the State undertakes every year should be worked out on the above listed priority schedule. (Rec. No. 67).

26. The most logical step would appear to be to incorporate corrective measures in the existing land use system to make the present land use practices less vulnerable to erosion and degradation hazards. Simultaneously, alternative management practices should be introduced with demonstration of best practice slowly to encourage the beneficiaries to shift gradually to the improved land use pattern. If the agro-silvicultural practices or agro-horticultural practices can be made profitable while practising mixed farming, it may be possible to achieve this gradual shift in land use pattern and retiring the marginal and sub-marginal land from cultivation of common agricultural crops to productive and remunerative alternative uses. (Rec. No. 69).

27. After the creation of the Department of Rural Development which handles the DPAP in the Ministry of Agriculture, the technical expertise rests in the Department of Agriculture whereas the responsibility for carrying out these programmes rests in the Department of Rural Development. There is, therefore, a need for bringing together the line hierarchies responsible for technical developments and technical planners comprehensively into the DPAP planning and implementation at all levels from the project upwards. (Rec. No. 71).

28. At the project level, the project authorities must have directly under their control technical officers of sufficient capacity in water and soil management and afforestation. (Rec. No. 72).

29. The State Agricultural Universities in collaboration with the Indian Meteorological Department and other concerned organizations, should take up in hand immediately and prepare maps of drought-prone areas, delineated on the basis of inter-disciplinary exercises of superimposition of rainfall analysis of soil zones to provide the basis for drought proofing and modification of cropping patterns. The Committee would further recommend that such studies should be completed in respect of States having arid and semi-arid areas according to time bound programme. Discussions with the concerned people indicate that it should be possible to complete such studies for different States substantially within a period of one year. (Rec. No. 76).

30. Any soil conservation programme would be self-defeating unless the people on whose lands these are carried out are not only involved in it effectively but have some stake in improving the land and maintaining it. The Committee, therefore, recommends that :

- (i) the existing practice of subsidising private works on farmers lands should be continued;
- (ii) if there are any works, on the private lands like construction and renovation of rivers which would benefit not only the land on which they are located but also other lands belonging to other farmers, these should be treated as items of benefit to the community and financed to the extent of 100 per cent by the State; and
- (iii) the existing practice of financing the soil conservation programme of community land on 100 per cent basis should continue. (Rec. No. 77).

31. Even with the improvement of existing works and the completion of projects under construction, the bulk of the drought-prone areas will continue to be dependent on rainfall. The Irrigation Commission has, therefore, rightly emphasised the need for investigations into further possibilities of increasing irrigation by both surface and groundwater. We fully endorse this view. (Rec. No. 80).

32. The most striking feature of the drought-prone areas is the absence of sizeable irrigation sources such as perennial rivers. Consequently, small works such as tanks, *bhandars* and dugwells constitute the most important sources of irrigation; a large number of these works have at present structural and other deficiencies which need to be removed in order to improve their performance. (Rec. No. 81).

33. In certain areas, where groundwater level is low and irrigation from wells is precarious, attention may have to be given towards construction of percolation tanks and check dams on a watershed basis. (Rec. No. 82).

34. It has long been realised that amelioration of drought-prone districts can only be carried out effectively by transfer of water from more richly endowed basins to the drought-prone areas. In future planning, the strategy will have to be to ensure that such inter-basin transfers are systematically developed and relief given to drought-prone areas, particularly those which do not have much of natural precipitation. (Rec. No. 83).

35. The Committee strongly urge that necessary studies and investigations for formulation of a National Plan to transfer water from one system to another in order to utilise the surplus water to meet the needs of drought-prone and deficit areas in the country should be given a very high priority. It is only when these plans are executed that the picture in the drought-prone areas would undergo a substantial change. Till then, the nation would have to be content with taking such other measures as are feasible for the development of drought-prone areas keeping in mind the constraint that adequate water resources would not be available. (Rec. No. 84).

36. The schemes of inter-basin transfer of river water would take a very long time to fructify, even if they are found technically feasible. In the meantime, it is local source of ground and surface water, to whatever extent it is available, which will have to be harnessed and reliance placed in the drought-prone areas for bringing more area under irrigation. This underlines, among other things, the need for a quick and early completion of hydrological surveys in these areas. Recently, there has been a growing awareness on the part of the States to undertake these surveys. The Committee would strongly urge that this programme should be stepped up and both the Central Ground Water Board and the State Ground Water organizations should complete the hydrological surveys of all the arid and semi-arid areas as per a time bound programme. (Rec. No. 85).

37. Even with full exploitation of possible irrigation programmes in the drought-prone districts and with all transfers of water from other basins and may be possibly on a national basis, water will still remain a very valuable commodity for agriculture and human development. It is, therefore, necessary to ensure that available water is utilized to the maximum in improving the economics of the area. Here, there is a need for the laboratory to get close to

the land in translating the principle of proper and economic water use. (Rec. No. 86).

38. The necessity is for making better use of available water in drought-prone areas to give maximum coverage in irrigation by selection of crops needing lower water duty and by rigid control of water used in the irrigation systems by bringing into effect all aids for such controls like linking of channels, etc. The Committee would strongly urge that the objective in all sources of irrigation in the drought-prone areas should be to get maximum return out of every unit of water. (Rec. No. 87).

39. What is essential is that the limited water must be put to optimal use. This requires not only rationing of water but also banning the growing of such crops as requiring heavy irrigation like sugarcane, paddy, etc. The Committee would strongly urge that such an approach must be brought about if necessary with legislative support. (Rec. No. 89).

40. Another aspect is that there must be concerted effort towards avoidance of water losses. The Committee would, therefore, urge that it should be enjoined on all concerned that wherever an irrigation scheme of whichever type exists or is taken up, utmost priority should be given to the introduction of optimum use of water practices. This also would go a long way in increasing the protection available to the farmers in these areas. (Rec. No. 90).

41. The Committee notices that generally minor irrigation schemes of surface reservoirs are not designed and constructed for commands less than in some States 200 acres and in some States 100 acres. This is due largely because of the responsibility of such works being cast on Irrigation Departments, which are not attuned to design and undertake small projects. In drought-prone areas the precipitation has to be conserved on a watershed basis starting from the highest available point for storage and gradually going down and trying to hold back as much of the precipitation as possible within the watershed. This will require a system of designing small ponds and minor irrigation reservoirs for very small areas of command. An organization will have to be given the responsibility for planning such water holding structures on a watershed basis in drought-prone areas. The obvious organization should be suitably strengthened with the necessary expertise. (Rec. No. 91).

42. In some of the arid and semi-arid areas the groundwater is saline. In such specially difficult areas, a proper planning of conjunctive use of saline and fresh water and adoption of suitable agronomic practices and selection of cultivars tolerating some salinity, will have to be fitted into the programmes. The objective is maximum use of whatever water is available. In the context, the large scale experimentation by Haryana of utilising saline ground water in the canal system would be worth looking into. (Rec. No. 92).

43. The present stage of use of the reservoirs in the various drought-prone areas, the system of reclamation and the cropping pattern may be investigated quickly and, at least within the next year a proper plan of maximising the use of such water drawn up. (Rec. No. 93).

44. Despite the technology being available and its economic feasibility established, still the farmers are not changing over to new pattern. The trouble is that every household is anxious to somehow produce sufficient foodgrains of the varieties most prevalent in the area. The basic fear dominating the farm population is the possibility of drought and famine, forcing it to produce as much as he can do not only to meet his current consumption, but also for a carry-over for the next year when the food crops may fail. If the farm population is to be brought out of this fear complex and persuaded to change the present pattern of land use, there must be some guarantee that they must get their food requirements throughout the year at a reasonable price and the type of food required by them from nearby fair price shop. The country with its vast distributing organizations should now be in a position to give this guarantee provided the requirements are estimated in detail at the block level, adjusting the requirements to the changes in cropping pattern that have taken place and providing necessary foodgrains throughout the season at nearby fair price shops. This is the first essential and foremost support for a proper land use strategy. (Rec. No. 94).

45. The topmost priority in the drought-prone areas must be given to prepare optimal land use and land capability maps, which will provide the basic guidelines for planning for agricultural and

other development. Once such maps are available, it would be necessary for the concerned planning and development authority in the area to draw plans to take up relevant developmental strategy for such lands as are found unfit for crop cultivation, or are in a position to give better return if diverted to use other than crop farming. The Committee considers this as a very essential step not only for proper land use, and improving the productivity and economic conditions of the people living in these areas, but also in restoring the ecological balance which would go a long way in not only improving the conditions of the people in these areas but would also be in the larger national interest. (Rec. No. 95).

46. Successful dry land agriculture requires a two-pronged strategy. When the monsoon is normal, it should be used most effectively. Making the best of it involves a good deal of attention and work — the best varieties, the best practices, inter-cropping and so on. The second part of the strategy comes into operation the moment the weather turns aberrant. This approach must outline for each agro-ecological region the list of anticipatory measures and alternative crop strategies that ought to be adopted when there is evidence of the incidence of drought. This kind of programme involves steps like :

- (a) maximising production and altering crop patterns when necessary, in irrigated areas;
- (b) proper development and management of irrigation;
- (c) mid-season corrections in crop planning in unirrigated areas;
- (d) introduction of crop life saving practices; and
- (e) building up of appropriate seed and fertilizer buffer to implement the drought cropping strategy. (Rec. No. 96).

47. There are crops that could give farmers something in return for his effort even in unfavourable years. These are fodder crops. Mixed cropping system comes into full play in this situation. If one crop fails, another comes to the rescue of the farmer. It is important to treat all practices as a package because it is the cumulative effect that enables a farmer to raise crops successfully in rainfed areas. It is needless to say that partial adoption of this package will not produce the desired result. This is the task which

the State Agricultural Development Organization in these areas must take up in right earnest and gear up the extension machinery as well as the input supply organization towards this end. It requires a close and coordinated effort on the part of the various agencies involved in introducing this package approach and all have to work together as per a preconceived cropping programme, based on proper land use pattern. (Rec. No. 97).

48. "Watershed based resource utilisation" involves the optimum use of the watershed precipitation for the improvement and stabilisation of agriculture on the watershed through improved water, soil and crop management. More effective utilisation of water for the production of crops can be facilitated by one or more of the following means :

- (i) directly by improving infiltration of rainfall into the soil and thus making more soil water available for plant use;
- (ii) through drainage, collection, storage and reutilisation of run off; or
- (iii) by water recovery from wells after deep percolation beyond the root profile. (Rec. No. 98).

49. Improved technology will relate to crops - variety fertility, management, land development, water conservation, etc. In the end, millions of small, often illiterate farmers, who have little capital must learn to apply the tools of science to extract more food and ultimately a better quality of life from their hostile environment. Compromises must be found between short-term and long-term objectives. The challenge is great. (Rec. No. 100).

50. Timely completion of all farm operations before the rain is essential. The earlier the sowing is done, the longer the period the crop has to grow and mature. Hence, the tillage operations should be completed before the onset of rains. In an inter-cropping system it is necessary to till or harrow immediately after the harvest of one of the component crops, as otherwise weeds take over and the yield of longer duration component is drastically reduced. (Rec. No. 101).

51. The various dry land research over the last six years have identified and/or fabricated several farming machinery. The costly implements could be supplied to farmers on hire service. (Rec. No. 102).
52. During the last 6-7 years, scientists in different regions have evaluated all the important crops generally grown in the area for their relative efficiency of production. On the basis of data obtained efficient varieties/crops have been identified for different regions of the country and these are now available for use by the extension machinery. The experience has been that change-over to improved crop varieties is a basic requirement to enable the growers to benefit fully from yield based inputs, fertiliser, available moisture, etc. (Rec. No. 103).
53. The farmer will have to be prepared to sow as soon as the seeding rain occurs. This can only be done if the land has already been tilled after the previous harvest. It is sometimes suggested that this tillage should be done after the harvest at a time convenient to the farmer. In drought-prone areas, disturbing the top soil after the *kharif* harvest during periods of high temperature and high wind can lead to serious soil erosion. The tillage to be effective and, at the same time, not destructive will have to be done just after the harvest so that the land settles down before the temperature and wind increases. Alternatively the tillage will have to be done at a time shortly before the expected seeding rain so that erosion effects are minimal. (Rec. No. 104).
54. The most important contributor to the increased productivity of land in the drought-prone areas is the utilisation of the land for a *kharif* crop wherever a *kharif* fallow, followed by *rabi* programme, is the traditional practice. The analysis made by ICRISAT which we have reproduced gives the parameters for deciding which areas are suitable for a *kharif* sowing. The Committee would recommend that based on this analysis *kharif* sowing shall be attempted at the seeding rain in all these areas in drought-prone zones. (Rec. No. 105).
55. Special efforts should be made to enrich the organic matter content of drylands. All the organic wastes of plants, cattle dung, etc., should be incorporated into the soils as FYM or compost. The practice will improve the soil structure and their water holding capacities. (Rec. No. 106).

