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Agricultural Productivity and Productivity Regions in West Bengal

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Abstract

The green revolution technology has played an important role in the development of agriculture but it has also created regional imbalances in crop productivity. The productivity variations in production of cereals, pulses, oilseeds and cash crops in the state of West Bengal have been computed on the basis of Crop Yield Index method initiated by W.M.Yang. In this paper an attempt has been made to examine an overall pattern of agricultural productivity in 18 districts of the state by computing the composite index. On the basis of index value of productivity, the regions were categorized as high, medium and low productivity area.

Keywords: Agricultural Productivity, Productivity regions, Inter-district variations, Crop yield index.

Introduction

Agricultural productivity may be defined as the ratio of total agricultural output to total input used in farm production. Productivity has interchangeably been used to explain production. Production refers to the total volume of output, while productivity refers to the output in relation to resources expended. Therefore, agricultural productivity can be defined as a measure of efficiency in agriculture with which land, labour, capital and other resources are employed.

Agriculture occupies an important place in the economy of West Bengal. It not only provides food to the large and fast growing people but also raw materials to numerous agro-based industries. About 70 per cent of the working population is directly or indirectly engaged in agriculture. In the last three decades agriculture has shifted from subsistence to commercial agriculture. The state of West Bengal is one of the fertile regions in the country. So there is a considerable scope for the improvement of agricultural production and productivity per hectare and per agricultural worker,

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particularly on small and marginal farms which will help to increase income levels and improve the quality of life of the people in the rural areas.

Agricultural productivity has been computed worldwide by many scholars using different methods. Thomson (1926) while measuring the relative productivity of "British and Danish Farming" emphasized and expressed it in terms of gross output of crops and livestock. Kendall (1939) treated it as a mathematical problem and inter related a system of four coefficient (a) productivity coefficient, (b) ranking coefficient, (c) money value co efficiency and (d) starch coefficient or energy coefficient. Shafi (1960) has determined the agricultural efficiency in Uttar Pradesh taking into consideration, eight food crops grown in each of the 48 districts of the state. Chatterjee and Maitrya (1964) has calculated the levels of agricultural development and productivity during 1950-51 to 1957-58 in the state of West Bengal, taking two crops (Rice and Wheat) into consideration. Khusro (1965) has linked assessment of productivity with the output per unit of a single input and output per unit of cost of all inputs in the agricultural production. Shafi (1965) has assessed the productivity on the basis of labour population engaged in Agriculture. According to him, it can be calculated by dividing the gross production in any unit area by the number of man-hours or less precisely by the number employed in agriculture.

Shafi (1967 & 1969) applied Stamp's standard nutrition unit technique for measuring the efficiency of agriculture in India. He has considered the district as the areal unit and has selected all the food crops grown in India. Noor Mohammad (1967) considered net total productivity (being the relationship between the net products and factor inputs) as a method for the measurement of field productivity and also to assess comparison in time and space. The purpose of this measure is to changes in labour and capital inputs in agriculture. S. H. Siddiqui (1999) calculated the productivity indices of North Bihar Plain on the basis of Yang's method.

To compute productivity the present study is based on Yang's 'Crop Yield Index' method due to the fact that it considers the yield of all crops compared with the average yield of crops in the region.

Objectives

The present study has the following objectives:

1. To determine the productivity on the basis of computing productivity indices considering the major crops grown in the study region.

2. To delineate the crop productivity regions in order of high, medium and low.
3. To suggest suitable measures for the purpose of agricultural development in weaker districts of the state.

Database and Methodology

The present study is based on secondary sources of data collected from Evaluation Wings, Directorate of Agriculture, Govt. of W.B. and Bureau of Applied Economics and Statistics, Govt. of W.B., Kolkata.

