
Statistical Analysis of Regional Distribution and Productivity of Food Grains of West Bengal

Dr. Ruksanara Begum

Assistant Professor, Department of Geography, Barasat Government College, West Bengal, India

Abstract: A lion's share of Indian population is directly or indirectly depends upon agriculture. Agricultural sector in India contributes 17.4 percent of national GDP. West Bengal a state of the eastern India due to its geographic location is bestowed naturally with a thick layer of fertile alluvial soil which is ideal for agricultural activity. It contributes more than 8 percent of Indian food production. It is the leading producer of rice and many other crops. The state practices mainly rice based cropping pattern and the production of rice and cereals are appreciable and production is in surplus. But production of pulses are not appreciable rather lagging behind. West Bengal being a populous region always struggles a lot to ascertain food security of its people. In this circumstance an attempt has been made to study regional distribution and productivity of food grains. For this secondary data has been taken into consideration and data has obtained from Statistical Abstract of West Bengal-2015. The objectives of the study are, to study distribution of different food grains, to compare yield of different food grains and to find out district wise productivity of food grains. Parameter taken into consideration for this purposes are yield rates of different food grains. To examine distribution of different food grains over the state of West Bengal percentage have been calculated. To compare yield rates of different food grains standard deviation and co efficient of variation have been applied. Lastly Composite Index method has been applied to find out district wise productivity of food grains. It has been found that main cereals like rice, wheat and maize are cultivated in every district whereas cultivation of barley is concentrated. Millets production is concentrate either in northern mountainous region or duars region or western plateau region. Among pulses musur is cultivated in every district but other pulses have been harvested in concentrated way. Cereals have been harvested widely than pulses. Production of pulses are highly inconsistent and production of cereals are highly consistent. Regarding productivity of the districts it has been found that Murshidabad's productivity is the highest and Howrah's productivity is the lowest.

Keywords: Yield rate, main cereals, millets, pulses, productivity, consistent, inconsistent.

1. INTRODUCTION

Agriculture is the mainstay of economy in Indian civilization. A lion's share of people engaged in agricultural activity in India and many people directly or indirectly depends upon agriculture. Being the largest industry in the country, agriculture provides employment to around 60% of the total work-force in the country (Sarkar S, Ghosh K. T, 2017; Swaminathan M.S, Bhavani R. V, 2013). Instead of that the share of agriculture in GDP has fallen from 39.6 percent to 14.6 percent in between 1980 to 2010 (Mondal D, De S, 2015). But from there it again raised its share in national GDP and now it contributes 17.4 percent of national GDP (Brahmachari K, et al., 2018). Food production is the base for food security which is the access of quality nutritional food for every people for their active and healthy life. It is very important to ensure food for every individual because nation is experiencing high demand for food. In one study it has been revealed that more than one third of the people of our country is expected to be very poor and one half of all children are malnourished (Dev S. M, Sharma A.N, 2010). A share of people are living below poverty line, facing food insecure, starving and many of them die due to starvation. (Nandi S, 2016; Dev, S. M. 1998).

West Bengal after independence experienced sluggishness in agricultural productivity. From 1965 to 1980 West Bengal experienced low productivity in agriculture. During that period the productivity was much lower than other Indian states. But gradually the situation started to change specially during 1977-1975. Agricultural sector becomes the vital segment of the state economy. At that period the state was able to overcome the stagnant situation and rapid growth of yield was recorded. During the said period food grain production of West Bengal was remarkable and it exceeded the production of other leading states of India (Saha A, Swaminathan M, 1994; Kumar R. S, 2007). Still the GDP have fallen down from 34.37 percent to 18.7 percent in between 1980 to 2010 (Mondal D, De S, 2015). This may be due to the structural transformation of the economy of the state (De U.K, Chattopadhyay M, 2010; Ghosh B.K, Kuri P.K, 2005). According to 2011 census 68.12 percent people are living in the rural areas of

West Bengal. So agriculture is still remains as their mainstay. 44.04 Percent people of the state are now directly involved as main and marginal agricultural workers/ labourer (Census 2011; Statistical Abstract 2015) and 2.43 percent of people are engaged as government employee in agriculture and agricultural marketing sector of West Bengal (Statistical Abstract 2015). At present the agricultural sector along with forestry and fishery of the state contribute 20.84 percent estimates of GSVA at basic prices, GSDP and per capita income, at Base 2011-12 to total GSDP (at constant prices) (Economic Review 2017 -2018). Regional variation in productivity and development in agriculture are very common in underdeveloped or developing countries which were mistreated by the process of colonialization. Colonial rulers for their own interest developed industries or profitable plantations in few selected centres which were mainly export oriented. So reorganization of agricultural productivity or development were always at the back foot then (Maitreya P, Chatterji A, 1964). So this variation of productivity had started long ago and still continuing. So in this context an attempt has been made to study regional distribution and productivity of food grains of West Bengal. To study this secondary data has been taken into consideration.

1.1 Objectives

The objectives of the study are:

- To study distribution of different food grains.
- To compare yield of different food grains
- To find out district wise productivity of food grains.