56. Not only would consistent rainy season cropping often not be profitable, it would probably endanger the profitability of the more important post-rainy season crop. We, therefore, emphasise strongly the importance of breeding for high yield potential post-rainy season sorghums for these and similar regions. (Rec. No. 108).

57. The cost of broadbed and furrow system is not very high considering the crop advantages that appear to arise from the package of practices. Time taken for primary tillage is a very important aspect in drought-prone areas where the rainfall pattern is extremely variant and the moisture accumulation in the soil for seed bed persists only for very short spells of time. It may, therefore, be worth considering by the extension organizations whether this additional expenditure should be undertaken or not. Anyhow there is definitely a case for adaptive research analysis in the medium and shallow vertisol areas. (Rec. No. 111).

58. Research and experiments by themselves are not enough to decide on detailed advice on either the crop patterns or improved agricultural practices for various zones of the country with various types of soils and rainfall pattern under the low rainfall group. A lot of adaptive research will have to be done by the State Agricultural Departments in close association with the ICAR research stations with the technical support of agricultural universities, to evolve the most profitable or most fool proof crop or mixed crop system and improved practices which can be recommended in micro regions in the States under different soil conditions in drought-prone areas. The Committee recommends that necessary adaptive research should be organized quickly in the blocks, particularly having black soils. (Rec. No. 112).

59. Broad bed and furrows definitely have a benefit in the deep and medium vertisols situation. Compared to the cost of land shaping on this basis, the benefits are substantial. The broad bed and furrow system can be adopted in individual fields and need not necessarily be with adjustment of boundaries on a watershed basis. ICRISAT experimentation seems to prove that watershed based adaption of field boundaries to graded cultivation may result in only modest increase of gross returns. But this may not be sufficient to motivate farmers to exchange land on a voluntary basis. They have also pointed out that whereas water control on a watershed basis is desirable for drainage and run-off and irriga-

tion control, the existing field boundaries can be respected. From the practical angle, however, for selling this strategy to the farmers more rational research on the field under varying conditions is absolutely essential and the earlier it is undertaken it would be better. (Rec. No. 113).

60. Arid areas are considered to be the best suited for sheep husbandry which is already an important source of livelihood for a large number of rural people. In semi-arid areas the total livestock is pretty large. They are poor milkers but good draught breeds. However, these cattle and buffalo breeds require further improvement of their potential for production. Sub-humid arid areas also have sufficient livestock resources, but it is their proper use and management that would determine the success of the programme for their development. In humid arid areas the resource endowment is the best. The productivity of cattle is low and efforts are necessary to develop them through improved breeding and management practices. (Rec. No. 114).

61. Crop husbandry in these areas with low total rainfall, is a gamble. All the farming communities, particularly small and marginal farmers, can better depend on sheep rearing as the main source of livelihood. (Rec. No. 117).

62. Cross breeding of superior local flocks with exotic rams for better yield of mutton and wool will result in the production of bigger animals with higher body weight having proportionately higher nutritional requirements. Unless, therefore, a strong fodder base is created, the potentiality of the crossbred animals cannot be fully harvested. (Rec. No. 118).

63. Village based flocks must have additional pastures. This is very relevant in drought-prone areas. The Committee has already pointed out how one-third to half of the land holdings, whether small, medium or big, are left fallow every year in the poor rainfall areas because of inability to cultivate them in time. An extension programme should be launched to put some of these general fallow lands under a permanent pasture cover with suitable cultivation practices to maximise fodder production within the holding. (Rec. No. 121).

64. While recommended breeds of sheep are now available for arid and semi-arid areas of the country, such breeds are not yet available for humid regions. It is, therefore, suggested that sheep development in humid areas should be brought about mainly through selective breeding in local breeds and introduction of exotic breed must wait or be done in stages by using halfbred rams. (Rec. No. 125).

65. Identification of cattle breeds, both exotic and indigenous, suitable for the semi-arid area has to be done, to develop their productive capacity. Improved indigenous breeds from other areas with similar agro-climatic conditions should be utilised for upgrading of local, non-descript stock in the villages under dryland farming conditions. (Rec. No. 137).

66. Any programme for rapid improvement of cattle wealth and thereby the income from cattle would be most welcome addition to the poor economy of drought-prone areas. Hence there is a need for rapid introduction of the crossbreeding programme. The Committee would, therefore, strongly recommend that the bases of exotic cow farm, breeding bull farm and frozen semen banks should be brought up to great efficiency immediately so that an active cattle development can take place in drought-prone areas. (Rec. No. 138).

67. One of the reasons given for the slow pace of spread of frozen semen technology is the lack of canisters for holding liquid nitrogen to keep the frozen semen straws in conditions for insemination in the field. The Committee understands that the present demand far out-reaches available supplies in the country. The Ministry of Agriculture will have to take a close look at the present programme of demand and supplies and solve the problem satisfactorily. Otherwise, this single factor may be a serious deterrent to the rapid growth of animal husbandry in the drought-prone areas. (Rec. No. 139).

68. *Murrah* in Haryana and *Mehsana* and *Surti* in Gujarat are the high milk yielding breeds of buffaloes. These breeds have attained not only all-India importance but also international recognition as important milk breeds of buffaloes. The following approaches should be followed for improvement of these breeds. Firstly, their genetic potential for milk production should be improved

further through selective breeding in their native breeding tracts. Secondly, the sires of proven worth belonging to these breeds should be used for upgrading non-descript buffaloes in other areas through crossbreeding. Graded *murrahs* are considered suitable to and are being distributed in arid and semi-arid tracts of drought-prone areas. (Rec. No. 140).

69. The necessity for milk production enhancement being so great, all production potential should be actively exploited for obtaining the maximum possible use. This would require enlargement and strengthening of the existing programmes as also initiation of additional programmes. Carefully planned systematic breeding programmes including progeny testing of selected bulls should be undertaken for progressive genetic improvement of the stock. (Rec. No. 141).

70. At present most of the veterinary hospitals are poorly equipped, do not have modern aids for arriving at prompt and correct diagnosis of diseases and lack facilities for undertaking surgical operations. Even drugs for treatment of common ailments are in short supply. These problems are more acute in the drought-prone areas. The Committee would urge that wherever animal husbandry programme is taken up, immediate steps should be taken to provide animal health cover. (Rec. No. 142).

71. Pasture development in drought-prone areas, apart from increasing fodder availability and thereby promoting development of animal husbandry, confers the benefit of providing grass cover on lands subject to wind and water erosion. Unless the livestock are fed adequately and with quality fodder to provide all the nutrients in required proportions, their productive potential is not realised in the form of increased production of milk and other animal products. Adequate production and good quality of fodder and grass thus becomes a pre-requisite for the success of animal husbandry programme so vital to the economy in these areas. (Rec. No. 143).

72. Naturally, grassland development cannot be taken up all over the area identified for such development. It is recommended that it would be desirable to take up the development work initially in areas where reasonable accessibility to water facilities are available so that the stabilisation of the grasses and fodder can be accomplished quickly so as to demonstrate the benefit from the new

method to the people before they lose patience with the reservation. (Rec. No. 150).

73. Grassland development programme will have to be on a package basis, with a link-up of research, extension, infrastructure development, input supply and control. (Rec. No. 155).

74. With irrigation resources, commercial seed production of vegetable crops, e.g., lady's finger, cucurbits, tomato, potato, jute-seeds, chillies, brinjal, peas, cumin, coriander, etc., can be taken. Large scale production of vegetables for fresh market and for preservation factories also has enormous scope. Gardening of vegetables like cauliflower, tomato, potato, carrots, onion, garlic, etc. can be highly profitable. (Rec. No. 157).

75. Research work is in progress at the Central Arid Zone Research Institute, Jodhpur, and Haryana Agricultural University, Hissar, to further identify the types of cultivars within these fruit crops which can withstand salinity without detrimental effects on their productivity. The results of this research should be pursued further. Some of the vegetable crops like spinach, beat, cabbage, brinjal and some root crops are tolerant to salinity. (Rec. No. 158).

76. In recent years, extensive research has been carried out in Mexico, Israel, Australia and USA to increase horticultural production by efficient management of watersheds. In India, such work is in progress at the Central Arid Zone Research Institute, Jodhpur. Some of the indigenous plant types can be planted even without following this technique, e.g., kair (*capparis decidua*), *cordia myza*, custard apple, etc. Their productivity, will however, increase if due consideration is also given to watershed management. (Rec. No. 159).

77. In hot arid zone, the rainfall is not only very low but is confined to the period from July to September with 9 to 21 rainy days out of 12 to 30 rainy days in the whole year. The fruit crops selected for cultivation in these regions must be such that their maximal growth period falls during the period of maximum water availability in the soil and low vapour pressure deficit in the atmosphere. (Rec. No. 160).

78. While selecting cultivars of a particular fruit tree, care should be taken to choose the early ripening ones so that they make maximum use of the residual soil water from the monsoon rains. (Rec. No. 161).

79. Among the vegetable crops, the most hardy types belong to the *cucubataceous* and *seiaraceous* groups. Besides these cowpea, gourd, early cauliflower and okra are also sufficiently hardy. There is, however, need to grow the drought-hardy cultivars of these vegetable crops for rainfed production. (Rec. No. 162).

80. In vegetable crops also, optimum production is possible by adopting techniques of moisture conservation and run-off concentration. (Rec. No. 163).

81. Considering the marginal nature of the land in many cases, and the non-availability of adequate moisture and the risk involved in successfully raising foodgrain crops, great importance would have to be placed on opportunities to diversify rural economies away from crop production, to the extent possible, into activities that are less dependent on the vagaries of rainfall. Horticulture is one of the excellent opportunities which could provide a greater income to the farmers in such lands which are not good for crop production. The Committee would strongly urge that horticulture should be taken up as an integral part of the package approach to the development in the drought-prone and desert areas. All essential steps would have to be taken. Extension support is the first essential item. This would not, however, be enough by itself unless suitable varieties are identified, seeds and cultivars provided when needed. (Rec. No. 164).

82. At present, areas classified under permanent pastures, cultivable wastes, barren, uncultivated land and forests are overgrazed and denuded. Hence, not only the development but protection and management of the forest and plant cover also assume considerable importance. It is necessary to provide for the requirements of fuel and fodder so that the people are not tempted to cut trees indiscriminately and inhibit the process of afforestation. (Rec. No. 165).

83. It is necessary to educate the farmers about the importance of tree planting on farm land. As the first step towards farm

forestry, the farmers can confine their activities to grow their own timber, fuel and fodder trees along field bunds and marginal land where cultivation is uneconomical and not possible but the soil allows it. (Rec. No. 167).

84. Trees are not necessarily trees with only fuel value. Trees yielding many varieties of minor forest produce and trees giving fruits on which the tribal population live and also earn some money by collection, are also being devastated. One of the main objectives of the tribal development programme is to ensure that these benefits are not lost to the tribals but augmented. So in all these plantations, it should be a rule that trees giving minor forest produce like mahua, karanj, neem, etc. and fruit trees like mango, tamarind, jack and others are suitably interspersed. (Rec. No. 173).

85. The research in utilising solar energy and wind power for replacing the diminishing sources of energy is, national issue. It will be noticed that quite a lot of research is now going on. Before the research can be applied in the field, more proper cost benefit studies will have to be done on location specific studies so that the technology can be suitably given to the people for adoption. The Committee would, therefore, recommend that in all these researches in development of equipment and in running of systems for utilisation of solar energy and wind power, the research should define clearly limitations of use of the equipment and the cost-benefit of the utilisation. (Rec. No. 193).