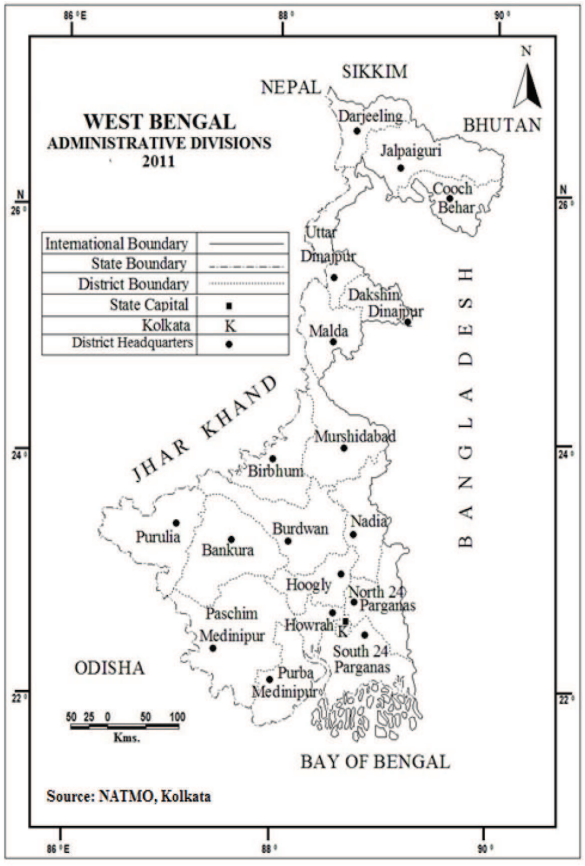
To assess the crop productivity indices on the basis of Yang's (1965) crop yield index method values pertaining to area and yield of major crops for the year 2010-2011. Computation of Crop Yield Index considers the yield of selected crops in the district and compares it with the average yield of crop in the entire region. In calculation of crop yield index, a value in percentage is obtained by dividing the yield per hectare of crops in a particular farm by the average yield of the crop in the entire region. The obtained value is multiplied by 100 and is given the index number, by taking the area, devoted to each crop as a weight and multiplying this by percentage index, the products are obtained. By adding the products and dividing the sum of the products by the total cropped area in the district, the average index obtained is the desired crop index for the particular district, using crop area as weight.

The Study Area

The state of West Bengal has been selected as a study area which is located between 21˚ 25 / 24 // to 27˚ 13 / 15 // north latitudes and 85˚ 48 / 20 // to 89˚ 53 / 04 // east longitudes with three international boundaries i.e., Bangladesh, Nepal and Bhutan. It occupies a geographical area of about 88,752 sq. km. (2.70 per cent of the India's total geographical area) and extending from the Himalayas in the north to the Bay of Bengal in the south. It is surrounded by Sikkim and Bhutan in the north, Assam and Bangladesh in the east, the Bay of Bengal in the south and Orissa, Jharkhand, Bihar and Nepal in the west. The agriculture area of the state is 51,675.40 sq. kms. in 2008-09 and ranking the first in production of rice and jute, and second in production of tea in the country. West Bengal accounts for 16.10 per cent of the total rice production from the 13.43 per cent total rice producing area; 79.53 per cent

of the total jute production from 68.13 per cent of total jute producing area and 19.56 per cent of total tea production from about one-fourth of the area of the country respectively. The total population of the state is 9,13,47,736 and density of population is 1029 in 2011. There are five main seasons in West Bengal, spring, summer, rainy season, a short autumn, and winter. The summer temperatures in the state ranges between 260C and 400C while the winter temperatures ranges from 130C to 190C. The annual rainfall varies in the different parts of the state. North Bengal receives the highest rainfall, 200 to 400 cm. In the coastal areas rainfall is about 200 cm, in the Ganga plain and in the central part of the state rainfall is 150 to 200 cm. Drought is a common phenomenon in the Bankura and Purulia districts.

Figure 1: Administrative Divisions in West Bengal



Crop Productivity Regions (2010-2011)

With the computation of crop productivity for all the districts of West Bengal, the productivity indices were categorized into high, medium and low.

