CHAPTER: IV

PATTERNS AND STRUCTURE OF AGRICULTURE IN DAKSHIN DINAJPUR AND BARDHAMAN DISTRICTS IN WEST BENGAL

I. INTRODUCTION

Agriculture is the primary occupation of a large part of working population of the State of West Bengal. It is worth to mention that about 70 per cent of the rural population depends on agriculture for their livelihood (State Action Plan on Climate Change, West Bengal, April 12, 2010). In the state there are six agro-climatic zones namely Hill zone, Terai zone, Old Alluvial and New Alluvial zones, Laterite zone and Saline Coastal zone which offers an extensive and diverse climate, soil, water availability through irrigation and rainfall, and biodiversity creating diversified cropping systems. Different food grains and commercial crops are producing in these zones. We know agriculture sector in West Bengal is characterized by the predominance of small and marginal farmers tilling more than 68% of the total cultivated area. Average per capita land holding in the state is less than 1 hectare. The growth rate of this sector, however, has plateaued over the years at about 2% (GoWB, 2010).In the last three decades, especially with land reforms and associated structural changes there has been a gradual and noticeable progress of agriculture in the state. The importance of agriculture in the state's economy is reflected by its contribution of about 20.69% to the total net State Domestic Product (SDP). However, the growth rate of farm sector remained at 2 per cent in the five year plan period, the employment support of this sector is nearly 57% (Adhikari, Bag, Bhowmick and Kundu, 2011). The main reasons behind the slowing down of the agricultural growth in the state are the limited investments of both public and private sector, poor infrastructure with marketing linkages and low agricultural productivity. Therefore, the major concern of the state is how to increase the growth rate of agriculture and allied sectors particularly to enhance agricultural productivity in the state (Anon., 2009). The state is constituted in the heart of fertile geographical delta that comprises of a high geographical diversity with 6 agro-climatic zones. The net sown area is 61% of the total geographical area against national average of 46%. The gross cropped area of the state presently is 97.5 lakh hectares with cropping intensity of 184%.

Small and marginal farmers consist of over 90% of total farm population (State Agricultural Plan- West Bengal,2010) and they own near about 84% of cultivated land. Irrigation covers 69% of net cropped area though there is high reliance on monsoon (Anon, 2009).

In West Bengal area of agriculture has been reducing gradually due to overpopulation and urbanization. Net cropped area in hectare was 5463424 in 1990-91 where it decreased at 4991222 in 2010-11. Similarly gross cropped area in hectare has reduced after 1996-97 to 2010-11 from 9032936 to 8832348. But the cropping intensity has increased by 177 in 2010-11 from 159 in 1990-91. Although it was better in some years especially in 2007-08 and in 2008-09 with 184 and 185 (Statistical Hand Book, WB, 2011). Total production of food grains has decreased 15591 in 2009-10 to 14634 in 2010-11 in thousand tones but overall production of food grains has increased from 1990-91 to 2010-11. Among all food grains rice is produced in a large extent and it occupied largest producer position over the nation. Similarly, performance of other crops producing in West Bengal has made good position. It is recorded that West Bengal occupied second largest position in potato production. In this section we are discussing about land classification available in the state and for two selected districts namely Bardhaman and Dakshin Dinajpur. The performance of agriculture of West Bengal and as well as for two selected district has been discussed separately.

II. AGRICULTURE IN WEST BENGAL

In West Bengal agriculture is the major occupation of the rural population. It issmall farmer centric with 90 per cent of the cultivators being small and marginal farmers. Although more or less 30 lakh landless families have earned the right of cultivation and growing crops on their own land after enactment of Operation Barga system but still small and marginal farming communities hold 84% of the State's agricultural land. State has the highestpopulation density (976 per sq. km) in the country. As a result, the per capita cultivable landholding is under a steady process of fragmentation. This has resulted in uneconomic holdingsize to sustain a farmer's family. Increase in the price of agricultural inputs, fragmentation ofland holding, uncertain prices of perishable agricultural produces, inadequate marketinfrastructure, distress sale of produce by small and marginal farmers etc. are some of theproblems being confronted by the farmers of the state. Similarly, due to lack of propermarketing and processing facilities and for high price of feeds and fodder for farm

animal,management of the traditional family mixed farming system in the rural areas has becomemore difficult than ever before. By and large, the socio-economic conditions of the farming community are gradually declining.The state is also faced with decline in soil fertility, annual degradation of natural resourcesdue to floods, siltation of river and reservoir beds and erosion of river banks. The State has21.91 lakh ha degraded lands of different kinds. In fact, about 29% of the geographical area of the state is under soil degradation. In addition to this, the state has 44.39 lakh ha of landwith drainage problems to varying extents, limiting adoption of modern agro-techniques forhigher productivity of field crops, horticultural crops and household animal productivity.

Availability of land for different purpose say for cultivation, house building, industry, forest etc. is decreasing gradually due to over population. According to current census report (2011) population of West Bengal is 9,13,47,736 where this digit was 8,01,76,197 for 2001. But availability of land is stagnant and rather it is mitigating due to erosion and other factors. In the following Table we have shown classification of land in West Bengal. We can see that percentage of net area sown in the state was 60.5 out of total reporting area 8685 thousand hectare in 2009-10.