86. The equipment so far designed for cooking and for providing hot water for family use is well within the means of a family with modest means in the rural areas. The Central Arid Zone Research Institute (CAZRI) will have to develop brochures explaining this and giving the cost-benefit data so that the extension workers can straight away adopt this programme in the rural areas. (Rec. No. 194).

87. Use of solar energy can be suitably designed to provide for drying facilities. There may be many uses for such drying facilities in the rural economy. Where this will be useful will have to be studied and suitable brochures developed by CAZRI. (Rec. No. 196).

88. The major problem is the transfer of appropriate technology to the people in the specific watershed for promoting rational use of land, water and other natural resources. Effective transfer of appropriate technology for watershed development would involve the following activities :

- (i) ascertaining the present level of technology in the related sectors;
- (ii) identifying the type of technology needed and suited for the felt needs of the population of the watershed in general;
- (iii) based on such feed-back, need for adoption or adaptation of available technology for improving the productivity of the areas and preventing the ecological deterioration;
- (iv) testing the suitability of new specific technology in different agro-physical and climatic regions requiring a large number of adaptive field trials and operational research projects under different geographical and socio-economic conditions; and
- (v) strengthening the linkages between research and field personnel. (Rec. No. 198).

89. It is to be noted that the development of appropriate technology for the drought-prone areas requires an effective feed-back mechanism. The research has also to give priority to the development of low cost technology. A careful analysis of the methods of agriculture, animal husbandry, etc., in these areas might indicate that a few modifications in the existing practices could yield better results instead of introducing new innovations which may not only be costly but may also require lot of efforts before the farmer could be persuaded to take them up. (Rec. No. 199).

90. Unidisciplinary research now generally prevalent in the Agricultural Universities and parallel research being carried on in various institutions, Central and State in various aspects of the sciences has to be brought together in multi-disciplinary applied research programme in order to solve the specific problems of drought-prone areas. The establishment of regional research centres on a multi-disciplinary basis is essential. (Rec. No. 200).

91. What are the important steps necessary for transferring appropriate technology to rural areas, particularly the drought-prone areas? The obvious answer is the field extension and farmers training, supply of information literature, audio-visual education, field demonstrations, etc. Training of extension workers would also be necessary. (Rec. No. 201).

92. The most distinguishing characteristics of the new methodology is that the Village Level Workers and the Agricultural Extension Officers are utilised in an intensive time-bound management system under a fixed programme of training and visits to the farmers' field regularly every fortnight. The training has a direct focus on specific agricultural practices and recommendations related directly to farm operations during a given fortnight. (Rec. No. 202).

93. The new agricultural extension methodology aims at ensuring transfer of know-how available at the Agricultural Research Stations to the farmers' fields through an effective time-bound management system. This is being achieved through a systematic schedule of training of extension workers, to equip them with the latest know-how. The transfer of technology from extension worker to the farmers is ensured through a fixed programme of visits every fortnight. The methodology followed in the existing set-up can be adopted in the DPAP areas also but what would be essential is that the extension personnel working in these areas must be provided training in all the disciplines for which the area has the best potential and support is called for. (Rec. No. 203).

94. The technical capacity of the VLW in the programme is limited to agricultural development only. On the other hand, in the watershed management approach which is basic in DPAP the main thrust is firstly in restoring ecological balance and then maximising soil and water conservation for increasing crop productivity. The technical expertise for doing this work has to be spelt out carefully. (Rec. No. 204).

95. The planning and execution of the soil and water conservation programme for the Government and community lands should be done by a suitable organization in the Project. This work obviously cannot be done under the present T & V programme. For this, the Committee suggests the following approach. Once prio-

rity watersheds have been identified in the Project area for watershed management, technical teams of the soil and water conservation experts in the project technical group must prepare the soil and water conservation programme for the Government and community lands with such help as may be required from the higher technical echelons for the individual watersheds. This plan must be implemented in full in the first year of the watershed programme as without this protection to the higher reaches, the farmers' programmes will not be fully productive. (Rec. No. 205).

96. The soil conservation organization in the district should be given the responsibility to get the work done on schedule. The funds should be provided by the DPAP. (Rec. No. 206).

97. The landshaping programme on the holdings of all the farmers participating should be completed in the off season before the start of the second cropping season. The technical support for this will have to come from the soil and water conservation experts in the project, helped by the VLWs who suitably trained in advance will follow the T & V method to get the programme implemented in time. (Rec. No. 208).

98. Where a change of cropping is essential in any holding to prevent wrong use and consequential soil deterioration, the technical experts in the project should identify the holdings and the changes necessary. The VLWs should then be used in the T & V programme to get the changes done by persuasion. (Rec. No. 209).

99. In the T & V method there is back-up by a Technical Group which trains the VLWs every fortnight during the cropping season for the programme to be put across in the field in the next fortnight. This back-up technical group with a base experimental area is crucial for watershed programme. (Rec. No. 210).

100. Besides the technical disciplines involved in the T & V system, a soil and a water specialist will have to be included. It is preferable that this group is based at the project centre, for each DPAP project area. (Rec. No. 211).

101. The technical team back stopping the watershed programme will have to decide for each watershed the present status of available technology suitable as a first step to improving the traditional cultivation practices and land use patterns by marginal changes

to improve the productivity and prevent deterioration of the ecology. (Rec. No. 213).

102. The most important stage in transfer of technology will be the testing of the suitability of specific technology in different agro-physical and climatic regions so that introduction of most modern technology can be done in the location specific condition. This requires a large number of operational research projects follow up by the adaptive field trials. (Rec. No. 214).

103. It is necessary for the ICAR to expand the national demonstration concept to include a large number of national demonstrations of the latest technology for handling the watershed approach in drought-prone areas. (Rec. No. 215).

104. The ICAR may examine early how best the lab-to-land programme can be modified to suit the requirements of watershed approach. (Rec. No. 216).

105. Education of individual farmers about the right crop to grow on his field and the correct agronomic practices along with the minimum soil conservation and water conservation practices on his holding should be the main plank of the T & V programme in the initial stage. (Rec. No. 217).

106. Operational research programmes in large watershed should now be taken up by the ICAR in the various DPAP zones so that the technologists may refine and improve upon the package approach to make it location specific to the various DPAP zones in the country. The operational research project will be a necessary back-up to the national demonstration programme. (Rec. No. 218).

107. The Government of India provide assistance to the State Governments through the Centrally sponsored schemes to strengthen the efforts of the States in the transfer of appropriate technology to the rural areas. The Committee would strongly recommend that the assistance provided under this scheme should be available for extension support in the drought-prone areas. (Rec. No. 219).

108. We cannot think of excluding programmes for the landless in the watershed development programme. If the marginal or surplus lands are being distributed among the landless, the watershed

project should provide for the development of pastures or horticulture on these lands, with guaranteed employment in secondary and tertiary sectors during the waiting period. This should also be specifically provided as part of the plan to achieve a participatory process. (Rec. No. 225).

109. The watershed budget should have adequate provision for the extension education programmes of the people of the area before the watershed programme is undertaken. (Rec. No. 226).

110. The Committee has recommended in its report on "Organisation of Administrative and Financial Structure for Backward Area Development", what it considers to be appropriate organisational and financial arrangements for realising the full potential of the area and executing a comprehensive development programme embracing all activities — developmental, social services, infrastructure, etc. The Committee would, therefore, reiterate that the recommendations made by it in its report on "Organisation of Administrative and Financial Structure of Backward Area Development" covering "planning process and decentralisation" methodology of Central and State Plan allocations, organisational set-up for plan implementation, personnel policies, financial and budgetary control, etc. are eminently suited for the development of the drought-prone areas and should be implemented as early as possible. (Rec. No. 232).

111. There should be a District Planning and Coordination Cell under the Chairmanship of the Collector to work out a proper programme and secure the best development of resources particularly in respect of such schemes and programmes which cut across the boundaries of more than one IDP. (Rec. No. 233).

112. An Integrated Project Level Authority consting of two or three blocks should be set up by an executive order. (Rec. No. 234).

113. Apart from the high level Steering Committee which will guide implementation of all the programmes, a Coordination Cell has been suggested at the State headquarters not only to monitor the progress but also to ensure that the funds earmarked for the development of these areas are not diverted by the departmental heads to other areas. (Rec. No. 236).

114. The Committee would strongly recommend that each State should have an inter-disciplinary land authority/board for planning in major watersheds and giving guidance to the lower level organisation in the planning, execution and implementation of the programmes on micro-watershed basis. (Rec. No. 237).

115. The existing, departments at the State level like agriculture, forest, horticulture, etc., are concerned with their sectoral activities. What is essential is an organization at the state level which can ensure preparation of integrated projects on watershed development, guide their implementation and monitor the progress with reference to the overall objectives. (Rec. No. 238).

116. The Committee would strongly urge that as a counterpart of the State Board, the Central Government in the Ministry of Agriculture must also set up a National Land use Board/Authority. (Rec. No. 239).

117. Expertise in various disciplines, which constitute the key component of planning and implementation of programmes on watershed approach are located in the Department of Agriculture and in the Department of Agricultural Education and Research under the Ministry of Agriculture. As it is essential that there is complete coordination and agreement between various disciplines which has to provide input to the development activities in drought-prone areas, the Committee would strongly urge the constitution of a Standing Multi-Disciplinary Committee with its own secretariat to guide project preparation, supervise implementation and provide necessary technical and research support, etc. (Rec. No. 240).

118. The present procedure is that at the request of the State Governments, the Central Government sends teams to assess the damage of the drought-affected areas. The Committee would strongly recommend that a representative of the Division dealing with the drought area programme should invariably be included in the Central Team to assess the quantum of funds to be made available to the States and once schemes are sanctioned and approved whether for creation of permanent assets or for providing relief, these should be prepared and executed in consultation and under the supervision of the Integrated Development Project Authority. (Rec. No. 241).

119. The authority in the project would be in a far better position to decide as to the type of works which should be undertaken immediately to provide relief to the affected people. It would use these funds not only for providing relief to the drought affected but also get part of their own programmes for the benefit to the area with the help of these funds. The Committee is of the view that if such a system could be streamlined and operationalised, there would be better utility for funds made available for drought relief, in such areas which have been identified as chronically drought affected. (Rec. No. 242).

APPENDIX 9

Report of the National Committee on the Development of Backward Areas on Chronically Flood Affected Areas — Relevant Recommendations

Crop damage is one of the worst damage caused in floods. An appropriate cropping strategy and other steps have, therefore, to be adopted in these areas. The obvious pathways would be to popularise suitable flood escaping or flood tolerant cropping system or intensive crop production with irrigation in the flood free months there. The Committee considers that maximum utilization of the water resources available in these areas and introduction of suitable cropping strategies would be the most important steps for the development of these areas. (Rec. No. 9).

2. The Committee would also like to emphasise the importance of pre-disaster preparedness measures since they can change a major disaster into a minor one and mitigate the suffering of those likely to be affected. (Rec. No. 11).

3. The present restriction on use of margin money on disaster preparedness measures should be reviewed. Funds need to be provided. (Rec. No. 16).

4. The Committee has already recommended a Sub-Plan approach for allocation of Plan funds in respect of backward areas. It has also dealt with extensively about the allocation of financial resources, etc. The Sub-Plan approach would equally be applicable to the chronically flood affected areas identified by the States in accordance with the criteria recommended by the Committee. The Committee has recommended a special grant of Rs. 5 lakhs per block, on a phased basis, to take care of certain special items like surveys, investigation, etc. As in the case of chronically flood affected areas, a block would not be the unit of identification, but a basin or sub-basin, the allocation may be on area basis. A suitable formula would have to be devised so this additional allocation is also available in respect of the chronically flood affected areas. (Rec. No. 17).

5. Adequate research support needs to be provided to solve 'Diara' land problems. Suitable research projects should be taken

up on crop and varietal improvement, efficient methods of tillage for timely operations, efficient use of irrigation water, pests and disease management. etc. Organised marketing system to pick up the farm produce from the producers and fetch remunerative prices will go a long way to promote this cropping strategy. (Rec. No. 18).