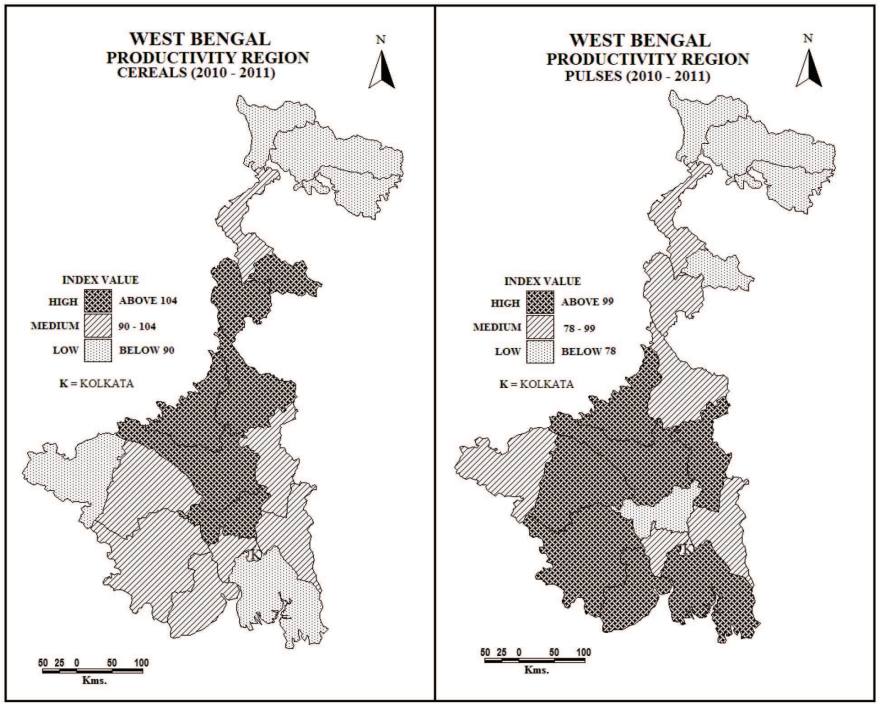
Productivity Regions – Based on Cereal Crops Yield Index

Cereal crops occupy an important place in Agriculture of West Bengal. They occupy 5364.8 thousand hectares area, which account for 60.74 per cent of the total cropped area of the region. Productivity region of cereals has been depicted in Figure 2 whereas the number of districts in each category is given in (Table 1). The region of high productivity of cereals lies in the central, southern, eastern and western part of the study area which includes the districts of Dakshin Dinajpur, Malda, Murshidabad, Hoogly, Burdwan and Birbhum with an area of 2005.1 thousand hectares. The high productivity in this region is due to the assured irrigation facilities, sufficient amount of fertilizers consumption, high yielding varieties of seeds and agricultural implements and machinery. The medium productivity region covers central, south-eastern and southern part of the study region and it includes the districts of Uttar Dinajpur, Nadia, North-24 Parganas, Purba Medinipur and Paschim Medinipur. Altogether they cover an area of 2211.2 thousand hectares. The area under low productivity of cereals lies in northern, south-eastern and western part of the study region which includes the districts of Darjeeling, Jalpaiguri, Cooch Behar, South-24 Parganas and Purulia, with an area of 1148.2 thousand hectares.

Table 1

Productivity Regions under Cereal Crops in West Bengal (2010-2011)			
Category	**Index Range**	**No. of Dist.**	**Name of the Districts**
High	Above 104	6	Dakshin Dinajpur, Malda, Murshidabad, Hoogly, Burdwan and Birbhum
Medium	90-104	7	Uttar Dinajpur, Nadia, North 24 Parganas, Purba Medinipur and Paschim Medinipur
Low	Below 90	5	Darjeeling, Jalpaiguri, Cooch Behar, South 24 Parganas and Purulia
Source: NATMO, Kolkata			

