

**FOOD SECURITY AND CROP DIVERSIFICATION:
CAN WEST BENGAL ACHIEVE BOTH SIMULTANEOUSLY?**

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Econophysics and Economics of Games, Social Choices and Quantitative
Techniques.

Eds., Banasri Basu, Bikas K. Chakrabarti,
Satya R. Chakravarty and Kausik Gangopadhyay

(forthcoming)

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INTRODUCTION

This paper deals with the prospects for cereal crop production and crop diversification in contemporary West Bengal.¹

Current agricultural policy in West Bengal can be said to have four inter-related objectives:

- To protect and extend the achievements of the State with regard to rice production, thereby protecting and extending the basis for self-sufficiency in food production and for food security.
- To improve yields in rice production, thus releasing a significant proportion of cropped area in the State for the diversification of crop production, and, in particular, the production of oilseeds, pulses, fruit, vegetables and flowers and other non-food crops.
- To protect bio-diversity in West Bengal and develop agriculture and related activities – and, in general, plan land use for agriculture and non-agricultural purposes – in an ecologically sustainable way.
- To ensure that the development of agriculture and related activities is an instrument of employment-generation, income-enhancement and, in general, qualitative improvement in the living standards of the working people of the countryside.

This paper attempts to assess whether it is indeed possible to achieve simultaneously the objectives of food security in rice production and large-scale diversification in crop production.

¹ The paper draws extensively on a section of Rawal, Swaminathan and Ramachandran (2003).

The paper is based on State- and district-level data on area, production and yields of rice for the time period 1980-81 to 2006-07. For most of the analysis, districts that have recently been bifurcated have been combined, since separate data on the districts created newly are available only from 2000 onwards. We begin by estimating the cereal requirements for the population of West Bengal in 2011-12, the end of the 11th Plan period. We then present alternative projections of rice production in 2011-12, based on varying assumptions about yields and area cultivated. Since rice is the main cereal crop in the State, accounting for around 93 per cent of total cereal production, we focus on rice in this paper.

CONTEXT

West Bengal's rural economy was characterised by rapid growth in the 1980s and early 1990s. The major features of growth, which was particularly marked in the rice economy of the State, were rapid growth in aggregate production; growth in yields per hectare, particularly in the boro (or rabi) season, but also in the aman (or kharif) season; and an overall narrowing of the gap between districts with respect to production and yield performance.

The West Bengal path to agricultural growth has been unique in post-Independence India.² In those parts of the rest of India that saw a rapid and substantial growth in agricultural incomes, the major sources of surplus accumulation were capitalist landlords, rich peasants, and, in general, the rural rich. In West Bengal, by contrast, the moving force of agricultural change and of the dynamism of the rural economy in the 1980s and 1990s were small cultivators. Agricultural growth in West Bengal was made possible because of the removal, by means of land reform and the establishment of panchayati raj, of institutional fetters to growth. It has been pointed out that "the West Bengal example, where value added has grown faster than gross output, contrary to the trends elsewhere, suggests that greater efficiency in input use is possible through reform and devolution" (Sen 1992).

² Abhijit Sen has noted that "West Bengal, with a growth rate of over 7 per cent per annum in agricultural value added -- more than two-and-a-half times the national average -- can be described as the agricultural success story of the eighties" (Sen, 1992).

In 2005-06, with a production of 14.5 million tonnes, West Bengal was the largest producer of rice in the country, followed by Andhra Pradesh and Uttar Pradesh. West Bengal accounted for 15.8 per cent of all-India rice production in 2005-06.

Table 1 *Exponential trend growth rates of area, production and yield of rice in West Bengal*

Period	Years	Area	Production	Yield
1980s	1980-81 to 1989-90	1.4	7.32	5.98
1990s	1990-91 to 1999-2000	0.37	2.08	1.71
2000s	2000-2001 to 2006-07	1.64*	1.27	1.64
Last 10 years	1997-98 to 2006-07	-0.28	1.7	1.98
Last 15 years	1992-93 to 2006-07	-1.14*	1.98	2.11
Full period	1980-81 to 2006-07	0.6	3.48	2.9

Notes: *Not significant at 10 per cent level of confidence. Estimated using three year moving averages.
Source: Computed from Government of West Bengal, *Economic Review* (various issues), Government of West Bengal, *Statistical Abstract* (various issues).

