

Chapter 2

Green Revolution in Eastern India

K. G. Karmakar and B. B. Sahoo

2.1 Background

In spite of dynamic growth in the industrial and service sectors, growth in the agricultural sector has lagged behind. In particular, during the last two decades, there has been a distinct slow down in the growth in agricultural sector. As a result, the gap between the agricultural and other sectors has widened. Public investment has perceptibly declined, extension and other support services were largely inadequate and major crop yields have stagnated. Due to risks and uncertainties in production, marketing systems, access to institutional credit by the small and marginal farmers have been very low. The other difficulties faced by the small farmers are securing adequate collateral for getting bank loan, increased expenditure on crop cultivation, marketing bottlenecks, and low returns. Therefore, the typical farming in eastern India is all about poor farmers, fragmented landholdings, minimum farm mechanization, traditional agricultural practices, low use of inputs, and poor market linkage. All these have resulted in poor performance of the sector in spite of robust overall economic growth, leading to farmers continuing in a low investment and low return production cycle and increasing agrarian distress, which are manifested through forced migration, farmers' suicides, and reduced income from agricultural activities. Poor agricultural growth in eastern India has also hampered the country's food security.

Recognizing that the gap between available potentials and actual growth in the agricultural sector is maximum in the eastern region of the country, the Government of India, in the Union Budget for 2010–2011, announced a package of ₹ 400 crore for enhancing agricultural production in eastern India. To facilitate growth in agriculture, arresting poverty and enhancing income levels of farmers, an attempt has

K. G. Karmakar (✉)

S.P. Jain Institute of Management & Research, Munshi Nagar, Dadabhai Road, Andheri (W),
Mumbai, Maharashtra 400058, India
e-mail: karmakar@spjmr.org

B. B. Sahoo

National Bank for Agriculture and Rural Development (NABARD), Bangalore, Karnataka, India

© Springer India 2015

15

M. Ghosh et al. (eds.), *Diversification of Agriculture in Eastern India*,

India Studies in Business and Economics, DOI 10.1007/978-81-322-1997-2_2

been made to draw up an Action Plan for effective utilization of the newly created fund and enhancing crop productivity.

2.2 National Challenges

Indian agriculture has been passing through a difficult phase. While the rate of growth in agriculture has been decelerating, the absolute number of population dependent on agriculture has been increasing. Land degradation is widespread and fertile farmlands are being diverted towards non-agricultural uses. Due to increasing pressure on water and land resources from other sectors, the overall challenges are to ensure greater productivity with less water and less land. Agriculture production and farm incomes are frequently affected by natural disasters such as droughts, floods, pestilence, hail, cyclones, etc. Most agriculturally developed parts of the country are overexploiting their water resources, and possibilities for further expansion of irrigation are limited. The vulnerability of agricultural production to these disasters is compounded by the outbreak of epidemics. Global warming and climate changes are also posing threats to the stability of farm production.

Indian agriculture is dominated by small holders (85%), who suffer from several production and marketing constraints. In spite of various reforms in agricultural marketing, linkages between producers and consumers remain weak, farm delivery services are poor, and value addition is very low. Linkages between the laboratory and the field have weakened. Involvement of the corporate sector in contract farming, value addition, processing, and marketing is very limited. Although there are a large number of farmers' club, self help groups, joint liability groups, and non-governmental organizations, they are not very active either in enhancing crop productivity or in offering necessary training to the farming community.

Rainfed areas, which are characterized by low levels of productivity and low input usage, constitute about 60% of the gross cropped area (GCA) in the country. Secondly, most of the rural poor live in the rainfed regions. Further, stagnant farm output and rising population levels have resulted in a demand-supply mismatch leading to rising prices of essential commodities and dependence on imports. Along with enhanced use of inputs due to seed-fertilizer-irrigation technology, the energy inputs such as diesel, electricity, chemical fertilizers, etc., have also increased, resulting in an adverse ratio of crop output to energy inputs over time. Several factors such as diversion of cultivable land for commercial and bio-fuel crops and increase in cost of inputs like diesel oil and other sources of energy have resulted in skyrocketing prices, food crisis and has threatened food security, especially for the poor. The average farm size has been declining. Public investment in creating rural infrastructure has also been declining. Further, in many villages, sizeable cultivable areas are left fallow.