1.2 Database and Methodology

The present study is based on secondary data obtained from Statistical Abstract, West Bengal, 2015. Parameter taken into consideration for this purposes are yield rates of different food grains. Food grains include cereals and pulses. Yield of cereals includes yields of rice, wheat, barley, maize, jowar, bajra, ragi, small millets while yields of pulses comprises yields of grams, arhar (tur), mung, musur, khesari and other pulses.

To examine distribution of different food grains over the state of West Bengal percentage have been done. Bar charts have been made to show graphical representation of data. Distribution of total cereals and total pulses have also been studied and for that standard scores have been calculated. Standard score is actually deviation of individual data from mean in respect of standard deviation. To compare yield rates of different food grains standard deviation and co efficient of variation have been extracted. Standard deviation is the square root of the arithmetic mean of squares. Greater value of standard deviation shows higher deviations arithmetic mean (Das N G, 2001). Co-efficient of variation is also calculated to measure the relative variability. A higher value of C. V. shows higher inconsistency, whereas a lower value of C.V. shows higher consistency (Mahmood A, 2002). Composite Index method has been applied to find out district wise productivity of food grains. To do this eighteen districts have been ranked separately according their respective yield rates for every crops. As there are fourteen food grains in total so every district have got fourteen ranks. By adding these ranks composite scores have been obtained. Lowest scores indicate good condition in term of production and highest score indicates poor condition of production.

1.3 Study Area

West Bengal is situated in the eastern part of the country. In north western part it has its international boundary with Nepal and in western part it has national boundary with Indian states like Bihar, Jharkhand and Orissa whereas in east its neighbours are state of Assam and country Bangladesh. It has its northern boundary with Sikkim and country Bhutan. Its southern part gradually slopes down in Bay of Bengal. It has mountainous region in the north, plateau in the west, and coastal area in the south. Remaining part of it is plain land and is covered with thick alluvium which is ideal for agriculture.

West Bengal is the fourth largest state of India constituting 7.54 percent of nation's total population according to 2011 census. It covers an area of 88752 square kilometres which is 2.7% of country's total land and having high density of population which is 1028. Presently West Bengal consists of twenty districts. Out of twenty districts Kolkata and Alipurduar have been excluded from the study. Kolkata due to its full urban nature there has been no scope to incorporate it in this study. Alipurduar being a newly formed district there is dearth of data. So in the study in total eighteen districts of West Bengal have been considered for study purpose. In total the state produces more than 8 percent food of the country (Economic Review 2017-18).

2. DISCUSSION AND ANALYSIS

West Bengal is the chief producer of rice and other many foods. Rice is the main crop of this district. Others crops cultivated significantly in this state are potato, jute, sugarcane, wheat, maize, pulses, oil seeds and vegetables. Among food grains the district has produced surplus rice and cereals but at the same time the production of pulses and oilseeds are not satisfactory (Economic Review 2017-18). As stated before food grains can be broadly be divided into two parts viz. cereals and pulses. These crops occupied 68% of gross cropped area (Ghosh B.K, Kuri P.K, 2007; Sarkar D, 2015). In this section cereals has been again categorized into two parts e.g. main cereals and millets. Main cereals includes rice, wheat, barley and maize whereas millets includes jowar, bajra, ragi and small millets. Study of pulses as stated before includes study of grams, arhar (tur), mung, musur, khesari and other pulses.

2.1 Distribution of food grains

Table- 1: Source: Statistical Abstract, 2015.

District	Percent of Yield rates (in kg per hectare) of Food Grains							
	Rice	Wheat	Barley	Maize	Jowar	Bajra	Ragi	Small Millets
Burdwan	6.35	6.11	0.00	4.03	0.00	0.00	0.00	0.00
Birbhum	6.41	6.07	13.00	3.83	0.00	0.00	0.00	0.00
Bankura	5.40	5.66	0.00	5.40	0.00	0.00	0.00	19.06
PurbaMidnapore	5.60	5.86	0.00	3.00	0.00	0.00	0.00	0.00
PaschimMidnapore	5.41	4.51	0.00	4.33	0.00	0.00	0.00	0.00
Howrah	5.33	5.53	0.00	2.40	0.00	0.00	0.00	0.00
Hooghly	6.09	5.16	0.00	3.81	0.00	0.00	0.00	0.00
North 24-parganas	5.89	6.27	0.00	6.68	0.00	0.00	0.00	0.00
South 24-parganas	5.05	6.25	0.00	4.14	0.00	0.00	0.00	0.00
Nadia	6.28	7.24	15.09	5.62	0.00	0.00	0.00	0.00
Murshidabad	6.33	6.08	14.41	9.44	0.00	0.00	0.00	0.00
Uttar Dinajpur	5.36	4.94	15.36	10.49	0.00	0.00	24.09	0.00
DakshinDinajpur	5.61	6.71	0.00	7.55	0.00	0.00	0.00	0.00
Malda	6.77	6.03	13.97	4.31	0.00	0.00	0.00	0.00
Jalpaiguri	4.76	4.77	14.09	5.03	0.00	0.00	24.40	13.76
Darjeeling	4.11	3.07	14.09	4.56	0.00	0.00	31.56	38.51
Cooch Behar	5.07	4.94	0.00	11.05	0.00	39.66	8.90	21.35
Purulia	4.19	4.80	0.00	4.36	100.00	60.34	11.05	7.32

To understand the types of distribution of yield of different crops percentage have been calculated for each crops and bar charts have been used here to depict the distributions.