Table 1 shows that, while over a 26-year period, rice production in the State grew at a remarkable 3.5 per cent per annum, the growth spurt of the 1980s has petered out. The growth rate over the last decade was only 1.7 per cent. The rate of growth of production of rice in West Bengal continues to be greater than the rate of growth of population. Nevertheless, with population growing at 1.04 per cent in this decade (2001 to 2006), the slowdown is a matter of serious concern.³

The slowdown in production growth is primarily on account of a slowdown in the growth of yields. Yields have grown at less than 2 per cent per annum over the last ten years.

It is of note that the average yield of rice in West Bengal, although above the all-India average, is below the yields reported for Andhra Pradesh, Punjab, Haryana, Karnataka and Tamil Nadu (Table 2).

³ District-wise growth rates are reported in the Appendix.

Table 2 *Rice cultivation in major rice producing States of India, 2005-06*

State	Area (million hectares)	Yield (kg/hectare)
West Bengal	5.78	2509
Uttar Pradesh	5.58	1996
Orissa	4.48	1531
Andhra Pradesh	3.98	2939
Punjab	2.64	3858
Tamil Nadu	2.05	2546
Karnataka	1.49	3868
Haryana	1.05	3051
India	43.66	1984

Source: Government of India (2007).

Note: States have been ranked by area under rice cultivation.

Rice yields in West Bengal are below the averages reported for various countries in Asia including Vietnam, China and Japan (Table 3).

Table 3 *Rice yields in selected geographical regions and countries, 2006* (in tonnes per hectare)

Country/Geographical region	Yield
World	2.74
Asia	2.79
South East Asia	2.59
Japan	4.23
China	4.18
Vietnam	3.26
Bangladesh	2.60
India	2.08

Source: Computed from FAOSTAT (cited in IRRI, 2008).

There is clearly scope for increasing rice yields in West Bengal, in relation to the actual yields obtained in other parts of the country, in relation to yields obtained in other rice growing regions and countries and in relation to potential yields obtained in field trials.

In terms of absolute levels of rice yields in 2006-07, the districts of West Bengal can be categorised into four groups (Table 4).⁴

⁴ The spelling of district names follows the Census of India 2001.

Table 4 *Districts grouped by rice yields, West Bengal, 2006-07*

Yield rate (tonnes per hectare)	Districts	Share in total area (per cent)	Share in total production (per cent)
1.5 to 2	Jalpaiguri, Koch Bihar, Darjiling	8.79	6.26
2 to 2.5	Haora, South 24 Parganas, Uttar Dinajpur, Dakshin Dinajpur, Purba Medinipur	24.68	21.95
2.5 to 3	Paschim Medinipur, Purulia, Murshidabad, North 24 Parganas, Nadia, Bankura, Hugli	45.76	47.13
Above 3	Malda, Barddhaman, Birbhum	20.76	24.66
Highest	Birbhum (3.13 tonnes per ha)	6.74	8.13
Lowest	Jalpaiguri (1.82 tonnes per ha)	4.04	2.84

Source: Government of West Bengal, *Economic Review*, 2007-08.

There were three districts with yields above 3 tonnes per hectare (with Birbhum at the top) and three districts of North Bengal with very low rice yields (below 2 tonnes per hectare). The latter three districts, however, account for less than 10 per cent of area under rice cultivation.

PROSPECTS FOR CROP DIVERSIFICATION

We first estimate the cereal requirement of the population of West Bengal at the end of the 11th Plan period. We assume this requirement to chiefly be met by the production of rice, which accounts at present for 93 per cent of total cereal production in the State. We then estimate the levels of grain production and yield that are required to permit alternative levels of diversification by releasing alternative amounts of land for non-cereal crop production.

Requirements of Cereals for Food Security

Projection of cereals requirements based on FAO norms

In 2006-07, for a population of 85.53 million persons, the requirement of cereals in West Bengal was 15.22 millions tonnes. The actual production of cereals was 15.8 million

tonnes in 2006-07 (of which rice amounted to 14.7 million tonnes), an amount sufficient to meet our current requirement.