Figure 2: Cereal and Pulses Production in West Bengal



Productivity Regions – Based on Pulses Crops Yield Index

In our predominantly stuffy vegetarian diet, pulses form a very important part as they provide us rich amount of protein. In this study region, only five crops (gram, mung, masur, khesari, maskalai or urd) are taken into account. They occupy 197.0 thousand hectares (2.23 per cent) of the total cropped area of the region. Productivity regions of pulses are shown in (Fig. 2). The high productivity region of pulses occupies an area of 94.1 thousand hectares with crop indices of above 99. It includes the districts of Nadia, South-24 Parganas, Burdwan, Birbhum, Bankura, Purba Medinipur and Paschim Medinipur. The medium productivity regions spread in central, western and southern part of the study region, with an area of 90.3 thousand hectares. It includes the districts of Uttar Dinajpur, Malda, Murshidabad, North-24 Parganas, Howrah and Purulia with crop indices ranging between 78 to 99. The low productivity region covers an area of 12.4 thousand hectares, spread in remaining five districts namely, Darjeeling, Jalpaiguri, Cooch Behar, Dakshin Dinajpur and Hoogly. Here the crop indices are below 78.

Table 2

Productivity Regions under Pulses Crops in West Bengal (2010-2011)			
Category	**Index Range**	**No. of Dist.**	**Name of the Districts**
High	Above 99	7	Nadia, South 24 Parganas, Burdwan, Birbhum, Bankura, Purba Medinipur and Paschim Medinipur
Medium	78-99	6	Uttar Dinajpur, Malda, Murshidabad, North 24 Parganas, Howrah and Purulia
Low	Below 78	5	Darjeeling, Jalpaiguri, Cooch Behar, Dakshin Dinajpur and Hoogly
Source: Calculated by Authors			

Productivity Regions – Based on Oilseed Crops Yield Index

Oilseed crops occupy 670.7 thousand hectares (7.59 per cent) of cropped area of the study region. Productivity regions of oilseeds are shown in (Fig. 3). The high productivity area covers an area of 77.8 thousand hectares with crop indices above 105, which includes the districts of North-24 Parganas, South-24 Parganas and Purba Medinipur. There are ten districts namely, Uttar Dinajpur, Dakshin Dinajpur, Malda, Murshidabad, Nadia, Howrah, Hoogly, Burdwan, Birbhum and Paschim Medinipur covering an area of 527.9 thousand hectares with crop indices ranging between 79 to 105. The remaining five districts namely, Darjeeling, Jalpaiguri, Cooch Behar, Bankura and Purulia showing low concentration of oilseeds. Altogether they cover an area of 64.2 thousand hectares with crop indices below79.

Table 3

Productivity Regions under Oilseed Crops in West Bengal (2010-2011)			
Category	**Index Range**	**No. of Dist.**	**Name of the Districts**
High	Above 105	3	North 24 Parganas, South 24 Parganas and Purba Medinipur
Medium	79-105	10	Uttar Dinajpur, Dakshin Dinajpur, Malda, Murshidabad, Nadia, Howrah, Hoogly, Burdwan, Birbhum and Paschim Medinipur
Low	Below 79	5	Darjeeling, Jalpaiguri, Cooch Behar, Bankura and Purulia
Source: Calculated by Authors			