Experts opine that frequent occurrence of floods, drought, and irregular rain increase the financial burden of the common farmers. Rise in cost of cultivation, stagnant crop yields, and un-remunerative prices of agricultural produce have

adversely affected the profitability of the farmers. As a result, many farmers are considering alternate occupations. The benefit of minimum support price (MSP) has been restricted to a handful of farmers producing notably wheat, rice, sugarcane, and cotton.

In spite of available arable land, water resources and fertile soil, food security in the country is in danger. The yield growth for many crops in the country has declined perceptibly in the 1990s. When the requirements of cereals, pulses, roots and tuber crops, milk, and oil and fats in the country are 450, 55, 63, 200, and 40 million t, respectively, the actual production of these food items are 216, 14, 31, 90, and 20 million t, respectively. These production gaps need to be met by enhancing productivity.

There exists a large yield gap in major crops produced in the country. It is evident from the 2003–2005 data of the Planning Commission that the yield gaps in wheat ranged between 6% (Punjab) and 84% (Madhya Pradesh); rice over 100% in Assam, Bihar, Chhattisgarh, and Uttar Pradesh; maize between 7% (Gujarat) and 300% (Assam); jowar between 13% (Madhya Pradesh) and 200% (Karnataka); mustard between 5% (Haryana) and 150% (Chhattisgarh); soybean between 7% (Rajasthan) and 185% (Karnataka), and sugarcane between 16% (Andhra Pradesh) and 167% (Madhya Pradesh).

2.3 Methodology of the Analysis

Keeping in view the priority, the analysis has been restricted only to eastern India, i.e. five states (Bihar, Chhattisgarh, Jharkhand, Orissa, and West Bengal) and eastern districts of Uttar Pradesh (27 out of the total 71 districts in Uttar Pradesh). To avoid data limitations, all information regarding crop area, cropping pattern, input availability, and yield gap have been collected for the year 2005–2006. A total of 34 crops consisting of 5 cereal crops, 3 pulses, 9 oilseed crops, 3 fiber crops, 9 horticultural crops, and 5 other crops have been considered for the analysis. The data relating to crop area, cropping pattern, farm credit, and crop productivity were collected from secondary sources from Centre for Monitoring Indian Economy (CMIE), Economic Survey, Directorate of Economics and Statistics, and National Bank for Agriculture and Rural Development (NABARD). The ground level credit flow has been taken as a proxy for agricultural credit. Jowar, bajra, and maize have been considered under coarse cereals. In the absence of any information, sum total of net sown area and fallow land has been considered as the land available for crop cultivation. Further, net sown area has been taken as the kharif cultivated area. The Sen Committee Report, which looked into the reasons for low agricultural productivity in the mid-1980s, was also reviewed.

2.4 Agricultural Scenario: Eastern India vis-à-vis All India

The challenges before eastern India are not very difficult, from those at the all India level. In spite of good rainfall, abundant surface, and ground water resources and plentiful of labour, land use, crop diversification, crop yield, and farm income are not up to the mark. Rain water is not efficiently utilized due to inadequate provision of irrigation structures such as canals, gully-plugs, check dams, and irrigation projects. As a result, water resources in monsoon season are unevenly spread or controlled leading to floods and there is little water in dry seasons, leading to drought. In spite of several development programmes in the eastern region such as Command Area Development Programme, Drought Prone Area Development Programme, and Comprehensive Area Development Programme, most of the programmes fail to offer satisfactory results due to leakages, improper planning, and inadequate monitoring and control. While ground water exploitation in some states in the South and West have reached saturation level, utilization levels are only 8% in Orissa, 24% in West Bengal, 25% in Bihar, and 32% in eastern Uttar Pradesh.