6. Given such facilities, and subject to local requirements, the general cropping pattern for the chronically flood prone areas of U.P. should be (a) intensive '*rabi*' cropping after recession of flood water with irrigation and raising crops with improved varieties of wheat, potato, peas and mustard; (b) after '*rabi*' irrigated summer cropping (*Zaid*) be practised, using suitable short duration varieties of summer maize, mung or paddy so as to harvest the crops before rains; and (c) '*kharif*' cropping when taken up, mostly flood tolerant paddy varieties like Madhukar, Chakia-59, etc., may be adopted. (Rec. No. 19).

7. The 'Diara' land in Bihar constitutes the most flood affected areas of the State. 'Diara' lands of Bihar are similar in character to those of Eastern Uttar Pradesh. The various practices in 'Diara' land can be applied to other chronically flood affected areas wherever suitable. (Rec. No. 20).

8. Access to irrigation water is essential for promoting intensive crop production programmes during flood free months in chronically flood prone areas of Bihar. Adequate research support as advocated for 'Diara' lands in Uttar Pradesh holds good for Bihar. (Rec. No. 21).

9. The Committee endorses the contingent crop plans and alternate cropping pattern envisaged by the Government of West Bengal. (Rec. No. 27).

10. In general, agriculture in Orissa, means raising of paddy. The October-January sown crop of paddy, though covers only 5 per cent of the State's paddy area is practically free from flood and performs best. The season is comparatively cloudless and favours increased photosynthetic efficiency from November onwards. All efforts should be made to expand paddy area in the October-January season. The Committee advocates this strategy in the flood prone coastal area of Orissa. (Rec. No. 28).

11. The success of such a strategy depends on the availability of irrigation water. The Committee, therefore, reiterates its recommendations that immediate steps should be taken to increase irrigation facilities in the flood prone areas. (Rec. No. 29).

12. Intensive research carried out in the country by the scientists of the Central Rice Research Institute, Cuttack, Agricultural universities, etc., and elsewhere on paddy, now offers newer varieties and technology suitable for flood prone areas. Photosensitive high yielding varieties like CR-1009, CR-1011, CR-1018, Pankaj and Jagnath can successfully be grown in rainfed, shallow and intermediate waterlogged areas (15-50 cm. water depth). For recurrent flood areas, flood resistant varieties like FRG-7, FRG-8, BR-14, FR-13A and FR-43B are recommended. Where semi-deep (50-100 cm.) flood water conditions are experienced, rice varieties like CR-1030, CR-260-30, CR-260-31, etc., would be the suitable varieties. Floating rice varieties like Jai Suria, CNDW 332, 327, 326 and 325 have shown great ecological adaptability and are recommended for deep water areas. (Rec. No. 30).

13. The Committee advocates the restructuring of the cropping, which can escape or tolerate flood damage in the flood prone areas. For popularising such a cropping strategy, it is reiterated that steps should be taken to make available irrigation facilities in such areas. (Rec. No. 31).

14. Due to management difficulties, deep water paddy produces low grain yields, ranging from 0.5 to 1 tonne per hectare. Suitable varieties are to be evolved to tolerate long periods of complete submergence. Nevertheless there appears no breakthrough in deep water paddy cultivation. In view of the importance of deep water paddy in the flood prone areas and the formidable problems faced for attaining any breakthrough in its promotion, the Committee strongly advocates intensification of scientific research on deep paddy on priority basis. (Rec. No. 32).

15. A strategy to retain some water in the natural depressions for providing lift irrigation during the later part of the *rabi* season and during hot weather season should be considered. (Rec. No. 33).

16. It should be possible to carry canal water for irrigating lands rendered flood free during *rabi* and summer season if there is

any major, medium or minor surface irrigation scheme operating in the relatively higher areas in the neighbourhood. The distribution arrangements can be made from the nearest canal water course either through portable pipes or through underground pipe system which may remain undisturbed during the floods. Such irrigation will provide gravity flow to the areas rendered free of floods for *rabi* and hot weather crops in and around natural depressions. Drip irrigation and sprinkler irrigation may be tried to secure economy in water use. (Rec. No. 34).

17. Wells could be sunk in the areas affected by floods. They would be normally covered during the period of submergence and can be used for irrigation purposes with manual or animal operated devices as well as with portable pumpsets to lift water from the wells in the flood free season after the monsoon. (Rec. No. 35).

18. In West Bengal many channels keep on flowing after the monsoon season even after the lands are rendered flood free. To raise *boro* paddy or wheat the farmers are used to put up *kuchha* bunds across the flowing channels to impound water and lift the same for irrigating the areas. The system is very crude and affects adversely the regimes of natural streams or the drainage channels. Instead of putting up temporary earthen bunds, if a systematic programme of construction of sluices with gates are drawn up and construction undertaken, perhaps the purpose will be better achieved and during the monsoon season the gates can be kept open to allow flood water to pass freely. (Rec. No. 36).

19. So far as areas subjected to flash floods are concerned, the same strategy of tubewells, wells and river lifts can be considered with similar portable arrangements for pumps, motors and distribution system for providing irrigation during *rabi* and hot weather seasons. In such areas it is most advisable not to try any crops during flood periods. (Rec. No. 38).

20. The moderation of run-off would directly help the chronically flood affected areas. For reduction of run-off, the Committee would recommend (i) prohibition of production in the hilly catchments; (ii) construction of flood detention reservoirs; (iii) contour bunding in hilly catchments; (iv) small check dams on the tributaries to delay run-off to point of concentration; and (v) elaborate flood

fighting arrangements at vulnerable points with adequate support of flood forecasting and warning thereof. (Rec. No. 41).

21. A number of smaller flood retention reservoirs of suitable capacity should be constructed on or near each river, by excavation if necessary. This will serve to regulate the ferocity of flash floods down-stream of these reservoirs. The retained flood water in various reservoirs can provide ample water supply during the dry season. (Rec. No. 42).

22. Any individualistic attempts at soil conservation measures may not yield the effective results. The whole watershed needs tackling in totality by the Governments and the individual farmers should be made to work within the prescribed norms. In consonance with overall objectives, any financial needs of the individual farmers should be satisfactorily backed by governmental agencies. (Rec. No. 44).

23. Embankment construction has been one of the age old method of reducing flooding. The Committee agree that the objective of remedial measures of the protection of a chronically flood affected area should be to train the rivers on their way to the sea by constructing protective embankments, judicious dredging, flood escapes, etc. One of the main reasons attributed to such frequent breaches has been found to be inadequate maintenance. The Committee endorses the Seventh Finance Commission's recommendations on the subject. (Rec. No. 45).

24. The importance of preparing a comprehensive plan of action assures greater strength in the context of drainage management. The Committee would like to emphasise involvement of all the concerned authorities/agencies which would be responsible for sanctioned construction works in the flood prone areas. (Rec. No. 46).

25. The maintenance of drainage by dredging and utilisation of the material thus dredged for filling up the hollow areas on the other side of the embankments is a possibility. The maintenance of major/medium drainage wherever maintained by Revenue Department, must be taken over by the Irrigation Department. (Rec. No. 47).

26. Flood relief channels should be constructed at suitable points to drain excess of flood water to remote artificial lakes; these should also be provided towards the downstreams and of enlarged channels to carry away surplus water to other artificial lakes. The flood relief channels can be used as feeders for minor irrigation canals. (Rec. No. 49).

27. The problem of sand casting, beyond a limit, is quite harmful for the crop growth. The Committee would recommend the initiation of scientific studies on the subject so that suitable crop planning can be devised. (Rec. No. 52).

28. Strict regulation of land use in the chronically flood affected areas is necessary. (Rec. No. 57).

APPENDIX 10

Report of the Irrigation Commission, 1972 — Relevant Recommendations

General

The Commission recommends that instead of the Irrigation Department determining the cropping pattern in consultation with the Agriculture Department, as is done at present, the latter Department should determine the pattern in consultation with the Irrigation Department. (Para 19.13).

2. While designing future canals, the results of research on soil-plant-water relationships, the contribution of rainfall in the growth period of crops and the interaction of other inputs like fertilizers, should be taken into account, and duties, deltas and water allowances fixed accordingly. (Para 19.13).

3. There is large scope for the conjunctive use of surface and sub-surface water, particularly in the Indo-Gangetic Plain, and the coastal areas of Orissa. It can also be applied to a lesser extent elsewhere in the country, where canal supplies can be supplemented by open wells or tubewells.

4. The Commission recommends that areas where conjunctive use is feasible, should be identified, particularly in the commands of existing canal systems. (Para 19.14).

5. There should be a number of fully investigated schemes kept ready for choice, so that financial resources may not get deployed on relatively uneconomic schemes. The quality of investigations should not be sacrificed to speed up project formulation. The investigation of irrigation projects and their ayacut development should be undertaken simultaneously. Also, studies of soil conservation measures, particularly for the more critical areas in the catchment should be taken in hand at the same time. (Para 19.15).

6. For judicious use of limited irrigation supplies, it is important to determine critical periods during which deficiency of moisture in the soil can seriously reduce the yield of crops. Irrigation systems should provide water not only in the required quantity but at the required time. (Para 19.16).

7. Broadly, the goals for irrigation policy may be classified under three heads, viz.;

- (i) maximum production per unit of area, as in the Brahmaputra Valley and the Indo-Gangetic Plain;
- (ii) maximum production per unit of water, as in regions of medium and low rainfall, in which about 70 per cent of the cultivated area of India lies; and
- (iii) maximum area served, as in drought affected areas. (Para 19.18).

8. Lining must be resorted to where water resources are inadequate and particularly where the percolated water cannot be retrieved or, when retrieved, is unfit for use. The Commission recommends that in all future projects, the main canals and branches should, in general, be lined and the lining of distributaries undertaken as and when resources become available. As an alternative to lining small water courses, pipelines may be worth considering. (Para 19.20).

9. There are many areas in the country where the use of sprinkler or drip irrigation would be more useful. There is, however, need for research, experimentation and demonstration to identify the areas, conditions and crops which are most suitable for this mode of irrigation. (Para 19.21).

10. Farmers should be encouraged to lift water for irrigating areas in canal commands which cannot be served by flow. Drain water should be utilised for irrigation in an authorised manner and the farmers be charged lift irrigation rates for it. (Para 19.22).

11. Some major rivers, particularly the Ganga and the Brahmaputra offer considerable scope for Floating Pump Irrigation Schemes. The Commission recommends that these possibilities should be fully explored in Bihar, Uttar Pradesh and West Bengal and on some major rivers in other States. (Para 19.22).

12. The Commission recommends that a comprehensive plan of ayacut development should be prepared for every major and medium irrigation project, simultaneously with the preparation of a plan for the project. (Para 19.24).

13. The Commission is of the opinion that a special administrative agency for the coordinated and expeditious development of command areas under medium and major projects is very necessary. No separate cadres should be created for the ayacut development programme and the relevant departments of the State Government, such as Irrigation, Agriculture, Co-operation, etc., should continue to discharge their respective functions within the ayacut under the normal departmental control. The coordinating agency for the ayacut could, however, set out specific tasks for various departments and institutions, coordinate their activities and ensure implementation of the agreed programme. Each irrigation project deserves a separate ayacut development agency. (Para 19.24).

14. Research should be conducted in command areas of projects to encourage the farmers to adopt improved irrigation practices and crop patterns with confidence. Demonstration plots, training programmes and the use of television for educating the farmers have been recommended. (Para 19.27).

15. The needs of the drought areas will not be adequately met by any minimum programme of irrigation. What is needed is a maximum programme, because even if such a programme is implemented, drought areas will lag behind. In drought areas only 25 per cent of the cropped area will come under irrigation, as against the 50 per cent for the country as a whole. (Para 19.31).

16. The Commission supports a liberal policy for irrigation works in drought areas and recommends the benefit-cost unity. The States should be provided with loans at the concessional rate of half the normal rate to facilitate the construction of irrigation works in the drought areas. (Para 19.32).