2.1.1 Distribution of main cereals

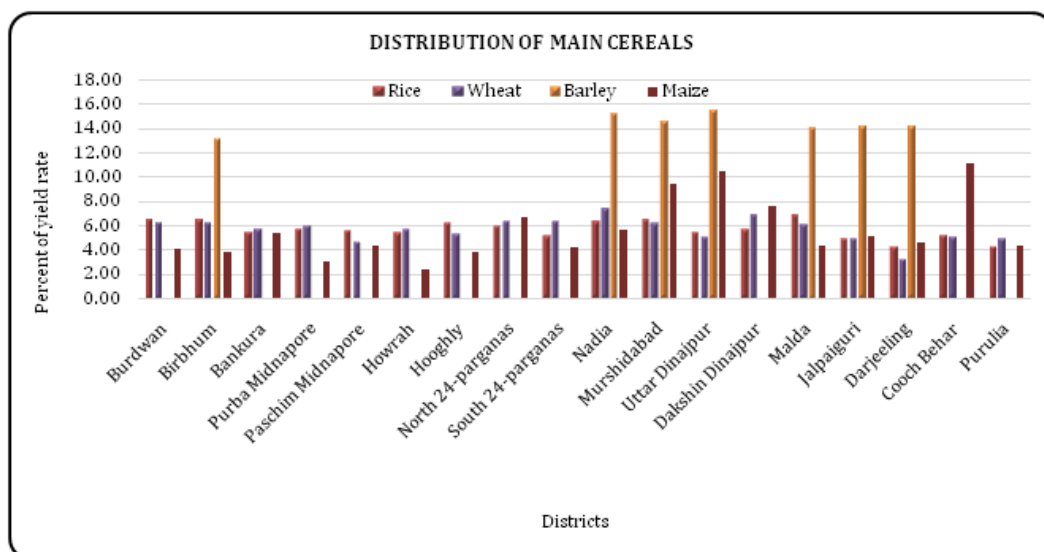


Fig-1: Source: Statistical Abstract, 2015.

Percent distribution of yield rate of rice depicts that Malda's yield rate is the highest as it has contributed 6.77% of total yield. Subsequent high yield rates which are more than average have found in Birbhum, Burdhaman, Murshidabad, Nadia, Hooghly, North 24 Parganas, Dakshin Dinajpur, Purba Medinipur. Below average yield rates have been found in rest of the districts and among these districts Darjeeling has contributed lowest yield registering 4.11 percent of total (Table-1, Fig- 1). Percent distribution of yield rate of wheat shows that Nadia is the highest contributing district in terms of yield. It has registered 7.24% of total yield. It is followed by Dakshin Dinajpur, North 24 Parganas, South 24 Parganas, Burdwan, Murshidabad, Birbhum, Malda, Purba Medinipur, Bankura where more than average yield rate of wheat have been recorded. Rest of districts have contributed below average yield and among these districts Darjeeling's production is lowest as it has contributed only 3.07 percent of total yield (Table-1, Fig- 1). Yield of barley has concentrated only in seven districts viz. Uttar Dinajpur, Nadia, Murshidabad, Darjeeling, Jalpaiguri, Malda, Birbhum. Among these districts percent distribution of yield is highest in Uttar Dinajpur which has registered 15.36 percent of total yield and the value is lowest in Birbhum which has recorded 13 percent of total yield (Table-1, Fig- 1). Percent distribution of yield of maize shows that yield rate of Cooch Behar is the highest which has contributed 11.05% of total yield followed by Uttar Dinajpur, Murshidabad, Dakshin Dinajpur, North 24-parganas and Nadia. These six districts have produced more than average yield of maize. Below average yield rates of maize have found in rest of the districts and among these districts Howrah has contributed lowest yield and has registered 2.4 percent of total yield (Table-1, Fig- 1).

2.1.2 Distribution of millets

It has been found that Yield of jowar is highly concentrated in nature. It has been produced only in Purulia district (Table-1, Fig- 2). Production of Bajra is also highly concentrated in nature. Only two districts viz. Purulia and Cooch Behar have produced bajra. Percent of yield of bajra in Purulia is 60.34 while it is 39.66 in Cooch Behar (Table-1, Fig- 2). Yield of ragi has been concentrated only in five districts and per cent of production is high in Darjeeling district i.e. 31.56 followed by Jalpaiguri, Uttar Dinajpur, Purulia and Cooch Behar districts. Among these five districts only Cooch Behar's yield rate is below average i.e. 8.9 percent and rest four districts' yield rate are more than average (Table-1, Fig- 2). Small millets have also produced in concentrated way. Cultivation has concentrated only five districts and among these districts yield rates of four districts are more than average. These are Darjeeling, Cooch Behar, Bankura, and Jalpaiguri producing 38.51 percent, 21.35 percent, 9.06 percent and 13.76 percent respectively. Purulia's yield rate is 7.32 and this is less than average (Table-1, Fig- 2).