Table 4.1: Classification of Land in West Bengal according to Use (in thousand hectares)

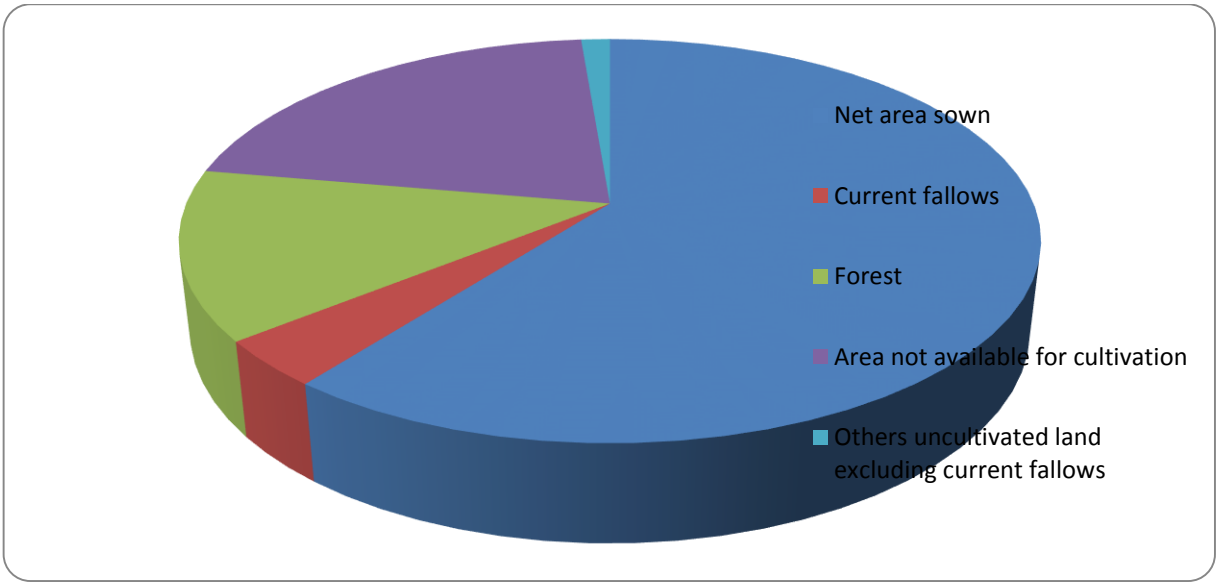
Classification of land	Classesof land in area (ha) and in percentage			
	2009-10		2010-11	
	Area	Percentage	Area	Percentage
Net area sown	5256	60.5	4991	57.5
Current fallows	323	3.7	574	6.6
Forest	1174	13.5	1174	13.5
Area not available for cultivation	1820	21	1840	21.2
Others uncultivated land excluding current fallows	112	1.3	105	1.2
Total reporting area	8685	100	8684	100

Source: Directorate of Agriculture, Govt. of West Bengal

Since we know that availability of land for cultivation has been decreasing we found 57.5 per cent land has remained as net area sown. Similarly, we can see that area for current

fallow has increased from 3.7 per cent to 6.6 per cent. Area of forest has remained same over the period of 2009-10 to 2010-11 with covering 13.5 per cent area. Area not available for cultivation has changed from 21 per cent to 21.2 per cent between two said periods. Area under other uncultivated land excluding current fallows has decreased from 1.3 per cent to 1.2 per cent. The classification of land for different purposes will be more visible if we look at the following pie diagram. In this diagram dark blue portion shows the area available for net area sown. Similarly, others fragmentation of land has heighted through the different portions in this figure.

Figure: 4.1: Classification of Land in West Bengal according to Use (in thousand hectares)



II.1. Categories of Farmers and their Landholding

West Bengal has nearly three percent of the nation's cultivable land and about eight per cent of the country's population. It produces more than 8 per cent of the food of the country. The agricultural sector is characterized by the predominance of small and marginal farmers tilling more than 68 per cent of the total operated area of the State. The average size of holding here is less than one hectare. Since the scope for bringing more area under cultivation is limited emphasis has been laid mainly on increasing the productivity of different crops by using quality seeds, fertilizers, plant protection measures as well as improved packages of practice and distribution of surplus and vested land to the actual

tillers through land reforms. We have shown categorization of farmers according to their land holding in the following table.

Table 4.2: Details of Landholding in West Bengal

Land Holdings of West Bengal, (2007-08 Agricultural Census)			
S.L	Category of farmers	Land ownership (%)	Land under operation (%)
1	Marginal (<1 ha)	81.17	50.65
2	Small (1 to <2 ha)	14.38	28.87
3	Semi-Medium (2 to <4 ha)	4.04	13.98
4	Medium (4 to <10 ha)	0.4	2.49
5	Large (10 ha & above)	0.01	4.01
6	Total	100	100

Source: Anonymous. 2010. Presented in National Conference on Kharif Campaign 2010, 18th & 19thMarch, 2010, New Delhi, Presented by Depertment. of Agriculture, Government of West Bengal.