According to the official population projections of the Census of India, the population of West Bengal will be around 89.78 million in 2011 (Census of India). According to the Food and Agriculture Organisation (FAO), the per capita physiological requirement of cereals is 396 gm per day or 144 kg per annum. This, in turn, requires 490 gm of production per day (to allow for waste, seed, and feed requirements) or 178 kg per annum. Thus, a population of 90 million would require 15.98 or 16 million tonnes of cereals.

Prospects for Diversification

State-level prospects

In 2006-07, total area under rice cultivation in West Bengal was 5.69 million hectares and yield of rice was 2.59 tonnes per hectare. We now create four alternative prospects (or scenarios) for crop diversification – or, more specifically, for the release of land for non-cereal production – in 2011. In each case below, the State meets the rice production of 16 million tonnes, which is, as discussed, the cereal requirement of the projected population in 2011.

1. If 1.25 million hectares of land on which rice is now grown were to be released for non-cereal production in 2011, an average yield of 3.61 tonnes per hectare is required to maintain food security. Rice yields must grow at 6.82 per cent per annum to achieve this yield.
2. If one million hectares of land on which rice is now grown were to be released for non-cereal production in 2011, an average yield of 3.41 tonnes per hectare is required to maintain food security. Rice yields must grow at 5.65 per cent per annum to achieve this yield.
3. If 500,000 hectares of land on which rice is now grown were to be released for non-cereal production in 2011, an average yield of 3.08 tonnes per hectare is

required to maintain food security. Rice yields must grow at 3.53 per cent per annum to achieve this yield.

4. If only 250,000 hectares of land on which rice is now grown were to be released for non-cereal production in 2011, an average yield of 2.94 tonnes per hectare is required to maintain food security. Rice yields must grow at 2.56 per cent per annum to achieve this yield.

Table 5 *Alternative prospects for the release of land for non-cereal production in 2011, West Bengal*

Area to be diverted to other crops (in million hectares)	Required rice yield (in tonnes per hectare)	Required growth rate of rice production (in per cent per annum)
1.25	3.61	6.82
1	3.41	5.65
0.5	3.08	3.53
0.25	2.94	2.56

Source: Computed from Government of West Bengal, *Economic Review*, 2007-08.

Two major conclusions emerge. First, the required yield levels are well within the capabilities of regular green revolution technology. Such yields have been achieved regularly in leading rice growing regions of the State in the past, and within the yield levels established through recent field trials.⁵

Secondly, in order to achieve the yields necessary to ensure food security *and* release a significant extent of land for diversification, growth rates of the rice-yield in West Bengal must rise well above the record of the 1990s and 2000s. Even to release 250,000 hectares of land from rice production, the required growth rate of rice yields is 2.56 per cent per annum, while actual growth rates in the 1990s and 2000s were 1.71 per cent and 1.64 per cent respectively (Table 5). A return to the growth surge of the 1980s, when the rate of growth of rice yields was 5.98 per cent per annum, will, of course, permit the release of more than one million hectares for alternative crops by 2011.

⁵ In Tamil Nadu, ICAR field trials conducted by the All India Coordinated Rice Improvement Project on irrigated plots reported yields per hectare of rice of 5.46 tonnes for high yielding varieties and 7.01 tonnes for hybrid rice varieties (<www.ppi-for.org/ppiweb>).

District-level projections

We can also create alternative district-wise scenarios. Here is an exercise in which, making certain assumptions based on current performance, one million hectares are released from rice production *and* an aggregate output of 16.1 million tonnes of rice is achieved.

We assume that rice yields of the four districts with highest yield in 2006-07 (Birbhum, Bardhaman, Malda and Hugli) will reach 3.8 tonnes per hectare in 2011-12 (that is, a level equivalent to average yields in Punjab and Karnataka), rice yields in Bankura, Nadia, North 24 Parganas, Murshidabad, Purulia, West Medinipur, East Medinipur and Dakshin Dinajpur will reach 3.5 tonnes per hectare, rice yields in Uttar Dinajpur, South 24 Parganas and Haora will reach 3 million tonnes per hectare and rice yields in the remaining districts will reach 2.5 million tonnes per hectare. If 10 per cent of the total area under rice is released from the four districts with the highest yields, and 20 per cent of the area under rice is released from the remaining districts, a total of 1 million hectares of land can be diverted from rice to other crops. The total production of rice will be 16.1 million tonnes, an amount sufficient to meet the demand for rice in 2011-12 (Table 6).