Improvements to Existing Irrigation Works

17. The Commission recommends that inadequacies in run-of-the-river systems should be met by the increased use of groundwater, by the construction of storage reservoirs and by supplementing supplies by transferring water from an adjacent basin. Farmers should be encouraged by providing them financial assistance, technical guidance and electricity, to sink wells or tubewells so as to make up any inadequacies in supply from canals and to extend irrigation. Other measures recommended to mitigate the effect of

inadequacies are the lining of canals, the control of drainage, the provision of regulations and escapes, the substitution of weirs by barrages and the improvement of headworks. (Para 19.33).

18. The Commission recommends that effective steps should be taken gradually to replace field-to-field irrigation of rice by the system of field channels. There should also be separate drains serving individual fields. (Para 19.33).

19. Irrigators in drought affected areas derive larger benefits from irrigation than those in other areas. The Commission is of the opinion that farmers in these areas should be charged the normal irrigation rate. (Para 19.45).

20. In canal commands, a lower rate should be charged for lift irrigation in view of the extra effort or expenditure involved in lifting water and the economy in its use. (Para 19.45).

21. Tubewell water is charged on the basis of the quantity of water supplied at the tubewell in some States, and in others on the basis of the electricity consumed. The Commission is of the view that the former is more equitable. (Para 19.46).

22. The Commission recommends that water rates should be reviewed and revised by all the States in the fourth year of every Plan. (Para 19.47).

23. The work of exploitation of groundwater in the State should be entrusted to two divisions; one under the Irrigation Department dealing with planning, operation and maintenance of heavy duty State tubewells, and the other under the State Agriculture Department dealing with drilling, boring of private wells and shallow tubewells. (Para 19.55).

24. The Commission feels concerned about dangers of serious waterlogging in the command areas of the Gandak and Kosi Projects. The high water table, heavy rainfall, perennial irrigation and the flat nature of the terrain are conditions that can create serious problems in these areas. The Commission recommends that the dangers of waterlogging in the Gandak and Kosi Projects should be vigorously dealt with from now on. (Para 19.61).

25. The Commission hopes that the States will continue to take steps to improve drainage in their irrigated areas. The drains should be excavated to adequate sections, and bad curves should be eased. (Para 19.61).

26. For an effective soil conservation programme, rivers and streams which carry a heavy silt load should be identified. The next step should be to locate the sources and assessment of sediment. This entails a systematic study of silt loads and discharges at selected observation stations. We have recommended that new observation stations on all important projects should be set up early. (Para 19.63).

27. A centrally sponsored scheme now covers 21 major projects for soil conservation. The Commission recommends that the States should make an early assessment of the erosion problem in the catchment areas of reservoirs not covered by the central scheme. Soil conservation should be taken up urgently in the more vulnerable areas. (Para 19.63).

28. The Commission recommends that the problem of soil conservation in all major projects should be completed in the next 20 years. In projects where the problem is acute, it should be completed within ten years. (Para 19.63).

29. A special problem, which deserves consideration, is the silting of canals, as has been observed in the Kosi Irrigation system. Such silting affects the functioning of the irrigation system. The Commission, therefore, recommends that the silt problem of the Eastern Kosi Canal should receive urgent attention. (Para 19.64).

30. Experience of entrusting certain functions of irrigation administration to the Panchayati Raj institutions and irrigators' co-operatives has not proved satisfactory. The Commission is of the opinion that some sort of body composed of irrigators has to be created to share responsibility. The Commission recommends that State Governments should examine the nature of organizations or societies or irrigators to be set up. (Para 19.69).

31. The Commission recommends: (i) computerisation of irrigation and agricultural statistics at the State headquarters; (ii) training of *patwaris*; (iii) strengthening of statistical set-up in districts; (iv) preparation of statistical extracts for each village,

each district and each State with the aid of computers; and (v) routing back abstracts to appropriate levels of administration. The Commission hopes that this process will ensure that the statistics are available within twelve months of the close of the relevant period. (Para 19.72).

Recommendations—Statewise

I. Bihar

1. The culturable areas in North Bihar with the exception of Champaran district north of the Don Canals, are areas where the ground-water resources are high yielding. In South Bihar, the Gaya plains are also underlain by high yielding aquifers. The low yield areas are in the south. There is a possibility of tapping artesian aquifers in the northern part of Champaran, Muzaffarpur and Darbhanga districts on the border of Nepal. (Para 3.11).

2. Progress of land levelling and land reclamation in Kosi command appears to be slow, largely because of the high cost of reclamation and the inability of farmers to bear it. The question of cost needs to be looked into. In particular, the smaller cultivator would need financial and other assistance. We are given to understand that the State Government is arranging demonstrations to bring home to farmers the benefits of land levelling. (Para 3.17).

3. Because of the slow utilisation of water in the canal systems of the Kosi and the Gandak, the need for an accelerated programme of extension and training has become urgent. Recognising this urgency the State Government has recently set-up four hundred farm service units to ensure the timely supply of credits and inputs and to guide farmers in processing and marketing their produce. (Para 3.22).

4. In the State there are two pockets which are particularly vulnerable to drought — one towards the east, comprising parts of Bhagalpur, Santhal Parganas and Purnea, and another in the West comprising parts of Patna, Gaya, Saran and Shahabad. Because of the high evapo-transpiration needs and the comparatively inadequate rainfall in some areas conditions very close to semi-aridity obtain in parts of Patna, Gaya, Monghyr and Hazaribagh districts and are conducive to drought.

5. Following the drought and famine in 1967, the State Government undertook an extensive programme of drilling tubewells for irrigation in the alluvial tracts where groundwater resources are adequate. It has also taken up a scheme under which it will subsidise farmers who wish to have high-capacity tubewells on their farms. The Government will also sink wells for farmers who take the subsidy. (Para 3.23).

6. In the Santhal Parganas, the Gumani and the Ajoy rivers have not been tapped. On both these rivers, good storage reservoir sites have been located. Large reservoirs have been proposed on the south Koel and the Saokh rivers for hydro-power generation. We recommend that the possibility of irrigation and the development of fisheries from these reservoirs should be investigated. (Para 3.24).

7. There are also immense possibilities for the exploitation of the large reserves of groundwater, which underlie about 50,400 sq. km. of its aluvium-covered area. Only 13 per cent of this potential has so far been explored by tubewells. We understand that credit facilities are available and if the pace of rural electrification to energise tubewells could be accelerated, there is every reason to expect success in the exploitation of groundwater. The key to rapid progress lies in the expansion of rural electrification in which field Bihar is trailing behind many other States. (Para 3.25).

8. *Kosi Project*: Though the Eastern Kosi Canal was opened for irrigation as far back as 1964 and ayacut development is being carried out under the guidance of a whole-time Area Development Commissioner, no appreciable headway has been made in constructing field and drainage channels, in the consolidation of holdings and cultivation of high-yielding varieties. It appears that the farmers are reluctant to excavate field channels, with the result that the development of irrigation has not progressed satisfactorily. (Para 3.31).

9. Land levelling has also not made much progress. Due to lack of adequate demand, the tractors are reported to have worked, on an average, for only 100 days in a year. The main reasons for the lack of response are said to be the inability of the department to provide the promised irrigation and the tendency on the part of the farmers to wait hopefully for a Government subsidy. Necessary action is called for to provide the water according to

schedule and to dispel the false hopes of the farmers that they will be given a subsidy. (Para 3.31).

10. The heavy silting up of the canal is a serious problem which deserves the immediate attention of the State Government. (Para 3.31).

11. We have also suggested that irrigation be confined to the *kharif* season and should begin only if required during the critical stages of crop growth, so that sedimentation is reduced to the minimum. (Para 3.31).

12. The working of the Eastern Canal has not been quite satisfactory, both from the point of view of the area irrigated and the problem of heavy sedimentation. We feel, therefore, that the proposal to construct a canal on the west bank should be thoroughly examined before it is accepted. The possibilities of using groundwater to irrigate the areas included in the command of the west bank canal should also be carefully investigated. (Para 3.32).

13. *Gandak Project*: This project has now been under construction for the last 10 years and with the present pattern of financing, its completion is likely to be prolonged indefinitely. The State Government should take steps for the early completion of this project. (Para 3.32).

14. *Sone Canal Project*: The State Government may take suitable steps for the control of pests and diseases and encourage a higher coverage with high yielding varieties. (Para 3.36).

15. It may also be possible to increase the area under wheat by supplemental irrigation from groundwater resources, which are abundant in this region. Such groundwater support to this diversion canal would help to get over the shortage of water for wheat and summer paddy. (Para 3.36).

16. During the course of our discussions with the State Officers, we were informed that the State Government proposes to do away with the Satta system of irrigation and to introduce a system under which those farmers who are given assured water supplies, will have to pay irrigation charges, irrespective of whether they actually irrigate their fields or not. We consider that

such action is overdue and that unless the Satta system is done away with, the irrigation intensity will continue to be low. (Para 3.37).

17. The major and medium projects in the State are, at present, looked after by different organizations, namely, the River Valley Department, and the Irrigation Department. It would be desirable to bring all the projects under one department for ensuring coordination and economy. (Para 3.38).

II *Orissa*

1. In Chapter VII of Volume I of our Report, we have discussed the problems of ayacut development and have made recommendations for their speedy development. In Orissa, the difficulties faced by the farmers and project authorities in this regard are the same as in other ayacuts. We would draw the attention of the State Government to our recommendations and particularly to those which relate to the State's role in extension work and the need to supply funds to farmers for the purpose of development. (Para 15.15).

2. We have also dealt therewith the problems of land-levelling and landshaping and the recommendations in this regard are of special relevance to certain areas in the Hirakud Project. (Para 15.15).

3. In Volume I, we have also dealt with the problem of field channels and we would like our recommendations to be studied carefully for their application to ayacuts in Orissa. (Para 15.15).

4. Where the area served is backward we would like the State to pay special attention to the development of infrastructure, roads, postal communication facilities, etc., and the improvement of marketing services such as setting up of *mandis*, providing warehousing and storage, banking facilities, etc. It would be necessary to announce the support price for foodgrains before the sowing season to provide the farmers with an assured market. Areas where sugarcane is allowed to be grown should be provided sugar mills. (Para 15.15).

5. The State will have to play an active role in evolving new varieties of seed and multiple cropping to suit local conditions.

We are glad that there is increasing awareness on the part of the State Government about importance and urgency of ayacut development. (Para 15.15).

6. We are of the opinion that in order to achieve effective flood control, atleast one flood retention reservoir should be built on each of the rivers—Mahanadi, Brahmani and Baitarani. (Para 15.19).

7. At Hirakud, a large number of farmers who met us, complained that applications for the supply of water from minor tanks, including those having a command of less than 24 hectares and are under the management of the Gram Panchayats have to be made to the Tehsildar. Considerable delays occur in the grant of applications, and the small farmers are the worst sufferers. We were informed by the State officers that the revision of the procedure has been under the consideration of the State Government since 1966-67. We are of the opinion that matter calls for an immediate action and the irrigation engineers should be given the power to sanction applications for irrigation. They should prepare bills for water rates, the collection of the bills remaining the responsibility of the Revenue Department as at present. (Para 15.25).

8. Some farmers complained that there is shortage of water at the tail-end of canals in the Hirakud Project due to the absence of shutters on many water courses and unauthorised cutting of canal embankments in the upper reaches. Sometimes areas at the tail-end are flooded due to lack of drainage facilities. These complaints deserve to be looked into. (Para 15.26).

9. In the Chakuli Farm in the Hirakud ayacut some experiments have been made in water-management by constructing field channels and drainage channels in rice fields. It was found that the water requirement of rice was thereby reduced to 97 cm. including the effective rainfall.

10. Elsewhere in this Chapter we have referred to the variability and undependability of rainfall in some areas of Orissa. We were told that the Padampur sub-division of Sambalpur district, which was not covered by the Hirakud Project, occasionally suffers from drought due to erratic rainfall. When rains fail or are irregular, there are failures of paddy crop. It was suggested

to us that there was ample scope for the renovation of derelict tanks and constructing new ones. As an example, if the Baganpur tank could be renovated, it would provide irrigation to about 1,620 hectares. Lift irrigation in this area is another possibility. (Para 15.30).

11. We urge the necessity of an early revision of the irrigation laws to levy irrigation rates on lands under tanks. (Para 15.31).