We have classified the lands in two ways say as land ownership and as land under operation in percentage. We can see that on the basis of land ownership the percentage of marginal farmers is 81.17 having less than 1 hectare land and percentage of land under operation for same category is 50.65. Small farmers having 1 to 2 hectare land occupied 14.38 per cent land as land ownership and 28.87 percent lands as land under operation. Percentage of semi-medium having 2 to 4 hectare land, medium having 4 to 10 hectare land and large having above 10 hectare land is very less.

II.2. Fertilizer Consumption

India is the third largest producer and second largest consumer of chemical fertilizer in the World. Indian chemical fertilizer industry started in 1906 with SSP production facility at Ranipat near Chennai and as days go on fertilizer industries are spread out this business through the nation. On the other hand, it became challenge to meet the required food for the people living in the nation. As a result demand of food grains has been increasing with higher rate compared to rate of increase of food grains. So deficiency of food grains has emerged over the nation. That is why the high demand of food grains can be meet only by increasing productivity of land. As result of this the chemical fertilizer is needed to cover

the scarcity of organic fertilizer and to rapid the productivity of land. In the following Table some statistics of fertilizer consumption furnished.

Table 4.3: Consumption of Fertilizer in West Bengal

Year	Consumption
2006-07	1340000
2007-08	1350000
2008-09	1500000

Source: Department of Agriculture, Government of West Bengal, 2009

Note: 1 Tonne=1000 Kilograms

From the above table we can see that consumption of fertilizer has been increasing over the years. Farmers no longer dependent on organic manure only. In 2006-07 total consumption of fertilizer was 1340000 tones whereas in 2007-08 it was 1350000 and in 2008-09 it was 1500000 tones. It is clear that farmers are concentrating on fertilizer use in cultivated land to get higher productivity and surplus production.

II.3. Credit Facilities

Credit is one of the most important factors of farm sector. It is needed to buy modern inputs in agricultural sector. There are two sources of credit namely, institutional credit and non-institutional credit. Non-institutional credit is supply of credit by money lenders, traders, relatives etc. with higher rates of interest. On the other hand, institutional credit is provided by different types of banking institutions. In the Table no. 2.8it can be seen that there are three types of major financial institutions. In this table we can see that different type of banking service in farm sector is increasing gradually.

Table 4.4: Credit to the Agricultural Sector in West Bengal

Financial institutions	Years of Consumption			
	2005-06	2006-07	2007-08	2008-09
Commercial Banks	320	492	653	563
Rural Banks	40	71	97	109
Cooperative Banks	140	233	285	194
Total	500	796	1035	866

Source: Department of Agriculture, Government of West Bengal, 2010

We have found that maximum numbers of commercial banks areexisting in West Bengal. It can also be seen that from 2007-08 to0 2008-09 the number of commercial banks has decreased from 653 to 563. On the other hand, rural banks and cooperative banks have been increasing gradually over the years and extending facilities of credit to farmers.

III. PRODUCTION –WEST BENGAL SCENARIO

Agriculture is the chief occupation of the people of the state. The majority of the population is cultivators and agricultural labours. Rice is the principal food crop of Wet Bengal. Other food crops produced in this state are maize, pulses, oilseeds, wheat, potatoes and vegetables etc. The state supplies about 66% of the jute requirements of the country because soil and rainfall are suitable for jute cultivation. Jute is a very important commercial crop in the state and it supports the jute textile industry in the Hooghly industrial region in and around Kolkata. The state accounts for most of the jute textile produced in Kolkata. Tea is another important cash crop. Darjeeling Tea is famous for its high quality. Tea is another important industry in the state. Kolkata is the biggest auction market for tea in India. Tobacco and sugarcane are also grown in the state. Agriculture has promoted the development of agro-based industries in the West Bengal.Rice mills, oil mills, silk industry etc. are other important agro-based industries in the state. West Bengal is the largest producer of rice in India. The total net irrigated area as a proportion of the total net agricultural area has

increased steadily from 32% in 1977-78 to nearly 70% in 2006-07. Use of improved seeds has increased for paddy cultivation from 28% in 1977-78 to 96% in 2006-07 and for all crops on average 80 per cent. The cropping intensity has also continuously increased to a level of 182 in 2006-07.

In the following tables we are giving some data related to production of different crops in the state of West Bengal. Three types of rice namely Aus, Amon and Boro are produced in different regions of West Bengal. In the following table we can see the trends of production of different crops of the period of 1980 to 2011.