2.4.1 Land use Pattern

Out of the total 166.07 million ha of the cultivable land in the country, 24.18 million ha (14.56%) have remained fallow. When 82.62 million ha (42.86% of GCA) is under irrigation, second crop is cultivated in 50.91 million ha (35.88% of net sown area). However, in the eastern region, fallow land constitutes 14.21% of the total cultivable area, and irrigation facility is available to 47.76% of the GCA. When the cultivable land in the eastern region constitutes 22.32% of the total cultivable land in the country, those of net sown area, rabi-cropped area, gross irrigated area, and cropping intensity in the eastern region are higher. However, among the eastern states, the maximum fallow land is found in Jharkhand (53.4%) followed by Orissa (13.0%). Similarly, the cropping intensity in the eastern region ranges between 102.74% (eastern Uttar Pradesh) and 180.04% (West Bengal). Table 2.1 presents the land use pattern in eastern India vis-a-vis all India.

The cropping pattern in the eastern India is quite similar with that in all India level. But when different states are arranged in a descending order from 1 to 10 in terms of area and productivity under different crops for the period between 1999 and 2000 and between 2005 and 2006, it is found that farmers of most of the eastern states have provided a higher share of their cropped area for the selected crops but the yield levels in these states are not very significant. Table 2.2 presents the rank of the selected five states, i.e. Bihar, Chhattisgarh, Jharkhand, Orissa, and West Bengal, in area and yield under different crops.

Table 2.1 Patterns of land use in the eastern region and all India during 2005–2006. (Source: Centre for Monitoring Indian Economy (CMIE), Various Issues, Directorate of Economics & Statistics, Various State Governments)

Sl. No.	Particulars	Eastern India	All India	Eastern region as a % of all India
1.	Cultivable land	37.07	166.07	22.32
2.	Net sown area	31.80	141.89	22.41
3.	Fallow land	5.27	24.18	21.79
4.	Fallow land to cultivable land (%)	14.21	14.56	–
5.	Rabi cropped area	12.07	50.90	23.71
6.	Net irrigated area	14.15	60.20	23.50
7.	Gross irrigated area	20.13	82.62	24.36
8.	Cropping intensity (%)	137.95	135.87	–
9.	Irrigated area to gross sown area (%)	47.46	42.86	–

Table 2.2 Rank of the selected states in eastern region by area and yield of different crops between 1999 and 2000 and between 2005 and 2006. (Source: Centre for Monitoring Indian Economy (CMIE), Various Issues, Directorate of Economics & Statistics, Various State Governments)

Sl. No.	Crop	Bihar	Chhattisgarh	Jharkhand	Orissa	West Bengal
1.	Rice	5 (6)	6 (10)	–	3 (7)	2 (2)
2.	Wheat	6 (6)	–	–	–	8 (7)
3.	Coarse cereals	8 (7)	–	–	10 (10)	–
4.	Pulses	7 (9)	10 (10)	–	9 (8)	–
5.	Groundnut	–	–	–	9 (9)	10 (10)
6.	Rapeseed and mustard	8 (8)	–	–	–	4 (4)
7.	Sesame	–	–	–	10 (–)	9 (3)
8.	Linseed	5 (3)	(4)	–(10)	7 (6)	8 (–)
9.	Castor	10 (8)	–	–	7 (6)	–
10.	Niger seed	–	3 (5)	6 (3)	2 (1)	10 (10)
11.	Cotton	–	–	–	10 (10)	–
12.	Jute	2 (2)	–	8 (7)	5 (4)	1 (1)
13.	Vegetables, root, and tubers	–	–	9 (–)	2 (2)	1 (1)
14.	Potato	3 (3)	–	–	–	2 (2)
15.	Ginger	–	–	–	2 (4)	4 (5)

Figures in parentheses are rank of the states in yield

2.4.2 Agricultural Inputs

Water is a key ingredient in deciding cropping pattern and use of modern inputs including chemical fertilizers and pesticides for increasing the crop yield. The average rainfall received in the eastern region at 937.53 mm is 6.66% more than that of all India level. But the average deviation from normal rainfall in the eastern region

Table 2.3 Details of annual rainfall, irrigation potential, fertilizer use and credit available during 2005–2006. (Source: Centre for Monitoring Indian Economy (CMIE), Various Issues, Directorate of Economics & Statistics, Various State Governments)