12. The water requirements of *rabi* rice are high at about 122 cm. and it should not be grown on areas of low rainfall. (Para 15.35).

III *Uttar Pradesh*

1. Apart from new major, medium and minor irrigation works, there is considerable scope in the State for improvements to existing irrigation works by the lining of canals, better water management and change for crop patterns. There is also considerable scope for expanding well and tubewell irrigation. A preliminary assessment by the State Government places this potential at 2.854 million hectares of irrigation. (Para 20.18).

2. Floods are a regular feature of Uttar Pradesh. The areas affected by floods are Bulandshahr in the west and Basti, Bahraich and Ballia in the east. The main causes of floods in the eastern districts are:

- (i) high intensity of rainfall;
- (ii) poor land slopes;
- (iii) high sub-soil water-level;
- (iv) accumulation of detritus in river beds; and
- (v) a number of depressions which are difficult to drain off. (Para 20.19).

3. Most of the irrigation works in Uttar Pradesh are run-of-the river diversion schemes depending on available supplies in the rivers. They are, therefore, unable to provide timely irrigation for high yielding crops. Constructed as protection works against the failure of rainfall, they are inadequate to meet the irrigation requirements of *rabi* and hot weather crops from the month of No-

vember to May, when river supplies are low. The State Government is aware of these limitations and has taken up the construction of some major and medium schemes to supplement canal supplies. With the proper reservoir support, not only can the existing shortages be overcome but irrigation benefits can be extended to new areas. (Para 20.28).

4. A fine example of conserving monsoon flows is the Karamnasa complex of storages and pick-up weirs, which have, more or less, completely harnessed the entire flows of the river. We would recommend that similar schemes for the conservation of water of other streams should be investigated especially those in backward areas. (Para 20.28).

5. We feel that there is good scope in the State for the construction of more lift irrigation schemes. These schemes would be particularly beneficial in providing irrigation to tracts with deficient rainfall and lacking in groundwater. (Para 20.33).

6. We would, however, like to sound a word of caution against the construction of pumped canals in areas which have copious rainfall and/or an abundance of groundwater resources. A case in point is the proposal to undertake another pumped canal from the river Ghaghra to augment the existing supplies in Dohrighat Canal for stabilising existing irrigation and providing additional irrigation in Azamgarh and Ballia districts. The region has assured and adequate rainfall and the water-table is within 4.6 m to 6.1 m of the surface during the hot season. It is higher during the monsoons. In our opinion, it would be worth considering whether sub-soil water could not be used for irrigation instead of pumping river water into the soil which may enhance the risk of water-logging. (Para 20.34).

7. The possibilities, economics and comparative benefits of larger tubewells have yet to be studied. At present, it is not possible for us to express an opinion on their economics. We would like the State Government to initiate studies in the matter. (Para 20.41).

8. Tubewells in the western districts running for 5,000 to 6,000 hours per year break almost even on their expenditure and revenue but those in the eastern districts running only 2,000 to 3,000 hours per annum suffer heavy losses. Their potential has not been

fully utilised though it is more than ten years since they were completed. (Para 20.42).

9. We also feel that an adequate extension service should be organized for State tubewell commands to develop high yielding varieties of crops. This is more necessary now as tubewell commands are being progressively reduced to increase water supplies to high yielding crops. This would also improve the working hours. (Para 20.44).

10. The development of groundwater in area of plentiful rainfall with high sub-surface water-level should, in our opinion, be left to farmers. However, to prevent an indiscriminate sinking of tubewells, and over-exploitation of groundwater, the construction of deep tubewells should be regulated by law. We have in view the districts of Ghazipur, Azamgarh, Ballia, Bahraich, Basti, Gorakhpur, Gonda and Deoria which would need special attention. It should be borne in mind that the State tubewells in these areas are being inadequately utilised and any further increase in their numbers would cause additional loss to the exchequer. (Para 20.45).

11. The concept of making conjunctive use of surface and groundwater does not appear to have caught on in the State. In the three major surface canal schemes — the Gandak, the Project Assist and the Ramganga — there is no plan to make conjunctive use of the surface and ground supplies. The Gandak and Project Assist Schemes will irrigate tracts where the water table is high and the release of massive surface supplies into the area may raise the water level higher and cause waterlogging. (Para 20.48).

12. We were informed that the effects of these projects on the groundwater regimes are being studied. Perhaps, it is not yet too late to reschedule canal supplies and plan for the conjunctive use of both surface and groundwater. Similar studies, in our opinion, should be instituted in the command areas of older schemes like the Ganga and Sarda Canals to find out the possibilities of supplementing surface supplies with groundwater. (Para 20.49).

13. Field-to-field irrigation is practised in some projects particularly in the eastern districts. We are of the opinion that the construc-

tion of field channels should be given high priority in the commands of projects where field to field irrigation is being practised. We think that if suitable subsidies are given for the construction of cross-culverts on village roads, losses of water caused by breaches in the field channels could be avoided. (Para 20.51).

14. The Agriculture Department of the State is not at present associated with the formulation of irrigation projects in the initial stages. The Irrigation Department determines the cropping pattern and the concurrence of the Agriculture Department is sought after the project's formulation. A suitable cropping pattern can be devised only after proper soil surveys, and we are of the opinion that the Agriculture Department, which is responsible for soil surveys, should be associated with the projects from the very beginning. (Para 20.52).

15. Flood levees along big rivers are costly to construct and maintain. We are glad the State Government has taken action to provide protection against floods to cultivated areas and habitation by constructing flood embankments. Our suggestions in this connection are:

- (i) a long range plan for constructing protection works should be formulated; and
- (ii) imposition of a suitable betterment levy on agriculture lands which get protected. (Para 20.56).

IV *West Bengal*

1. The drought affected areas are spread over districts of Purulia, Bankura, Burdwan, Midnapore, Birbhum, Malda and West Dinajpur and measure 0.8 million hectares.

Such areas of Purulia, Bankura, Burdwan and Midnapore are undulating and hilly. Their soil is mostly composed of sandy loam and laterite gravel and has very low moisture retention capacity. The drought-affected area of Malda comprises the borind which is comparatively high tract of sticky, hard soil of low fertility. This soil fails to yield a good crop if, rainfall is not adequate and timely. Drought in West Bengal is more often caused by want of adequate and timely rainfall, rather than by total failure of rains. Due to wide regional variations, the districts mentioned above re-

ceive less than the State's average rainfall of 1750 mm. The distribution is erratic. Random observations of fluctuations in groundwater levels in different areas of the State, made by River Research Institute of the State indicate that the sub-soil water level in the drought-affected areas varies from 4 to 7 m except in Malda district. The groundwater available in the region is suitable for irrigation. It is necessary, therefore, to carry out a systematic groundwater survey of the drought-affected areas of West Bengal. (Para 21.16).

2. The State Government has drawn up a Master Plan for flood control in a number of rivers in North Bengal. These schemes include the construction of flood embankments, soil conservation, afforestation and drainage, etc. The names of the schemes are as follows:

- (i) Master Plan for the Teesta river — cost Rs. 1,140 million
- (ii) Master Plan for the Jaldhaka river — cost Rs. 947 million
- (iii) Master Plan for the Raidak river — cost Rs. 610 million
- (iv) Master Plan for the Torsa river — cost Rs. 288 million

Due to the paucity of funds, the schemes have been phased over a period of 10 years. The State Government has suggested that the responsibility for flood control in North Bengal be taken over by the Central Government. (Para 21.20).

APPENDIX 11

Report of the Rashtriya Barh Ayog (National Commission on Floods) — Relevant Recommendations

The States should make a review of the utility of Zamindari/test relief embankments depending on the importance of areas protected. (Rec. No. 5).

2. Embankments which are considered useful should be incorporated in the overall flood control plan of the State. (Rec. No. 6).

3. Embankments which are not considered useful should not be retained but may be demolished, or allowed to languish/disintegrate/disappear in course of time. (Rec. No. 7).

4. Embankments which are retained should be properly maintained. In the cases where realigning is necessary, the possibility of utilising the old embankments as the first line of defence or as a local ring bund may also be examined. (Rec. No. 8).

5. There is need for closer coordination amongst concerned agencies like the Railways, National Highways, State Irrigation/Flood Control Departments so as to ensure that structures like bridges, roads, railways, etc., do not aggravate flood problems. (Rec. No. 10).

6. Prior consultation by National Highway authorities, State PWDs and Railways with the State Irrigation/Flood Control Departments should be made obligatory. To facilitate an expeditious check, the Government of India should evolve a guideline/check list for the purpose of vetting of waterways by the State Irrigation/Flood Control Departments, (Rec. No. 11).

7. The final estimate of crop damage in areas where they are completely destroyed but resown/replanted should be made in terms of loss of inputs. (Rec. No. 16).

8. Information on (i) stage of the crop at the time of flood; (ii) crop completely destroyed; and (iii) crops damaged but replanted/resown should be collected. (Rec. No. 17).

9. Crop losses in terms of money should be estimated by using farm harvest prices. (Rec. No. 18).
10. Crop yield rates should be derived from crop-cutting experiments. (Rec. No. 19).
11. The collection of crop damage statistics should be integrated with that of agricultural statistics. (Rec. No. 20).
12. Wherever possible, contour maps alongwith guage data should be used by the Flood Control Department to derive estimates of area flooded. (Rec. No. 21).
13. Remote sensing techniques operated through artificial satellite(s) may be used in selected areas to provide a sample check on the extent of area and cropped area affected by floods. (Rec. No. 22).
14. Large scale reclamation of alkali soils in the Indo-Gangetic Plains should be taken up to reduce drainage congestion in alkali areas. (Rec. No. 39).
15. Integrated action plan on soil conservation and watershed management should be prepared, implemented and maintained in the flood-prone basins/sub-basins. The implementation agencies should be adequately strengthened with trained personnel. People's participation should be mobilised. (Rec. No. 41).
16. The present programme for the control of shifting cultivation should be intensified and the concept of growth of urban centres in the fertile valleys developed on a pilot scale. (Rec. No. 43).
17. A Central Land Use Commission should be set up and entrusted with the responsibility of bringing about uniformity in the existing land use regulation for enforcement in inter-state basins. (Rec. No. 50).
18. Restructuring of cropping programme during the flood-free months should be undertaken and suitable programme for irrigation should be launched. (Rec. No. 51).
19. Special flood-prone area programme similiar to the Drought Prone Area Programme or Tribal Area Development Programme

should be launched for the rapid development of 'diara land', alongwith appropriate research and development support. (Rec. No. 53).

20. Terracing for cultivation on steep slopes should be enforced as a general rule. (Rec. No. 54).

21. The comprehensive approach to the problem of floods must form part of the overall comprehensive approach for the best possible utilisation of the land and water resources for optimum production on a sustained long-term basis. The approach to the flood problem should remain dynamic and flexible, so as to accommodate future improvements in policy, if called for, taking into account the state of our economy, our social conditions, and the availability of resources. (Rec. No. 81).

22. Various alternative measures, physical or otherwise, should be considered for flood management and the optimum combination of the measures available in a given situation selected. (Rec. No. 82).

23. There is a need for storage in various forms, which would even out the flow, and also conserve water for use during the drought period. (Rec. No. 83).

24. Afforestation and soil conservation measures are recommended as a useful complement to other measures, and should be taken up specially in the watersheds of rivers with heavy silt discharge. (Rec. No. 84).

25. Reservoirs, to the extent technically and economically feasible, must be considered as an important component in any package of measures for flood management. (Rec. No. 85).

26. Where conditions permit, storage of natural detention basins should be brought into use for flood moderation during abnormal floods. (Rec. No. 86).

27. Research and development regarding groundwater recharge should be carried out. (Rec. No. 87).

28. Measures for drainage improvement should be planned and executed in a coordinated manner. Measures for irrigation and drainage should be integrated. (Rec. No. 91).

29. Floods should find a place in the comprehensive planning for water resources development. The first choice should, therefore, be to undertake comprehensive water resources development in rivers. (Rec. No. 94).

30. Flood space should be provided in reservoirs after examining the need and feasibility. (Rec. No. 96).

31. A river basin is the most suitable and proper unit for preparation of water and flood plans. (Rec. No. 99).

32. It is advisable to visualise flood works which may be needed for different reaches of the river and take account of their interaction. (Rec. No. 100).