Table 4.5: Production of Principal Cereals in West Bengal (in thousand tonnes)

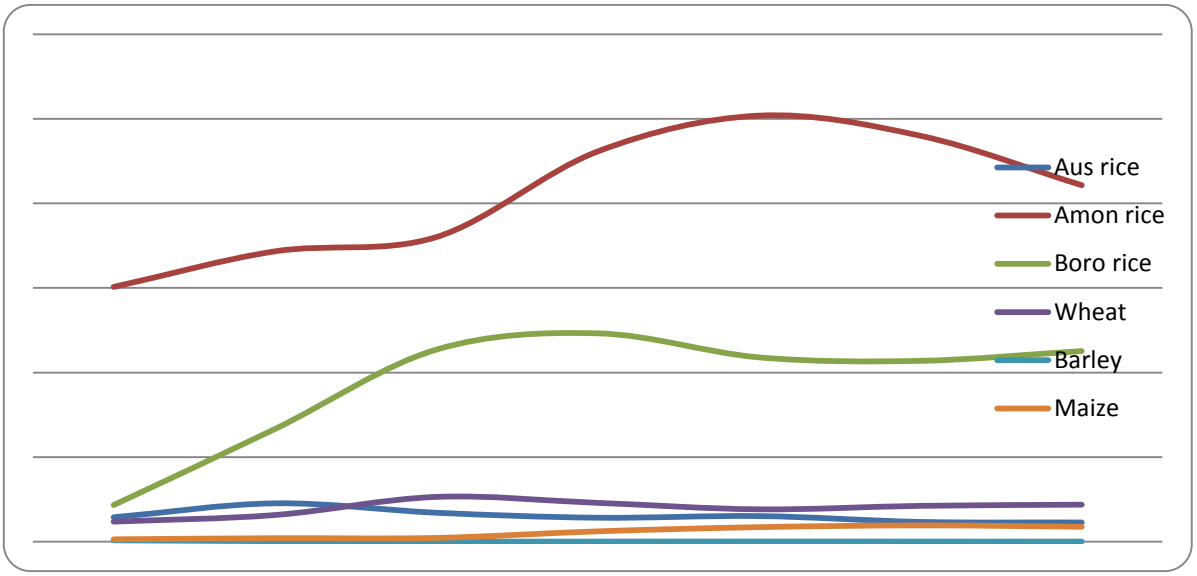
Production of Principal Cereals in Different Years								
S.L	Crops	1980-81	1990-91	2000-01	2007-08	2008-09	2009-10	2010-11
1	Aus rice	576.4	906.3	683.9	565.8	605	466.7	453.4
2	Amon rice	6024	6865.8	7202.8	9227.6	10074.3	9598	8429.3
3	Boro rice	865.2	2664.4	4541.3	4926.1	4358	4275.9	4506.8
4	Total rice	7465.6	10436.5	12428	14719.5	15037.3	14340.6	13389.5
5	Wheat	473.2	630.2	1058.6	917.3	764.5	846.7	874.4
6	Barley	31.2	11.6	1.8	2.7	4.2	2.4	3
7	Maize	55.6	81.6	88.3	244.5	343.4	385.2	352.3

Source: (1) Directorate of Agriculture, Evaluation Wing, Government of West Bengal, (2) Tea Board, Economic Review, GoWB, 2012

Amon rice is the leading rice of West Bengal because cultivation of this rice depends on rain water. We know cost of irrigation constitute a big portion of cultivation cost and Boro production is completely depends on artificial irrigation system. We can see production of Amon rice not vary over the periods compared to other two rice. But the Boro rice production has increased radically over the periods. On the other hand, Aus rice production has been decreasing gradually since Boro rice cultivation covering some extent of Aus rice cultivation. However now a days Boro is rice production has gradually been replaced by wheat and maize production in the state. Production of other crops like barley, sugarcane etc. also increasing gradually. But cultivation of wheat has increased dramatically. It was 473.2 thousand tones in 1980-81 and it has reached at 874.4 thousand tones in 2010-2011. It

is noticeable that for some crops production levels previous to period say 2009 were higher than current period. The trends of production are presented in the following figure.

Figure: 4.2: Production of Principal Cereals in West Bengal (in thousand tonnes)



In the above diagram red line which shows the production of Amon rice holds increasing trend up to 2009 and that after it going down. On the other hand, production of Boro rice is shown by the green line which was increasing with increasing rate up to the year 2001-02 given in the above table but after that it has fallen and there after started to increase slightly. Production trends of other crops more or less remains same.

Pulse is one of the major crops produced in West Bengal. Different types of pulses are produced in the state. In the following table production of different types of pulses is presented for the period 1980-81 to 2010-11. If we see the data of gram pulse production we see that it was 55.6 thousand tones in 1980-81 which declined at 23.7 thousand tones in 2010-11. Similarly, production of arhur declined from 17.1 thousand tones to 2.2 thousand tones in 2010-11. But the rate of decline of mung pulse is quite less compared to others pulses. The production was 14.8 thousand tones in 1980-81 and declined at 12.2 thousand tonnes in 2010-11. It is noticeable that only production of masur pulse has increased from 30.3 thousand tones in 1980-81 to 53.4 thousand tones in 2010-11. Similarly, production of khesari is quite good compared to other pulses.