Sl. No.	Particulars	Eastern India	All India	Eastern region as a % of all India
1.	<i>Annual Rainfall (mm)</i>			
(a)	Actual	937.53	879.0	106.66
(b)	Normal	1120.86	893.0	125.52
(c)	Deviation from normal (%)	(-) 16.36	(-) 1.57	–
2.	<i>Irrigation potential (million ha)</i>			
(a)	Targeted	1.73	10.92	15.85
(b)	Exploited	0.83	5.16	16.18
(c)	To be exploited	51.71	52.71	–
3.	<i>Fertilizer consumption (kg/ha)</i>	121.27	105.50	114.95
4.	<i>Credit to farmers (Rs./ha)</i>	3946.87	9131.00	43.22

is (–) 16.36 % as against (–) 1.56 % at the all India level. The fertilizer consumption in the eastern region at 121.27 kg/ha is 14.95 % higher than that of 105.50 kg/ha at all India level. However, it is disturbing that in spite of a large number of financial institutions in the region and an array of financial reforms, credit availability per hectare in the eastern region is only ₹ 3946.87 as against the all India average of ₹ 9131.00. At the disaggregate level, the situation is quite alarming as the average credit available in Bihar, Chhattisgarh, and Jharkhand have not even reached to ₹ 3000 per ha during 2005–2006. Table 2.3 presents the rainfall, irrigation potential, fertilizer use, and credit availability in eastern region vis-a-vis all India during 2005–2006.

2.4.3 Crop Yields and Yield Differences

Table 2.4 presents the crop yields in the eastern region vis-a-vis all India during the year 2005–2006. In almost all crops, eastern region falls behind all India average in crop yield. For instance, when the areas under cereals, pulses, oilseeds, and sugarcane in the eastern region as a percentage of all India are 50.15, 10.54, 5.61, and 12.84, respectively, crop output of these crops as a percentage of all India are 27.32, 11.33, 4.16, and 10.37, respectively. Only in the case of potato production, the eastern region gets an edge over the all India average, i.e. 51.40% of area but 54.65% of output. It is disturbing to note that in spite of the dominance of the eastern region over the all India scenario in terms of cropping intensity, irrigation, rainfall, and fertilizer use, crop yields of rice, wheat, oilseeds, sugarcane, ginger, turmeric, and garlic are lower than all India average by 15.65, 34.15, 25.93, 19.20, 48.01, 55.73, and 34.65 %, respectively.

Table 2.4 Yields of selected crops in the eastern region and all India during 2005–2006 (q/ha). (Source: Centre for Monitoring Indian Economy (CMIE), Various Issues, Directorate of Economics & Statistics, Various State Governments)

Sl. No.	Particulars	Eastern India	All India	Eastern region as a % of all India
<i>I. Food grain crops</i>				
(i)	Cereals	17.75	19.92	89.12
(ii)	Rice	17.74	21.03	84.35
(iii)	Wheat	17.25	26.19	65.85
(iv)	Coarse cereals	19.97	11.62	171.83
(v)	Pulses	6.43	5.98	107.49
<i>II. Non-food grain crops</i>				
(i)	Oilseeds	7.44	10.04	74.07
(ii)	Sugarcane	540.81	669.28	80.80
(iii)	Potato	197.68	185.92	106.33
(iv)	Ginger	18.39	35.37	51.99
(v)	Turmeric	21.92	49.52	44.27
(vi)	Garlic	28.98	44.34	65.35

2.5 Action Plan

2.5.1 Strategy

2.5.1.1 Expansion of Crop Land

By increasing net sown area and enhancing double-cropped area, the GCA can be increased. Net sown area can be increased by planting bamboo and tree crops such as mango in fallow lands and wastelands. Double crop area can be increased by increasing irrigation facilities, saving monsoon water through rain water harvesting structures, using sprinkler irrigation system, and using suitable kharif area for seasonal vegetable, roots, and tuber crops. The rain harvesting models of Gujarat and sprinkler/drip irrigation models of Andhra Pradesh could also be emulated.