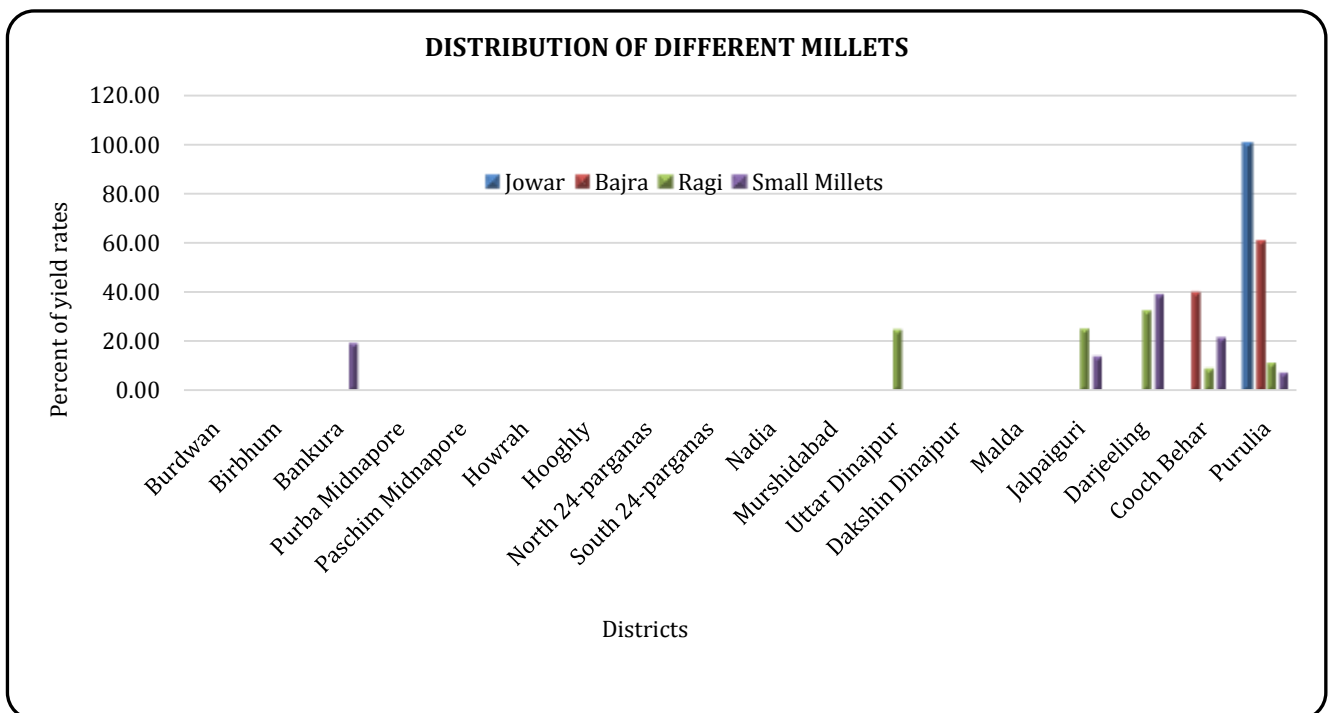


Fig-2: Source: Statistical Abstract, 2015.

2.1.3 Distribution of pulses

India is the largest producer of pulses. India contributes 25 percent of total pulse production in the world (Singh P, et al., 2016). But production of pulses are not appreciable rather it is lagging behind (economic Review 2017-18). In West Bengal cultivation of pulses have been given importance to retain soil fertility and to avoid high dependency on cereal crops (Bera R, et al., 2018).

Table- 2: Source: Statistical Abstract, 2015.

District	Yield of Food Grains					
	Grams	Arhar(Tur)	Mung	Musur	Khesari	Other Pulses
Burdwan	7.53	8.58	6.19	5.18	5.63	5.97
Birbhum	8.66	0.00	11.79	6.55	12.08	4.65
Bankura	8.63	0.00	5.21	6.68	0.00	6.97
PurbaMidnapore	0.00	0.00	7.18	7.97	10.47	1.74
PaschimMidnapore	8.30	11.75	5.11	11.59	12.03	5.23
Howrah	0.00	0.00	7.62	4.86	5.25	0.00
Hooghly	8.53	8.63	5.27	3.99	0.00	13.94
North 24-parganas	7.01	0.00	4.24	5.67	6.08	6.46
South 24-parganas	7.01	12.50	4.12	4.03	7.09	7.30
Nadia	6.65	12.50	4.34	5.95	6.08	5.96
Murshidabad	7.74	12.13	4.77	7.30	5.45	6.42
Uttar Dinajpur	5.87	7.27	6.15	4.91	0.00	5.64
DakshinDinajpur	5.90	0.00	0.00	5.24	0.00	4.98
Malda	5.85	9.30	3.98	4.42	7.16	6.45
Jalpaiguri	5.94	0.00	8.51	4.10	5.37	5.80
Darjeeling	0.00	9.51	5.77	4.26	6.12	5.90
Cooch Behar	0.00	0.00	5.75	3.41	5.90	4.42
Purulia	6.39	7.83	4.01	3.91	5.28	2.17