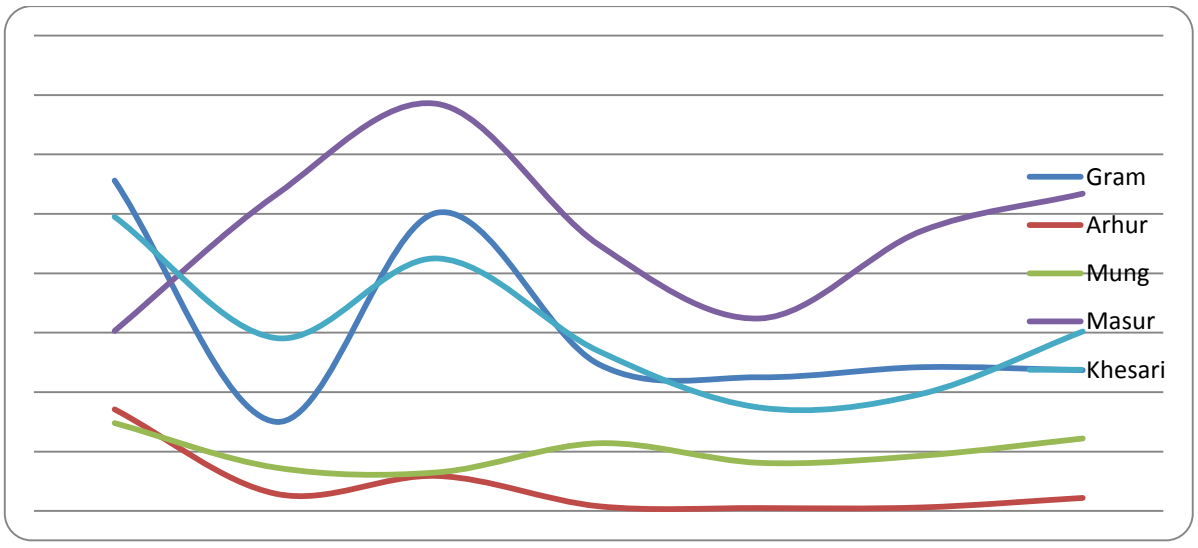
Table 4.6: Production of Pulses in West Bengal (in thousand tonnes)

Production of Pulses in Different Periods								
S.L	Crops	1980-81	1990-91	2000-01	2007-08	2008-09	2009-10	2010-11
1	Gram	55.6	15	50.2	24.7	22.5	24.2	23.7
2	Arhur	17.1	2.9	5.9	0.8	0.5	0.6	2.2
3	Mung	14.8	7.3	6.5	11.4	8.1	9.3	12.2
4	Masur	30.3	53.2	68.5	44.8	32.4	47.1	53.4
5	Khesari	49.5	29.1	42.5	26.9	17.4	19.7	30.2
6	Other pulses	70.9	85.9	45.9	49.4	48.8	49.6	54.9
7	Total	238.2	193.4	219.5	158	129.7	150.5	176.6

Source: (1) Directorate of Agriculture, Evaluation Wing, Government of West Bengal, (2) Tea Board. Economic Review, GoWB, 2012

The following figure -3.C shows the trend of pulses production over the period of 1980-81 to 2010-11. It is noticeable that except masur pulse which is shown by purple line production of all other pulses has declined up to 1990. But after that production of almost all pulses have incresed in the period of 2000 to 2001.

Figure: 4.3: Production of Pulses in West Bengal (in thousand tonnes)



Oil seed production is another important crop of farmers of West Bengal. Production of oil seed has been shown in the following Table. We know that mustard is the main source of

edible oil in the West Bengal. Other pulses are Lineseed, Seseam, Sunflower etc. produced in the state. Our present data shows production of mustard has been increasing dramatically compared to other crops. Total production of this oilseed was 79.2 thousand tones in 1980-81 and it has increased at 419.6 thousand tones in 2010-11. No doubt it is great achievement in oil seed production. Second position has been occupied seseam which is known as Till. The total production of this crop was 47.8 thousand tones in 1980-81 and it has reached at 168.6 thousand tones in 2010-11. But the production of lineseed has been decreasing gradually. In 1980-81, Lineseed production was 19.4 thousand tones where in 2010-11 the production has declined at 1.4 thousand tones. On the other hand, production of sunflower is quite good with 7.4 thousand tonnes produced in 2010-11.