Figure 3: Oilseed and Cash Crops Production in West Bengal

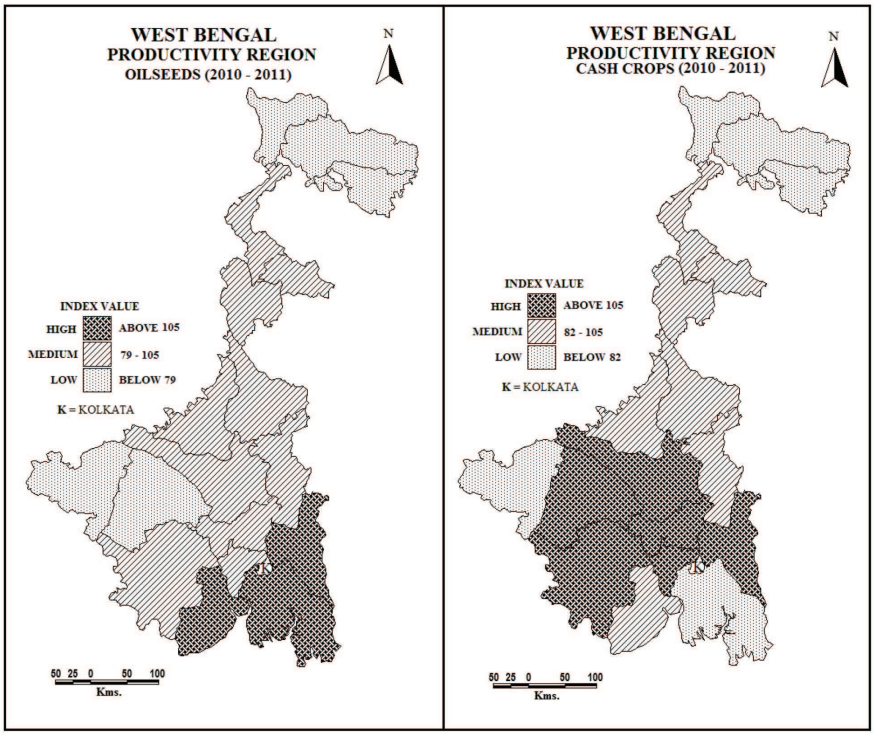


Table 4

Productivity Regions under Cash Crops in West Bengal (2010-2011)			
Category	**Index Range**	**No. of Dist.**	**Name of the Districts**
High	Above 105	6	North 24 Parganas, Howrah, Hoogly, Burdwan, Bankura and Paschim Medinipur
Medium	82-105	7	Uttar Dinajpur, Dakshin Dinajpur, Malda, Murshidabad, Nadia, Birbhum and Purba Medinipur
Low	Below 82	5	Darjeeling, Jalpaiguri, Cooch Behar, South 24 Parganas and Purulia.
Source: Calculated by Authors			

Productivity Regions – Based on Cash Crops Yield Index

Among cash crops, jute, sugarcane and potatoes account for an area of 1127.4 thousand hectares (12.76 per cent) of the total cropped area of the region. Productivity regions of cash crops are shown in (Fig. 3). The high productivity region of cash crops occupies an area of 366.0 thousand hectares with crop indices above 105. It includes the districts of North-24 Parganas, Howrah, Hoogly, Burdwan, Bankura and Paschim Medinipur. Medium productivity region extends over seven districts namely, Uttar Dinajpur, Dakshin Dinajpur, Malda, Murshidabad, Nadia, Birbhum and Purba Medinipur covers an area of 441.8 thousand hectares with crop indices ranging between 82 to 105. But the low productivity region covers extensive area in northern, western and southern part of the study region; it includes the districts of Darjeeling, Jalpaiguri, Cooch Behar, South 24 Parganas and Purulia covering an area of 197.6 thousand hectares. Here the crop productivity index is below 82.

Productivity Region - Based on Composite Yield Index

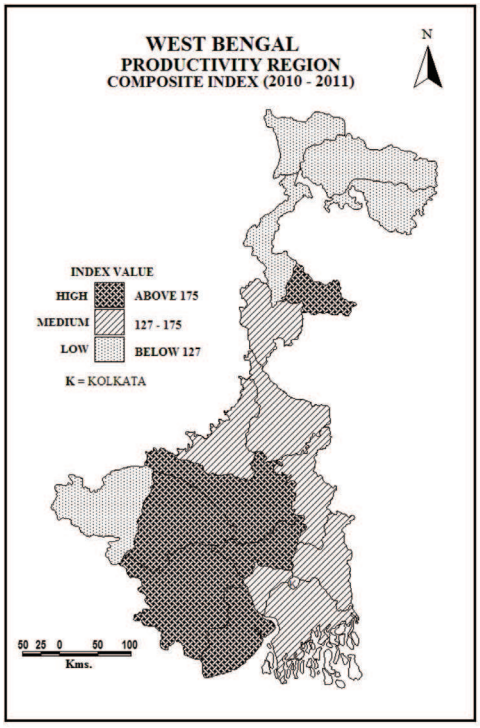
A composite index has been formulated after calculating agricultural productivity for each group of crops in West Bengal. The value of each districts are given in the Table 5 and their spatial patterns are shown in the (Fig. 4).