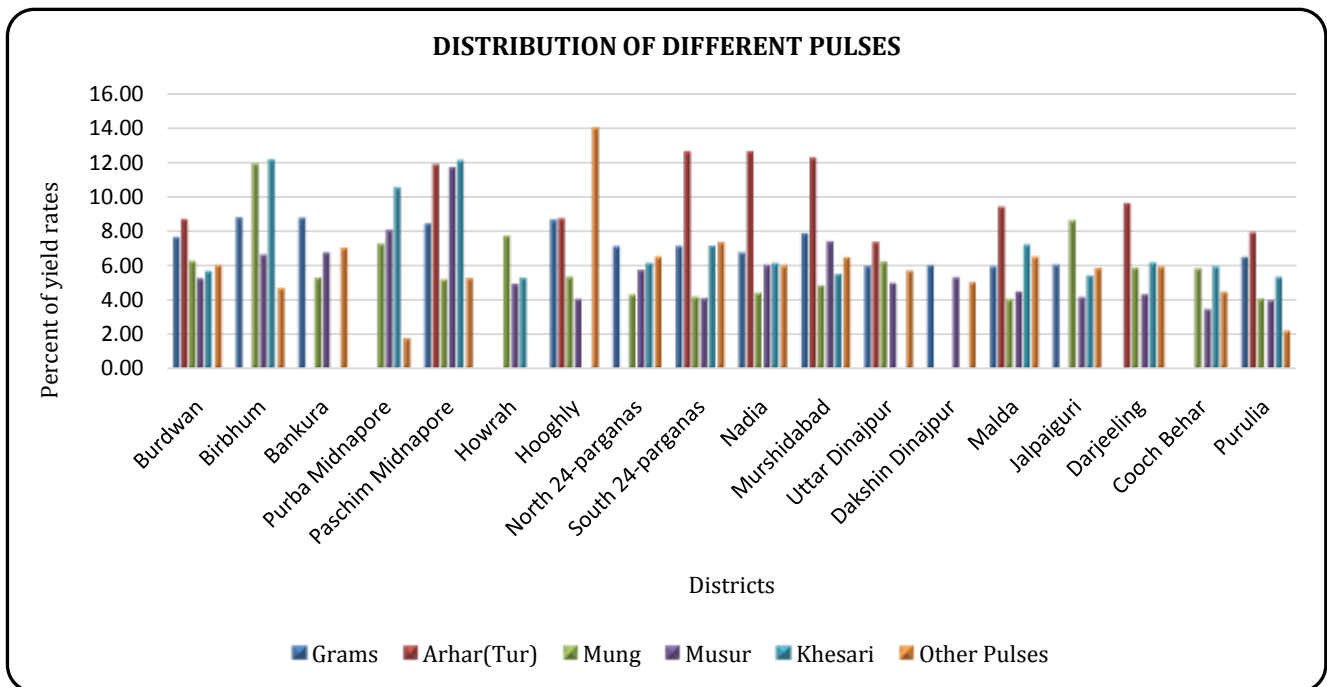


Fig-3: Source: Statistical Abstract, 2015.

Percent distribution of yield of grams depicts that Birbhum’s yield rate is the highest as it has contributed 8.66 percent of total yield. This is followed by Bankura, Hooghly, Paschim Medinipur, Murshidabad, Burdwan, North 24 Parganas, South 24 Parganas, Nadia, Purulia, Jalpaiguri, Dakshin Dinajpur, Uttar Dinajpur and Malda. The yield of gram is absent in remaining four districts (Table-2, Fig- 3). Yield rates of arhar shows that these have been grown in ten districts. Out of which South 24 Parganas and Nadia each has produced highest yield of arhar i.e. 12.5percent of total yield. Murshidabad, Paschim Medinipur are also good producers as they have produced 12.5 percent and 11.75

percent of total yield respectively. Other districts those have good share of yield in arhar's production are Darjeeling, Malda, Hooghly, Burdwan, Purulia and Uttar Dinajpur (Table-2, Fig- 3).Mung is cultivated throughout the state of West Bengal except DakshinDinajpur. Birbhum is the lead producer of mungas it has contributed 11.79 percent of total yield. Malda's contribution in Mung production is least as it has produced 3.98 percent of total yield of mung. Jalpaiguri, Howrah, PurbaMedinipur, Burdwan, Uttar Dinajpur, Darjeeling, Cooch Behar have produced more than average of mung production and rest of districts have produced less than average of yield (Table-2, Fig- 3). Musur has been cultivated all over the West Bengal. Maximum yield has been registered by Paschim Medinipur. Its production is far beyond the average as 11.59 percent musur has been produced in this district. More than average musur yield have been found also in PurbaMedinipur, Murshdabad, Bankura, Birbhum, Nadia and North 24 Parganas districts. Rest of the districts yield of musur is below the average. Cooch Behar has produced lowest musur(Table-2, Fig- 3).Percent distribution of yield of Khesari shows it has been produced in fourteen districts and out of these districts Birbhum is the highest contributing district in terms of yield of keshari registering 12.08 percent of total yield. It is followed by Paschim Medinipur and PurbaM edinipur which also have produced 12.03 percent and 10.47 percent of total yield respectively. These are followed by Malda, South 24 Parganas, Darjeeling, North 24 Parganas, Nadia, Cooch Behar, and Burdwan. Yield of khesari has found below average in Murshdabad, Jalpaiguri, Purulia, Howrah(Table-2, Fig- 3).Yield of other pulses shows that this have been cultivated throughout the state of West Bengal except Howrah. Hooghly's yield is considerably high as 13.94 percent yield has come from this district. South 24 Parganas, Bankura, North 24 Parganas, Malda, Murshidabad, Burdwan, Nadia, Darjeeling, Jalpaiguri, Uttar Dinajpur have produced more than average yield. Yields of other pulses in other districts are low especially in Purba Medinipur which has cultivated only 1.74 percent of total yield of other pulses (Table-2, Fig- 3).