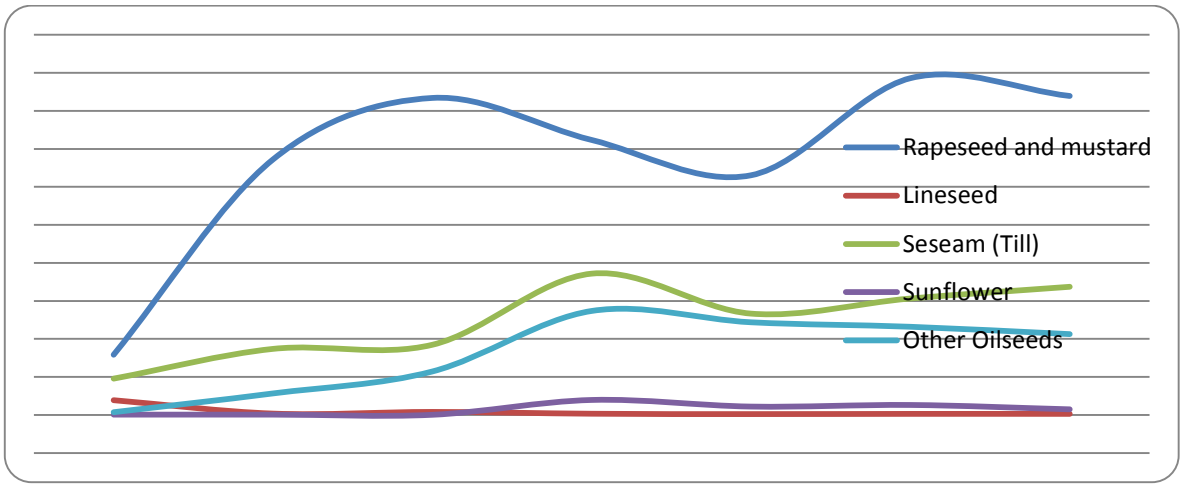
Table 4.7: Production of Oilseeds in West Bengal (in thousand tonnes)

Production of Oilseeds in different periods								
S.L	Crops	1980-81	1990-91	2000-01	2007-08	2008-09	2009-10	2010-11
1	Rapeseed and mustard	79.2	336.1	417	361.7	315.3	443	419.6
2	Lineseed	19.4	1.8	4	1.6	1.1	1.4	1.4
3	Seseam (Till)	47.8	86.9	92.3	185.9	133.3	153.2	168.6
4	Sunflower	0.4	0.4	0.2	19.7	11	13.1	7.4
5	Other Oilseeds	3.6	28.3	57.2	136.8	121.9	116	106.3
6	Total	150.4	453.5	570.7	705.7	582.6	726.7	703.3

Source: (1) Directorate of Agriculture, Evaluation Wing, Government of West Bengal, (2) Tea Board,Economic Review, GoWB, 2012

Picture of oil seed production will be clear if we see the following figure. It can be visualized that production of mustard seed far better than other oil seeds. Trends of this oil seed production has been showed by blue accent colored line. Second position in respect of production has been occupied seseam or Till in West Bengal.

Figure: 4.4: Production of Oilseeds in West Bengal (in thousand tonnes)



Fiber alsois the most important commercial crops in West Bengal. Jute is the main fiber produced in the state. Although industries related to jute has not been expanding, production of this crop is increasing gradually. It was 4442.7 thousand bales of 180kg each in 1980-81 and it has increased at 8137.5 thousand bales in 2010-11. Production of other fibers not much sound. Mesta production has decreased from 259.4 thousand bales to 76.8 thousand bales in 2010-11. The following Table shows the production fiber in West Bengal.

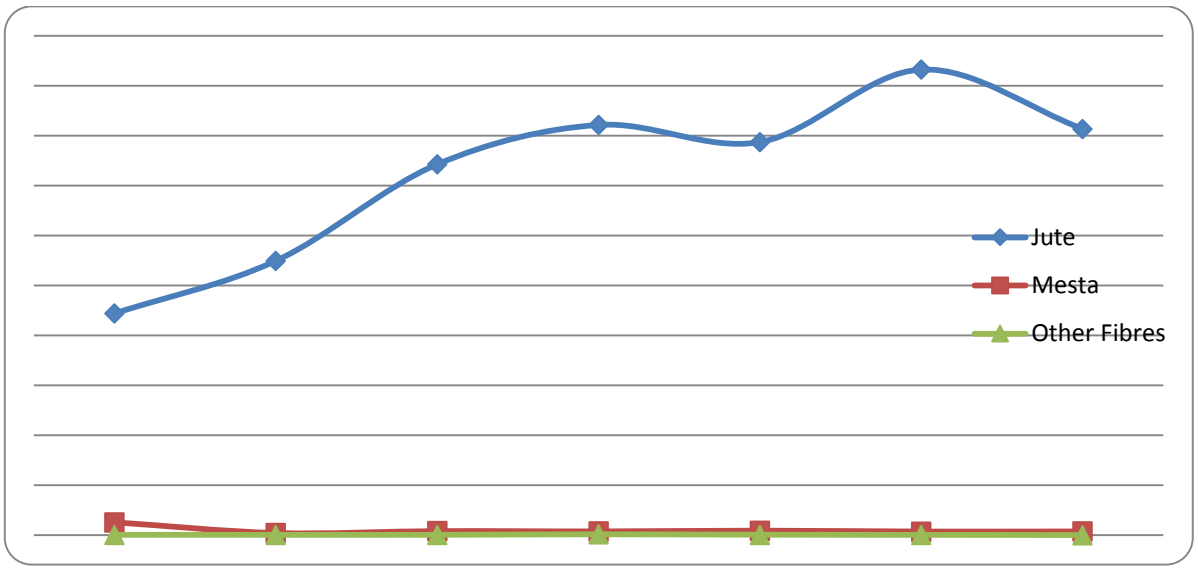
Table 4.8: Production of Fibers in West Bengal (in thousand bales of 180kg each)