2.5.1.2 Crop Diversification

When the cropping pattern in eastern region vis-à-vis all India scenario is observed during the last one and a half decades, it is found that cropping pattern in the eastern region has hardly changed over the last one and a half decades. This is evident from the fact that food grain crops constitute 78.83 % of the total cropped area of 41.41 million ha in the eastern region as against 63.07 % (192.80 million ha) at the all India level. It is also a fact that repeated production of same crop from a piece of land degrades soil quality and reduces crop yield. Therefore, to keep the soil healthy and improve crop yield besides increasing farm profitability, the cropping pattern in the eastern region must change. Location-specific crop-mix in accordance with soil, climate, and rainfall and irrigation facility needs to be put in place. To improve the

food security situation, farmers may be incentivized for the cultivation of non-food grain crops such as oilseeds, fibre crops, horticulture crops, vegetables, onion, and potato. Pulses, the principal source of protein for a vegetarian diet, face challenges in raising production levels. The availability of pulses has also been steadily declining. In dry lands, different pulses such as green gram, black gram, and horse gram may be tried. Innovative models such as Pulses Village, Oilseed Village, and Seed Village may be developed. These innovations will enhance the financial margins of farmers in the eastern region. Small/marginal farmers could also diversify into dairy/animal husbandry activities and fish rearing in ponds, which would also help in de-risking their agricultural operations.

2.5.1.3 Rural Infrastructure

Infrastructure is the key to agricultural progress. The Government has been playing a big role in creating core infrastructure such as major and medium irrigation projects, rural roads, rural electrification, and setting up of agricultural markets. Acknowledging the sharp decline in public investment in agriculture during the 1980s, the central and state Governments have been taking steps to reverse the declining trend. It is proposed to raise the level of public investments to 4 % of gross domestic product (GDP) agriculture by the end of the 11th Five-Year plan, i.e. by the year 2011–2012. In spite of the efforts of the Government in building rural infrastructure through a host of schemes such as Rural Infrastructure Development Fund (RIDF), Accelerated Irrigation Benefit Programme (AIBP) and Bharat Nirman, the irrigation potential created, availability of quality seeds, fertilizers, credit, and extension facilities and agricultural marketing in entire eastern region as against the all India situation, are not comparable. To improve the situation, restore, and maintain the created infrastructure, public participation is urgently needed. Involvement of the private sectors in building infrastructure, maintaining, monitoring, and evaluating the impact of the created infrastructure, building value chains, disseminating technical knowledge among the farmers groups such as self-help groups and farmers' clubs and creating a conducive atmosphere for public private partnership, may be encouraged through a suitable policy framework.

2.5.1.4 R&D and Use of Technology

The main challenge in research & development related to agriculture has been to improve the linkage between research and extension and to reform the system to improve the relevance of such institutes. Innovation of heat and drought resistant varieties of seeds, pest management, and manuals on easy and understandable farm practices should be brought out and widely disseminated through lab-to-land experiments so that farmers can emulate such practices. One of the research priorities should be evolving strategies to increase yields and incomes of the small farmers in rainfed conditions with the help of low cost and low technologies methods. On a

selective basis, in upland areas, systemic rice intensification (SRI) methods may be applied as also systemic sugarcane intensification (SSI) methods so as to conserve water and input use. Besides, the Prof. Dabholkar Model of increasing crop yields as per Natueco Organic methods may be tried.

2.5.1.5 Reducing Risk in Agriculture

Agriculture has two types of risk, i.e. Yield risk and Price risk. As the major cultivated area is dependent on rainfall, crop insurance is important for farmers. To cater to the needs of farmers, the Government has introduced the National Agricultural Insurance Scheme (NAIS) from the Rabi 1999–2000 season. However, certain shortcomings relating to calculation of generated income, low indemnity levels and delays in settlement of insurance have been observed in the implementation of the scheme. Further, crop insurance is not a long-term solution for yield variability. We need to focus on land and water management techniques including irrigation developments in the public delivery system. To address price risks, commodity futures markets are advocated. However, it is not clear whether farmers are actually benefiting from futures markets. For de-risking price risks and yield risks, contract farming and area-based rainfall index insurance may be thought of. Banks will be able to meet production credit, investment credit, and consumption credit needs of the farmers with a consolidated upper limit. The present Kisan Credit Card (KCC) is actually being used as only a passbook for recording transaction entries. It should be designed for operations over a 5 years period, as a genuine credit card over a 5 years cropping period, which is adequate for a crop pattern of 2 average years, 2 good years, and 1 of below average crops. At the end of the 5-year period, dues could be re-scheduled in un-irrigated areas, depending upon the reasons for non-settlement of bank dues.