2.1.4 Distributions of total cereals and total pulses

It has been found that Burdhaman, Maldah, Birbhum, Nadia, Uttar Dinajpur, Murshidabad plays important role in terms of total cereals production as these districts yield rates are more than average. Production of total cereal is also higher than average in the district Hooghly. Production of North 24 Parganas and Dakshin Dinajpur are near average. Cereal production of rest of districts are less than average. In Cooch Behar, Purulia and Jalpaiguri's yield rate is far below the average (Fig- 4).

Regarding yield rates of pulses it has been seen that Paschim Medinipur's yield rate is far above the average, Birbhum's production rate is also far higher than average. Districts like Murshidabad, Bankura, Howrah, Paschim Medinipur, Nadia, North 24 Parganas's yield rate are almost near average. Production of pulses for rest of districts are less than average. Yield rate of Purulia, Cooch Behar, Malda are remarkably lower than average (Fig- 4).

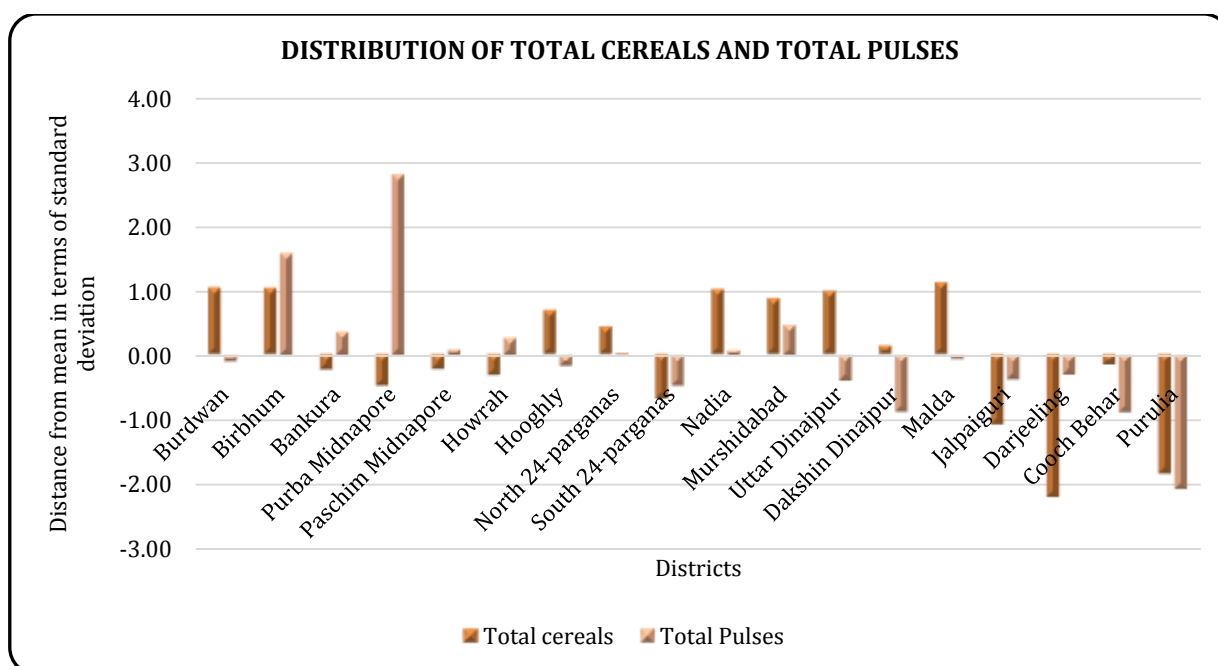


Fig-4: Source: Statistical Abstract, 2015.

2.2 Comparison of yield rates of different food grains

2.2.1 Comparison of yield rates of cereals

Table- 3: Source: Statistical Abstract, 2015.

Results	Yield rates of cereals (in kg per hectare)								Total cereals (in kg per hectare)
	Rice	Wheat	Barley	Maize	Jowar	Bajra	Ragi	Small Millets	
Mean	2845	2615	552	2952	18	36	197	202	2853
Standard Deviation	384.03	452.06	713.66	1335.81	75.42	106.44	366.96	393.26	384.87
C V	13.50	17.29	129.26	45.26	424.26	297.96	186.11	194.74	13.49

From the Table-3 it has been found that average yield rate for total cereals is 2853 kg per hectare. Among crops average yield rate for cereals is high for maize and it is followed by rice, wheat, barley, small millets, ragi, bajra and jowar. Values of standard deviation has revealed that it is very high for maize i.e. 1335.81 followed by barley i.e. 713.66, wheat i.e. 452.06, small millets i.e. 393.26, rice i.e. 384.03, ragi i.e. 366.96, bajra i.e. 106.44, jowar i.e. 75.42. So it can be stated that maize has been produced widely and it is followed by barley, wheat, small millets, rice, ragi, bajra. Production of jowar is highly concentrated. C.V. Values indicate that production of jowar is highly inconsistent as C.V. is very high i.e. 424.26 and Yield of rice is highly consistent as C.V. is lowest than others (Table-3).