Production of Fibers in different periods								
S.L	Crops	1980-81	1990-91	2000-01	2007-08	2008-09	2009-10	2010-11
1	Jute	4442.7	5496.3	7428.4	8216	7872.6	9325	8137.5
2	Mesta	259.4	45.8	83.6	77.5	92.9	75.1	76.8
3	Other Fibres	9.4	9	9.6	19.5	11.4	8	5.2
4	Total	4711.5	5551.1	7521.6	8313	7976.9	9408.1	8219.5

Source: (1) Directorate of Agriculture, Evaluation Wing, Government of West Bengal, (2) Tea Board, Economic Review, GoWB, 2012

Trend of fiber production would be clear if we see the following figure. It is Jute which alone is providing required fiber in the state. In this figure jute production which is shown by blue line diagram is quite high than other fibers.

Figure: 4.5: Production of Fibers in West Bengal (in thousand bales of 180kg each)



In addition to the above crops produced in West Bengal some other crops are also grown. These are sugarcane, potato, tea, and tobacco which are the important crops. More or less production of these crops has been increasing through the years. In the following Table we are giving data related to production of these crops for the period of 1980-81 to 2010-11. It is noticeable that all the above crops are playing vital role as exported item of West Bengal. It is tea which is considered as main commercial crop of this state which alone is produced in a big quantity among all other crops. After that potato and sugarcane are also produced in expanded quantity by the farmers of this state. On the other hand, although production of tobacco is very less, it is also increasing over the years since 2008-2009.

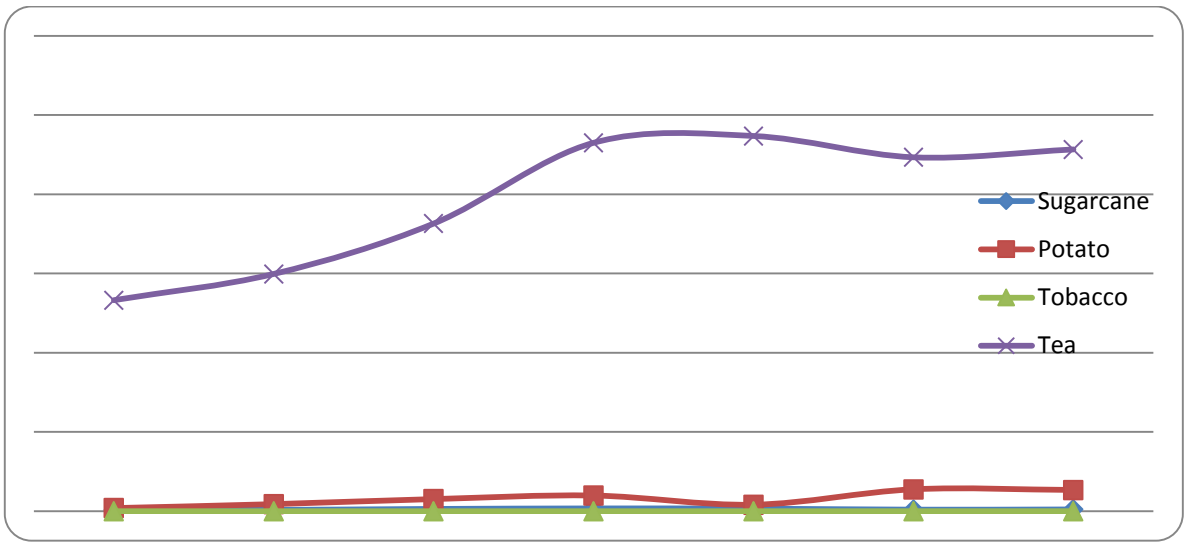
Table 4.9: Production of Miscellaneous Crops in West Bengal (in thousand tonnes)

Production of Miscellaneous Crops in different periods								
S.L	Crops	1980-81	1990-91	2000-01	2007-08	2008-09	2009-10	2010-11
1	Sugarcane	867.4	859.3	1465.6	1772	1638.3	1000.8	1134.1
2	Potato	1971.8	4481.8	7673.1	9900.8	4121.2	13838.1	13421
3	Tobacco	17.4	12.9	5.7	16.5	18	20.9	21.3
4	Tea	133186	149753	181536	232500	236780	223333(E)	228305(E)
5	Total	136042.6	155107	190680.4	244189.3	242557.5	14859.8	14576.4

Source: (1) Directorate of Agriculture, Evaluation Wing, Government of West Bengal, (2) Tea Board, E= estimated, Economic Review, GoWB, 2012.

In the following figure we are giving the trends of production of tea, sugarcane, potato and tobacco for the period from 1980-81 to 2010-11. In this figure purple colored line shows the production trend of Tea which is far better than other crops. The rate of production of this crop was very high up to 2007-08 and after that it is coming down gradually because of neglected view on tea gardens. On the other hand, production of potato also made good position in West Bengal.