Table 5

Productivity Regions based on Composite Index in West Bengal (2010-2011)			
Category	**Index Range**	**No. of Dist.**	**Name of the Districts**
High	Above 175	6	Dakshin Dinajpur, Burdwan, Bankura, Hoogly, Paschim Medinipur and Purba Medinipur
Medium	127-175	7	Malda, Murshidabad, Birbhum, Nadia, North 24 Parganas, South 24 Parganas and Howrah
Low	Below 127	5	Darjeeling, Jalpaiguri, Uttar Dinajpur and Purulia
Source: Calculated by Authors			

It will be seen from this figure that six districts namely, Dakshin Dinajpur, Burdwan, Bankura, Hoogly, Paschim Medinipur and Purba Medinipur are of high productivity region. It lies in the south-western and southern part of the study region. The productivity indices is above 175, it covers an area of 3360.60 thousand hectares or 38.06 per cent of the total cropped area of the study region. The medium productivity region is scattered over 7 districts namely, Malda, Murshidabad, Birbhum, Nadia, North 24 Parganas, South 24 Parganas and Howrah. They spread over north-central, central and south-western part of West Bengal, with productivity indices ranging between 127 to 175. Altogether they cover an area of 5269.3 thousand hectares or 39.80 per cent of the total cropped area. The low category of agricultural productivity occupies the remaining 5 districts namely, Darjeeling, Jalpaiguri, Uttar Dinajpur and Purulia extended over northern and western part of the region. They together occupy an area of 1953.93 thousand hectares or 22.14 per cent of the total cropped area of the entire region.

Figure 4



Conclusion

On the basis of productivity indices it is seen that there is diversity in the agricultural productivity. During 2010-11, the high level of agricultural productivity lies in northern, south-western part and south-central part of the study region. The state of West Bengal reflects a wide variation in agro-climatic specifies. From hilly tracts of Darjeeling to coastal South and North 24 Parganas diversified climatic and soil quality is observed across the state. Districts such as Jalpaiguri, Cooch Behar and Uttar Dinajpur come under Terai region while Purulia, Bankura, Birbhum and parts of Paschim Medinipur signify semi arid Red and Laterite zone. On the other hand the districts situated in the gangetic plain and having benefit of alluvial soil are Malda, Murshidabad, Nadia, Burdwan, Howrah, Hoogly and parts of Purba Medinipur. Large share of net sown area, high irrigation and cropping intensity, high productivity, high consumption of fertilizers, fertile soil and better agricultural technology are factors responsible for the high levels of agricultural productivity in the high productivity districts of the state. The agrarian sector of West Bengal exhibits an overwhelming predominance of small and marginal farmers who have little to invest for improved agriculture. In view of the rising prices of chemical fertilizers and pesticides a subsidy may be addressed to this section of farmers. Proper marketing channel is a problem that bothers the farmers of all regions. Particularly for the cash crops like Jute and Potato it remains essential. Potato is a quickly perishable product without a proper storage facility. The cold storages in most of the cases in rural West Bengal have developed under the auspices of private sector and the market being controlled by the merchants. Government intervention to provide warehousing and marketing facility is call of the hour. The village Panchayats can assume an important role in this context. Moreover, farmers must be properly educated and trained through extension services that taught them how to use the modern agricultural inputs for increasing the productivity.

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