2.2.2 Comparison of yield rates of pulses

From the table -4 it has been found that average yield rate for total pulses is 900 kg per hectare. Yield rate is high for khesari followed by grams, musur, other pulses, mung and arhar or tur. Values of standard deviation has revealed that it is very high for Arhar i.e. 732.12 followed by khesari i.e. 611.72, grams i.e. 513.84, other pulses i.e. 408.23, mung i.e. 340.68 and musur i.e. 308.97. So it can be stated that yield of arhar is widely spread. It is followed by khesari, gram, other pulses, mung and musur. Distribution of yield of musur is highly concentrated. C.V. values indicate that yield of arhar is highly inconsistent as C.V. is very high i.e. 95.78 and Yield of musur is highly consistent as C.V. is lowest than others (Table-4).

Table- 4: Source: Statistical Abstract, 2015.

Results	Yield rates of pulses (in kg per hectare)						Total Pulses (in kg per hectare)
	Grams	Arhar(Tur)	Mung	Musur	Khesari	Other Pulses	
Mean	892	764	791	871	908	797	900
Standard Deviation	513.84	732.12	340.68	308.97	611.72	408.23	260.80
C V	57.62	95.78	43.07	35.48	67.40	51.20	28.99

Close examination of yield rates of total cereals and total pulses show that Standard deviation value for total cereals are high so cereals have been harvested widely than pulses. C. V. values indicate that production of pulses are highly inconsistent as C.V. is high for pulses, and production of cereals are highly consistent as C.V. value is low for cereals than pulses (Table -3 and Table- 4).

2.3 District wise productivity of food grains

To understand the position of districts in terms of total yield of food grains districts have been ranked according to the yield rate of every crops. As stated before district producing highest yield has been assigned lowest rank i.e. 1 and thus ranks have been increased as yield decreased. In this way each district has got fourteen separate ranks as fourteen food grains have been considered in this study. Finally score values has been obtained for each district by adding district's fourteen different ranks. Thus districts having lowest score values ranks first in terms of total productivity and districts having highest score values secures last position in terms of total productivity.

In this way it has been found that Murshidabad ranks first obtaining 106 score value. This district is followed by Nadia, Birbhum, Burdwan, North 24 Parganas, Bankura, PaschimMedinipur, Malda, Uttar Dinajpur, Darjeeling, South 24 Parganas, Jalpaiguri, Purulia, Hoogly, Cooch Behar, PurbaMedinipur, DakshinDinajpur and Howrah (Table-5).

Table- 5: Source: Statistical Abstract, 2015.

District	Ranks of food grains as per yield rates														Total Rank
	Rice	Wheat	Barley	Maize	Jowar	Bajra	Ragi	Small millets	Gram	Arhar	Mung	Musur	Khesari	Other pulses	
Burdwan	3	5	13	14	17	11	11	11	6	8	5	9	10	7	130
Birbhum	2	7	7	15	17	11	11	11	1	15	1	5	1	14	117
Bankura	11	10	13	7	17	11	11	3	2	15	10	4	17	3	133
PurbaMidnapore	9	9	13	17	17	11	11	11	17	15	4	2	3	17	155
PaschimMidnapore	10	17	13	11	17	11	11	11	4	4	11	1	2	12	135
Howrah	13	11	13	18	17	11	11	11	17	15	3	11	14	18	182
Hooghly	6	12	13	16	17	11	11	11	3	7	9	16	17	1	149
North 24-Parganas	7	3	13	5	17	11	11	11	8	15	14	7	7	4	132
South 24-Parganas	15	4	13	13	17	11	11	11	7	1	15	15	5	2	140
Nadia	5	1	2	6	17	11	11	11	9	2	13	6	8	8	110
Murshidabad	4	6	3	3	17	11	11	11	5	3	12	3	11	6	106
Uttar Dinajpur	12	13	1	2	17	11	3	11	13	10	6	10	17	11	136
DakshinDinajpur	8	2	13	4	17	11	11	11	12	15	18	8	17	13	159
Malda	1	8	6	12	17	11	11	11	14	6	17	12	4	5	135
Jalpaiguri	16	16	4	8	17	11	2	4	11	15	2	14	12	10	141
Darjeeling	18	18	5	9	17	11	1	1	17	5	7	13	6	9	136
Cooch Behar	14	14	13	1	17	2	5	2	17	15	8	18	9	15	149
Purulia	17	15	13	10	1	1	4	5	10	9	16	17	13	16	147

3. CONCLUSIONS

So it has been revealed that among main cereals rice, wheat and maize have cultivated in every district whereas cultivation of barley is concentrated in seven districts. Malda is the highest rice producer, Nadia is the highest wheat producer, Uttar Dinajpur is the highest barley producer, CoochBehar is the highest maize producer. Millets production is concentrate either in northern mountainous region or duars region or western plateau region. Cultivation of millets has been found that are very much concentrated in nature. Production of pulses has revealed that only musur has been cultivated in every district. Birbhum is the highest gram producer among fourteen districts which produce grams. South 24v Parganas and Nadia are remarkable in production of arhar or tur out of ten arhar producing districts. Birbhum is the lead producer of mung. Production of mung is absent in Dakshin Dinajpur district. Musur has produced significantly in Paschim Medinipur district. Birbhum is the highest khesari producer of West Bengal out of fourteen districts which has produced khesari. Hooghly is the highest producer of other pulses.