33. Soil conservation and afforestation measures be stepped up. (Rec. No. 101).

34. Local factors may be taken into account and standing for planning and design for surface drains fixed by areas/regions in each State. (Rec. No. 102).

35. Drainage schemes undertaken in irrigated areas and for the purpose of land reclamation should not form a part of 'flood' sector. These schemes should, however, be discussed in the Technical Advisory Committees of the State Flood Control Boards. (Rec. No. 103).

36. Due attention should be paid to the environmental changes likely to be brought about by a flood and/or a water resources development project. (Rec. No. 104).

37. It is important not only to bring more area under watershed management and soil conservation treatment, but also to take measures to stop damage to further areas as also to maintain areas that are treated. (Rec. No. 114).

38. The organization giving technical assistance to the State Irrigation Ministers' Conference may be strengthened in order to discharge additional functions. (Rec. No. 148).

39. River Basin Authorities should be constituted as statutory authorities. (Rec. No. 149).

40. It would be preferable to have unified Irrigation and Flood Control Departments in the States. (Rec. No. 150).

41. Intensive studies should be undertaken not only to identify suitable recharge areas for flood water absorption and recharging the ground aquifers but also an efficient methodology to execute such recharging programmes in the field on an operational scale. (Rec. No. 183).

APPENDIX 12

Report of the Committee on Forestry Programmes for Alleviation of Poverty, 1984 — Relevant Recommendations

About 15 per cent of the country's population comprising tribals and other poor people depend totally on the use of forest resources for their livelihood. The degradation of forest resources has created the problem of environmental degradation, rural poverty and unemployment. Therefore, forestry has to play a dominant role in the rural development upgradation of environmental and upliftment of the poor families living below the poverty line.

In this context, a Committee was set up by the Union Ministry of Agriculture in March 1982 to suggest *inter alia*, beneficiary schemes in the forestry sector. It submitted its report in April, 1984. The main recommendations of this Committee are given below:

1. Afforestation of Degraded Forest Areas:

Massive plantation programme is needed through involvement of poor families on the pattern demonstrated in Gujarat (Social Security Through Afforestation Schemes) and Madhya Pradesh (Hitgrahi Yojana). Some of the suitable beneficiary schemes include:

- Bamboo and teak plantations and development of cottage industry.
- Plantation of multipurpose species for yielding fuel, fodder, small timber, etc.
- Plantation of tamarind with eucalyptus.
- Scheme for rehabilitation of degraded forests under partnership concept with the people.

2. Social Forestry: To ensure adequate supplies of fuelwood, fodder, small timber and timber and bamboos, all sections of community, schools, panchayats, voluntary organizations and industrial companies should be motivated to participate in social forestry programmes.

3. *Agro-Forestry*: The agro-forestry can be developed through:

- (i) Casurina plantation either pure or mixed with raising of vegetables in early years;
- (ii) Sisal plantations and fibre extraction; and
- (iii) Plantation of suitable trees species on degraded farm lands (unsuited for profitable agricultural crops).

4. *Minor Forest Produce*:

(a) Scientific management of minor forest produce (MFP) as well as unexploited resources is most important for economic development of forest dwellers. The collection and processing of MFP can employ not only the able bodied workers but also infirm, women and children in their traditional habitat. It is, therefore, suggested that:

- (i) itemwise resources inventory survey of MFP should be carried out for each State and Project reports to be formulated for organizing collection, storage, processing and marketing of MFP items;
- (ii) for increasing production of MFP items which have gained economic importance, raising of following species is recommended;
 - (a) Plantation of *terminalia chebula* (Harra) with tendu;
 - (b) Plantation of tamarind; and
 - (c) Cultivation, collection, processing and marketing medicinal herbs.

5. *Sericulture*: For increasing the production of silk and tassar, the following measures may be taken :

- (i) development of tassar-sericulture by raising of Arjun plantation, improved methods of rearing, reeling, spinning and weaving;
- (ii) plantation of mulberry trees, rearing of worms, grading, reeling, shipping and weaving of silk;

6. *Oilseeds of Tree Origin*: For increasing the production of oils from the forest, following measures may be taken up at economic level :

- (i) collection, storage and processing of oilseeds of tree origin in forest areas;
- (ii) encouraging landless and marginal farmers to raise mahua plantation on usar wasteland and degraded farm land by providing subsidy, technological inputs and other assistance; and
- (iii) exploring the possibility of oil extraction from different seeds available in abundance.

7. *Generation of Employment*: In forest areas, employment can be generated through:

- (i) intensive forest management and plantation programmes;
- (ii) massive programme of social forestry and agro-forestry;
- (iii) intensive collection, processing and development of MFP; and
- (iv) development of forest industries.

8. *Cottage Industries*: In forest areas, following forest-based cottage industries can be developed:

- (i) scheme for leaf cup making;
- (ii) bee keeping and honey extraction schemes;
- (iii) bidi rolling and marketing the same;
- (iv) schemes on bamboo crafts and wood crafts;
- (v) extraction of fibre from sisal and making of ropes;
- (vi) manufacture of handmade cardboard and paper;
- (vii) extraction of oil from oilseeds of tree origin and manufacture of soap;
- (viii) manufacture of toys and other fancy articles from timber, etc;
- (ix) myrobalan crushing and tanning of extraction;

- (x) extraction of oxalic acid from *terminalia tomentosa* bark;
- (xi) grading of gums;
- (xii) processing of stick lac and manufacture of various valuable items;
- (xiii) manufacture of agarbatti.

9. *Shifting Cultivation*: Shifting cultivation can be eradicated only through co-operative efforts, motivating the local population through the introduction of alternative programmes. Integrated programmes of agriculture, horticulture, animal husbandry and forest suitably harmonised with proper land use practices should form a backbone of such a strategy. For ensuring success of the programmes following should be kept in view:

- (i) the settlement of shifting cultivators should primarily be within the area of their traditional habitat;
- (ii) the broad approach on family based programmes should be followed in the areas, the aim being individual economically viable schemes with a suitable mix of economic activity on choice of tree crops;
- (iii) the tree species to be selected for rehabilitation of shifting cultivation area should be quick growing, soil enriching, provide requirement of forest products and more importantly provide a supplementary means of income.

10. *Development of Forest Villages*: Projects should be prepared for overall development of tribal villages by providing assistance to the tribals residing there to improve their economic conditions.

11. *Primitive Tribes*: These tribes mainly depend on forest for their survival and existence. The Ministry of Home Affairs have identified 72 primitive tribes deserving special attention. The inadequate supply of forest food and animal protein has been said to be one of the important factors for their slow extinction. Following measures were recommended:

- (a) plantation of mahua, mango, jamun, tendu, jack-fruit trees which are likely to supply food to these tribals and
- (b) a scheme for developing tubers, mushrooms, etc.

12. *Development of Artisans:* A large number of tribals depend for their subsistence on work in wood-crafts, wood and grass crafts, etc. The Committee suggested that tribals should be given training in modern logging techniques, providing tools to improve their working efficiency, regular supply of raw materials and marketing of their produce, etc.

13. *Development of Tribals Owning Timbers on their Holdings:* Timber trees like teak, sal, bija, saja and other trees on their agricultural land should be grown by the tribals. However, they do not know the value of these trees. Scientific management of privately owned timber trees will upgrade the economy of the tribals.

14. *Financial Resources:* For improving the forestry resources, the Committee suggested that :

- (i) an allocation of Rs. 7500 crores to be provided during the Seventh Plan for raising 15 million ha of plantations;
- (ii) for settlement of shifting cultivation, an allocation of Rs. 100 crores may help in model schemes;
- (iii) for intensive development of forest villages, an allocation of Rs. 100 crores may bring two lakhs tribal families above the poverty line;
- (iv) minor forest products development and processing be provided with an allocation of Rs. 100 crores for economic development of 3 million artisans, landless and tribal families;
- (v) substantial financial allocation should be made for forestry schemes under the following programmes:
 - (a) Integrated Rural Development Programme;
 - (b) National Rural Employment Programme;
 - (c) Drought Prone Area Programme;
 - (d) Desert Development Programme;

- (e) Hill Area Development Programme;
- (f) Tribal Sub-Plan Programme;
- (g) Scheduled Castes Component Plan; and
- (h) Rural Landless Employment Guarantee Programme.

15. NABARD should support suitable projects on social forestry, farm forestry and other poverty alleviation programmes.

9. The weakest link in the production of horticulture crops is the non-availability in adequate quantities of the seeds of improved varieties of vegetables and grafts, suckers and other planting material in fruits and other crops. The Group has identified this as an area of weakness which should be attended to urgently.

10. In order to cut down the high cost of seed potato, the Group recommends that as a short-term remedy 'Seed Plot System' may be adopted widely by the farmers for improving the quality of the seeds.

11. The Group recommends the need for seed multiplication and rapid spread of improved varieties so as to improve the productivity of onion. The Group also emphasises the need for developing varieties with long shelf life, early maturing as well as curing of onion bulb in the field. The potential yield of onion can be upgraded to greater degree, if efforts are made to develop F-1 hybrids.

12. Availability of quality seed in case of tomato is the basic pre-condition for improvement of its productivity. The farmers should be suitably advised to grow improved varieties for near and distant markets.

13. Problems in bulk transportation of whole fruits can be partially minimised if suitable technology is devised to manufacture concentrates, puree, paste, etc. and pack them in cheap containers like pouches.

14. The National Seed Corporation should distribute seeds of improved varieties of cauliflower on a larger scale in order to boost the production of cauliflower.

15. The Group recommends that extension services in the States should devote more attention to the problem of harvesting and grading so that good quality fruits of appropriate maturity and grade are transported outside the State.

16. As in Malaysia, each pineapple processing factory should procure the fruit from a defined area. Setting up of processing units and quicker transport facilities are necessary for increasing production, improvement in quality and remunerative prices to the growers.

17. In order to provide genuine plant material multiplied from selected superior mother trees, the Group recommends the regulation of nursery production by legislation and strict supervision of multiplication and indexing of mother plants. Harvesting of immature fruits should be discouraged.

18. *Citrus Fruits*: In order to check decline and collapse in the citrus plantations, the Group recommends nursery legislation to regulate the multiplication and production of plants as a long term measure. As a short-term measure, regular prophylactic programme for prevention of pest and diseases have to be undertaken. Plant protection measures can boost up the production of citrus fruits. Since isolated sprays can never be effective, co-operative efforts among the orchardists would be necessary with subsidy from the Government on the cost of chemicals and spraying.

19. Concentrated areas of production having agro-climatic conditions or traditional production areas should also be integrated with terminal markets, through suitable mechanism even though they are distantly located.

20. Production of fruits and vegetables for exports should be undertaken on a systematic and continuous basis. Such production areas should preferably be close to ports (sea or air) wherefrom export is to take place. The ISI grades for different fresh fruit and vegetables should be applied. Packaging Institute at Bombay can help in developing cheaper and better packaging materials and techniques.

21. The scope of regulated markets should be extended to the perishables where these are grown in reasonable quantities.

22. In future, all models of market development for bigger towns and cities should evaluate the possibility of having multiple markets located at strategic points proximate to the centres of concentrated consumption. It will reduce the overheads of marketing and burden on physical facilities.

23. In order to safeguard the interest of the producer, the market committee should have majority representation of the concerned growers.

24. There is need for a strong organization for dealing exclusively with all aspects of post-harvest handling, quality control, marketing and storage of horticultural produce. There is full justification and necessity of developing and creating an organization and expertise in the field of horticulture. Department of Agriculture and Co-operation should take positive steps in this direction.

25. Grading should be made compulsory for inter-state trade. There should be Central legislation to suppress unfair and fraudulent practices in inter-state trade.

26. The work of MPDC regarding developing Market Information Service should be accelerated so that the market information service for fruits and vegetables is developed with maximum speed. The model developed by MPDC can meet the operational needs of the farmers and the trade for day-to-day market intelligence. The MPDC should amplify the coverage of the scheme to cover more markets and all the 12 fruits and vegetables covered in this Report.