2.5.2 Emerging Action

We need to act on many fronts for increasing crop productivity. Among others, research and innovation hold the key. Agriculture Universities and Research Institutes should enhance their research work and put in place a system by which lab-to-land exchange of knowledge is done. Biotechnology is the key to improving crop yields. Sharing and emulating noteworthy best practices and exemplary case studies across Krishi Vigyan Kendras (KVKs) would usher in a modernizing influence on agricultural production. As most of the farmers in the eastern region do not have access to formal sources of credit, necessary steps may be taken by the government and financial institutions. In this connection, the Lead Bank Scheme (LBS), introduced in 1969, needs to be reviewed. The RBI review of the LBS in 2010 was a shoddy attempt at maintaining the status-quo. In the context of rising food prices, reviving agriculture production, and productivity is crucial. Action is needed for better man-

agement of water resources, quality seeds availability, adoption of scientific farm practices, rational use of fertilizers, integrated pest management, and diversification of agriculture. The key to growth for productivity is adoption of new technologies, especially biotechnology. Bt. Cotton is a shining example of how biotechnology can revolutionize production. In 5 years of introduction of Bt. cotton, productivity of cotton has almost doubled. When rice productivity in India is below 3 t/ha, China is developing super hybrid rice, targeting yield levels of 15 t/ha. As these factors are all inter-related, a co-ordinated R&D approach is necessary.

The eastern region is dominated by small and marginal farmers, and most of these farmers sell their produce at below MSP. Effective marketing support may be provided to farmers so that the gap between producers' prices and consumers' prices can be narrowed down. In drought prone areas, low cost irrigation has to be put in place and drought tolerant vegetables and crops such as papaya and banana plantations apart from nursery and tree plantation may be experimented with. Research needs to focus on crops and cropping systems in the dry lands, hills, tribal, and marginal areas. Dry land farming technology has to be improved. Further, research has to be increasingly location-specific with greater participation of farmers. Horticulture crops that are land and water saving should be encouraged in dry land areas. Wastelands may be used for bamboo and other tree plantations.

In the absence of suitable marketing facilities in the region, most of the farmers have been selling their surplus produce at un-remunerative prices soon after harvests. Adequate strong facilities/spaces may be created in rural areas through public-private partnership to provide price advantage to the farmers. The extension machinery should make use of the available infrastructural facilities such as rural godowns, cold storages, and watershed scheme. Studies show that establishment of rural godowns have changed the agricultural scenario in items of change in cropping pattern, employment, marketing of produce, and enhancing farm income. Similarly, due to watershed projects, the farmers in the catchment areas derive a variety of benefits such as increased cropping area, increased functional efficiency and regulated irrigation, stabilised crop production, prevention of soil erosion and sedimentation of water bodies, and increased employment and income.

Experts opine that dry lands are best suited for organic agricultural practices. The climate, growing conditions, untapped production potential, vast human resources, least use of chemical fertilizers/pesticides, and a strong traditional farming system are some other advantages for such crop production. The potential areas for the growth of organic farming are rain-fed, tribal, and hilly regions. To popularize organic practices and reap the benefits of organic farming, experts should investigate how the small and marginal farmers could benefit from such farming, and how dry and wastelands could be used for such farming. In this context, public-private partnership models need to be firmed-up. There exists a large knowledge gap between the yields in research stations and actual yields in farmers' fields. Agri-clinics and agri-business centres may be established through creation of technology agents to provide vocational training so that effective translation of lab-to-land experiments can be encouraged. Groups of farmers may be encouraged to form "producers' companies" and make all arrangements for buying inputs and selling their produce at remunerative prices.

Diversification of Agriculture in Eastern India

Ghosh, M.; Sarkar, D.; Roy, B.C. (Eds.)

2015, XXI, 239 p. 5 illus., Hardcover

ISBN: 978-81-322-1996-5