Cereals have been harvested widely than pulses. Production of pulses are highly inconsistent and production of cereals are highly consistent. Regarding productivity of the districts it has been found that Murshidabad's productivity is the highest and Howrah's productivity is the lowest.

REFERENCES

- [1] Bera, R., Seal, A., Das, T. H., Sarkar, D., & Chatterjee, A. K. (2018). Production Potential and Economics of Different crops under Varying Physiographic Conditions in Damodar Command Area (Part), West Bengal, India. Research & Reviews: Journal of Crop Science and Technology, 6(3), 1-9.
- [2] Brahmachari, K., Sarkar, S., Santra, D. K., & Maitra, S. (2018). Millet for Food and Nutritional Security in Drought Prone and Red Laterite Region of Eastern India. International Journal of Plant & Soil Science, 1-7.
- [3] Das, N.G. (2001). Statistical Methods, (pp. 215-216), Calcutta: M.Das and Co.
- [4] De, U. K., & Chattopadhyay, M. (2010). Crop diversification by poor peasants and role of infrastructure: Evidence from West Bengal. Journal of Development and Agricultural Economics, 2(10), 340-350.
- [5] Dev, S. M. (1998). Regional Variations in Agricultural Performance in the Last Two Decades. Indian Journal of Agricultural Economics, 53(1), 15.
- [6] Dev, S. M., & Sharma, A. N. (2010). Food security in India: Performance, challenges and policies.

- [7] Government of India. (2011). Primary Census abstract 2011, New Delhi.
- [8] Government of West Bengal. (2016). District wise Estimates of Yield Rate and Production of Nineteen Major Crops of West Bengal During 2014-2015, (pp. 1), Bureau of Applied Economics and Statistics Department of Statistics and Programme Implementation, 1.
- [9] Government of West Bengal. (2017). Statistical Abstract 2015. (pp- 221-240), Bureau of Applied Economics and Statistics Department of Planning Statistics and Programme Monitoring.
- [10] Government of West Bengal. (2018). Economic Review 2017-18,(pp- 15-16), Bureau of Applied Economics and Statistics Department of Planning Statistics and Programme Monitoring,
- [11] Ghosh, B. K., &Kuri, P. K. (2005). Changes in Cropping Pattern in West Bengal During 1970-71 to 2000-01. IASSI Quarterly, 24(2), 39-56.
- [12] Ghosh, B. K., &Kuri, P. K. (2007). Agricultural growth in West Bengal from 1970-71 to 2003-04: A decomposition analysis. The IUP Journal of Agricultural Economics, 4(4), 30-46.
- [13] Kumar Ray, S. (2007). Economics of change in cropping pattern in relation to credit: A micro level study in West Bengal. Indian Journal of Agricultural Economics, 62(902-2016-67390).
- [14] Mahmood, A. (2002). Statistical methods in Geography. (pp. 8-9), New Delhi: Rajesh Publication.
- [15] Maitreya, P., &Chatterji, A. (1964). Some aspects of regional variations in agricultural productivity and development in West Bengal. Indian Journal of Agricultural Economics, 19(902-2016-68190), 207.
- [16] Mondal, D., & De, S. (2015). Growth and Fluctuation of Productivity of Total Food grain in West Bengal as Compared to all India during 1980-81 to 2009-10. Scholars Journal of Economics, Business and Management-2015; 2 (1A): 16, 25.
- [17] Nandi, S. (2016). Agricultural Production and Food Security in District Bankura, West Bengal, India. In Selected Papers of Bhopal Seminar 2015 (p. 63).
- [18] Saha, A., & Swaminathan, M. (1994). Agricultural growth in West Bengal in the 1980s: A disaggregation by districts and crops. Economic and political Weekly, A2-A11.
- [19] Sarkar, D. (2015). Study on growth of major cereals in West Bengal. Economic Affairs, 60(1), 157.
- [20] Sarkar, S., & Ghosh, T. K. (2017). Agricultural Development in West Bengal: An Inter-temporal Analysis. Economic Affairs, 62(3), 483-493.
- [21] Singh, P., Shahi, B., & Singh, K. M. (2016). Trends of pulses production, consumption and import in India: current scenario and strategies. Consumption and Import in India: Current Scenario and Strategies (May 15, 2016).
- [22] Swaminathan, M. S., &Bhavani, R. V. (2013). Food production & availability-Essential prerequisites for sustainable food security. The Indian journal of medical research, 138(3), 383.

AUTHOR'S BIOGRAPHY



Dr. Ruksanara Begum is an Assistant Professor in the Department of Geography of Barasat Government College, Kolkata, West Bengal, India. Her specialization is in Cartography and Social Geography. She has around fourteen years of teaching experiences. She completed her Ph.D. from University of Calcutta. She has contributed research articles on various aspects of social geography. She has published papers in international and national peer reviewed journals and one edited book volume.