27. The processing industry has been burdened with multiple taxes which have considerably increased the end-prices of processed items. The Group strongly recommends a comprehensive review and elimination of drastic reduction in taxes and duties including sales tax imposed at various stages.

28. Taking into account the present status of the processing industry and the vital role which it should play in the development of the country, the Group further recommends the following:

- (i) establishment of a large number of processing units of fruits and vegetables as well as agro-industrial complexes linking production with processing in the co-operative, public and private sectors should be encouraged.
- (ii) the capacity utilisation of the existing units should be stepped up.
- (iii) import of machinery and equipment considered essential for development, modernisation and/or improving productivity in the industry should be allowed duty free or at concessional rates.

- (iv) suitable varieties of fruits and vegetables to meet the processing needs with suitable varietal characteristics to reduce the cost of production and promote end-use should be developed.
- (v) speedy implementation of the programme for constructing roads, linking command areas of concentrated production of perishables with major assembly terminal markets.

29. With respect to Railways, the Group recommends that:

- (i) covered sheds should be constructed at important rail heads to save losses to perishables due to high temperature, etc.
- (ii) there should be close liaison between the Railways and the National/regional marketing organizations for the smooth flow of fruits and vegetable traffic.
- (iii) in peak production season, fruits and vegetables should be given high priority for movement by the railways. National Horticulture Board should have an officer to liaise with the Zonal Railways for advance movement planning.
- (iv) construction of railway sidings at big terminal markets for perishable products should be undertaken.
- (v) adequate number of covered wagons should be ensured at the important stations.
- (vi) the production of dry ice may be encouraged as it can be used for keeping the wagons cool and in the distribution of perishables in the local markets.

30. Sufficient facilities like storage should be provided at the international terminals so that export of fresh fruits and vegetables is speeded up. It is also necessary that suitable national airports should be put on the international map for export of fresh agricultural products.

31. Gravity ropeways, which are cheaper than mechanical/electrical ropeways, may be constructed for transport of perishables in hilly/difficult areas.

32. *Storage:* The marketing agencies, the growers and co-operatives should be encouraged to set up cold storages in the producing areas and adequate Government financing, in the shape of subsidy or grant, should be provided to accelerate the pace of construction of such capacity. The co-operative marketing societies may also be assisted through the NCDC or otherwise with funds for construction of adequate number of storages for perishable commodities.

33. The cold storage equipment, machinery, installation, etc. should be exempted from the excise and import duties. Supply of cement and steel should be arranged on priority basis. These cold storages should be linked with nationalised banks for advancing loans to the farmers against the stocks held in the cold storages.

34. Conditions for effective use of cool chambers need to be standardised. NAFED and the Central Warehousing Corporation may conduct necessary trials in this respect with the help of ICAR. It may be necessary to construct cool chambers on a large scale near railway sidings located in or around major producing and consumption areas.

35. Waxing of fruits and vegetables has been developed by Central Food Technological Research Institute, Mysore, for selected fruits and excellent results are reported to have been obtained. Further work to commercialise this technology developed by CFTRI to wax citrus, banana and other fruits is recommended.

36. It is necessary to develop cold storage facilities at port towns if a stable export programme of perishables has to be pushed through.

37. There should be an integrated approach in dealing with the perishable agricultural commodities from the stage of production till the stage of final consumption.

38. The Group recommends the setting up of a full fledged marketing extension service in due course in order to keep the farmers informed of market trends, improve marketing practices, provide guidance and help the farmers to get facilities from various marketing organizations.

39. To wean away the farmers from contractors who buy out the crop at flowering stage there is need for extending institutional

credit to the farmers. However, where institutional credit system is inadequate, marketing societies should provide finance by way of advances to the growers. The RBI should provide financial facility to such marketing co-operatives.

40. Credit should be given to the farmers for procurement of suitable harvesting tools and equipment. Units may have to be set up in co-operative sector for producing such tools and equipment. ARDC finance should be available for this purpose.

41. The present arrangement for training of personnel for preservation of perishables should be strengthened and expanded to cover rural production centres. The existing Farmers' Training Centres may be utilised for imparting training in preservation at the field level. More fruit and vegetable training centres should be set up in rural areas especially for village women.

42. The Group suggests that greater emphasis should be given on breeding varieties having different maturity periods and showing better amenability to handling, transport and storage under ambient conditions. A thorough screening may be done from among the existing cultivars to select the most suitable ones with better shelf-life and to meet the specific needs of the internal and international markets and processing industries.

Subject Index

	Page		Page
A			
Agriculture-resource base	30	— Poultry development	203, 204
— Agrarian structure	32, 33, 69, 70	— Research findings	200, 201, 210
— Agro-climatic zones	31	— Sheep development	204
— Irrigation	33-35		
— Land use pattern	31, 32	B	
— Physical resources	30, 31	Bio-fertilizers	144
Agricultural development		Blue green algae (BGA)	170
in tribal areas	118, 184	Budgetary allocations	
— Major constraints	185-188	for agriculture	102, 103
— Special features of		Business organizations	101
tribal areas	184, 185		
— Strategy for agricultural		C	
development in tribal		Central Institute for	
areas	188-196	Agricultural Engineering	
Agricultural growth rate	19, 90-93	Research	159
— Cropping intensity	37, 38, 86	Central Institute for	
— New policies and action		Small Tools	116
programmes — need for	26	Central Scheme for control	
Agricultural production and		of soil erosion	111
productivity trends	35-37	Centrally Sponsored	
— Commodity-wise review	38-47	Schemes	123, 124, 248, 249
Agricultural research,		— Dugwells	127
extension and training	72-74, 79, 80,	— Tubewell bores	123, 124
	152, 160, 161	Committee on Agricultural	
— Existing		Productivity in Eastern	
infrastructure	152, 153	India	2, 3, 263
— Farmers' training	165, 166	— Composition	3, 263
— Improved implements		— Scope of the Report	8, 9
and machinery	158, 159	— Terms of reference of	
— Needs of resource-poor		the Committee	2, 264
farmers	168	— Working groups	
— National Agricultural		appointed by the	
Research Project	153	Committee	6, 265-267
— Research efforts needed	155-157	Consolidation of holdings	107
— Research in IRRI	169-171	Constraints to agricul-	
— Results of research		tural growth	68
available on shelf	159, 160	— Administrative inefficiency	75
— Specific research		— Main constraints	69
problems	153-155	— Organizational constraints	73, 74
— Supplementary		— Social and structural	
extension services	164, 165	constraints	69-71
— Training and visit		— Technological	
system	160-163	constraints	71-73
Agricultural Universities		Compact area development	123
and research institutes	7	Co-operatives	98, 99
Agricultural servicing		Co-operative farming	106
agencies	81	Coordination	101, 166-168
Agro-forestry	111	— Inter-departmental	
Agro-Industries Corporations	95, 96	coordination	101, 102
Agro-service centres	117	— Coordination between	
Animal husbandry	199, 200	research and extension	166-168
— Dairy development	201-203	Credit policy	192-194, 212-234
— Goat development	205		
— Piggery development	205		

	Page		Page
— Deposit mobilisation	220, 221	G	
— Credit extension	231		
— Credit obligations	219, 220	Government functionaries	95
— Improving overdue climate	224, 225	Grameen banks of Bangladesh	238, 239
— Interest rate structure	221, 222	Green Revolution	1
— Organizational improvements	225-229	H	
— Policy measures to reduce overdue	222-224	Horticulture Marketing and Processing Company	179
— Recommendations regarding		Hydrams	135
— commercial banks and RRBs	230	High value crops	111-115
— insurance	232, 233	High yielding varieties of crops	48, 111-115
— medium and long-term loans	217-219	I	
— short-term loans	214-217		
— subsidy	232	Industry-linkages with Inputs	117, 118
— Role of NABARD	233		48, 140
— Simplification of procedures	231, 232	Investment and credit requirements	245
— Single-window approach	227	— Investment in agriculture and allied services	245
— Staff development	228	— Investment on major and medium irrigation	246
— Sub-committee on overdue	225	— Investment on minor irrigation	246-249
— Training	231	— Investment on drainage	250, 251
Credit trends	48-55	— Investment on rural electrification	252
Crop planning	109-111	— Investment on rural industry centres	253
D		— Medium and long-term credit loans	255
Diesel supply	96, 97	— Short-term credit loans	253, 254
E		K	
Electricity	89		
— Economy in use of electricity	128	Kolhapur weirs	135
— Electric power	96, 97	L	
— Supply and requirements of	89, 90		
F		Land and farm policy	106-118
Farm clinics	231, 240-244	Leasing agencies/companies	116, 117, 126, 127
Farmer groups	107, 108	Large-sized adivasi multi-purpose societies	55, 192-194, 227, 228
Farm machinery and implements	73, 115-117	Land development banks	50, 51
Failed well compensation scheme	127, 128	M	
Fertilizers	48, 88, 142, 143		
Fisheries development	205	Management and organization	94-105
— Inland fisheries	206	Marketing development	172, 194, 195
— Leasing policy	207	— Cold storages	183
— Marine fisheries	206	— Co-operative marketing	175-177
— Marketing infrastructure	208	— Demand constraints	172
— Renovation of ponds and lakes	206	— Marketing infrastructure	173
— Research findings	208, 211	— Perishable commodities	178
Floor limit for operational holdings	108, 109		

	Page		Page
— Public distribution	177	Soil testing	143
— Storage	182	Special development programmes	56-60
— Transport	181	— Assessment of progress	60
— Watch groups	175	— Command Area Development Programme	56
Monitoring and evaluation	104, 168	— Compact Area Programme	58, 59
N		— Comprehensive Area Development Programme	59
National Bank for Agriculture and Rural Development	2, 55, 233	— Development of oilseeds	56, 57
National Horticulture Board	180	— Drought-prone Area Programme	57, 58
C		— Dryland agriculture	59
Operation Barga	33	— Economic Rehabilitation of Rural Poor	59
Organic farming	145, 149-151	— Intensive Pulses Development Programme	57
P		— Integrated Rural Development Programme	57
Panchayat Samities	97, 98	— Special programme for increasing rice production	58
Pesticides	144, 145	— Special programme for small and marginal farmers	57
Population	30	Standing Committees	103, 104
Primary agricultural credit societies	49, 50, 226, 227	Strategy for accelerating agricultural growth	76
R		— Appropriate technology for Eastern India	76, 77
Regional Rural Banks	54, 55, 230	— Credit	80
Report of the Committee on forestry programmes for alleviation of poverty	195, 372-377	— Diversification in crop pattern	80, 81
Report of the Group on Perishable Agricultural Commodities	378-385	— Extension	79, 80
Report of the Irrigation Commission	352-366	— Land management	77
Report of the National Commission on Agriculture	303-317	— Organization and management	81
Report of the National Commission on Floods	367-371	— Policy measures	81-83
Report of the National Committee on Development of Backward Areas		— Price support and marketing	80
— Chronically flood affected areas	346-351	— Spearheads for accelerating agricultural growth	78, 79
— Drought-prone and desert areas	318-345	— Strategy for small and marginal farmers	112-115
Report of the Working Group for evolving scientific method of assessing crop yields	235-237	T	
Rural Industry Centres	183, 253	Tenancy reform	108
S		V	
Seeds	140-142	Vigilance	145
Sequencing of actions	102	Vikas Volunteer Vahini	231
Social and farm forestry	195	Voluntary organizations	99-101, 196-198
Soils	31, 111	W	
		Water Management	121
		— Artesian wells	133
		— Centrally sponsored schemes	123

	Page		Page
— Compact Area Development	123	— Leasing Agencies	126
— Conjunctive use of surface and groundwater	134	— Micro-watershed development	135, 136
— Cyclones	139	— Reservoir management	133
— Deep tubewells	128-130	— River lifts	134, 135
— Diesel Pumpsets	125	— Sale and hiring of pumpsets	126
— Drainage	136-138, 250, 251	— Surface irrigation	130
— Economy in use of groundwater	128	— Tank irrigation	134
— Electric pumpsets	125	— Warabandi	131
— Field channels	131	— Waterlogging	35, 136, 137
— Flood control	138	— Water releases	130, 131
— Groundwater exploitation	122, 123	— Water rates policy	129, 130, 132, 133
		Women — role of	192