Figure: 4.6: Production of Miscellaneous Crops in West Bengal (in thousand tonnes)



IV. AGRICULTURE IN BARDHAMAN DISTRICT

Barddhaman is the only district in the state of West Bengal where both industry and agriculture plays vital role. Statistically we can see average about 58 percent of the total population belongs to the agricultural sector and the remaining population depend on the non-agricultural sector which is 42 percent. The eastern, northern, southern and central areas of the district are extensively cultivated but the soil of the western portion is not useful for cultivation due to extreme lateritic type except in the narrow valleys and depressions having rich soil and good moisture. After implementation of the irrigation projects undertaken by the Damodar Valley Corporation in 1953 cultivation in the district has improved. Up to 1953 the cultivation was entirely dependent on the monsoon, and irrigation facilities were rather inadequate and more or less primitive. Side by side different type of agricultural implements is being used with this available irrigation system. As a result cost of cultivation is decreasing and famers were getting higher productivity. Rice is the most important crop of the district and in the alluvial plains to the east portions quite fertile for rice cultivation. The rice grown with its numerous varieties can be broadly grouped under the three primary classes distinguished from one another by distinct characteristics. The Aus or autumn, the Amon or winter and the Boro or the summer rice are produced here

coveringmaximum of the gross cropped area. Among commercial crops Jute, Mesta and Sugarcane, potato, oil seeds are cultivated in this district.

Land available in this district are using in different purposes. In the following Table we have shown the classification of land use of Bardhaman district. Land is classified into six categories. According to available data it can be seen that 8.04 per cent land of this district is used for different purposes. Present data of the year 2009-10 and 2010-11 showed that net area sown was 8.64 per cent and 9.06 per cent out of total sown area of West Bengal. It is also visible that area of current fallow land has decreased from 1.54 per cent in 2009-10 to 0.75 per cent in 2010-11. Area under forest has remained constant with 1.8 per cent in both the years.

Table 4.10: Details of Land Utilization in Bardhaman (in hectare)

Land classification	Land Utilization in area and in percentage					
	2009-10			20010-11		
	Area	Percentage	Total Area in WB	Area	Percentage	Total Area in WB
Area acoording to village papres	698762	8.04	8684113	698762	8.04	8684113
Area not available for cultivation	209893	11.53	1820274	212423	11.54	1839970
Others uncultivated land excluding current fallows	8616	7.71	111635	8360	7.96	105008
Area under forest	21165	1.8	1173669	21165	1.8	1173669
Current fallows	4978	1.54	322728	4352	0.75	574244
Net sown area	454110	8.64	5255807	452462	9.06	4991222

Source: GoWB, 2009

In the following Table we have discussed about the land holding of Bardhaman district. Landholding has been classified into five categories say, marginal having below 1 hectare land holding, small having 1-2 hectare holding, semi-medium having 2-4 hectare landholding, medium having 4-10 hectare landholding and large landholder who have above 10 hectares of cultivation land. We have taken data of 2000-01 and 2005-06 to compare landholding. Available data shows that landholder of marginal category and small has increased where landholding belongs to semi-medium and medium category has decreased. It has occurred due to over population and fragmentation of joint families. But we found that land holder of large category has increased from 60 in 2000-01 to 81 in 2005-06.

Table 4.11: Details Landholding of Bardhaman (in hectare)

Year	Land holding of Bardhaman District.									
	Marginal		Small		Semi-medium		Medium		Large	
	No.of holdings	Area of holdings	No.of holdings	Area of holdings	No.of holdings	Area of holdings	No.of holdings	Area of holdings	No.of holdings	Area of holdings
2000-01	325565	191610	88410	149896	32015	92627	6817	36993	60	992
2005-06	343359	196271	89543	154220	31761	92275	5377	27152	81	1500

Source: GoWB, 2009

Note: Marginal- Below 1.0 hectare

Small- 1.0 hectare and above but less than 2.0 hectare

Semi-medium- 2.0 hectares and above but less than 4.0 hectare

Medium – 4.0 hectare and above but less than 10.0 hectare

Large- 10.0 hectare and above

Fertilizer is one of the most important factors of cultivation and so farmers use fertilizer in a large extent to get higher productivity. Consumption of chemical fertilizer has been shown in the following Table. We have taken consumption level of Nitrogen, Phosphate and Potash of the year 2006 to 2011. It can be seen that consumption of these fertilizers has

increased up to year 2010 but after that level of consumption has decreased. The reasons behind the decrease of consumption level of chemical fertilizers may be that farmers have understood that over use of such fertilizer damage the fertility of soil.

Table 4.12: Fertilizer Consumption in Bardhaman (in thousand tonnes)

Year	Nitrogen (N)	Phosphate (P)	Potash (K)	Total
(1)	(2)	(3)	(4)	(5)
2006-07	83.4	53.9	37.8	175.1
2007-08	80.9	60.7	41.0	182.6
2008-09	83.6	59.7	50.4	193.7
2009-10	85.2	62.4	48.6	196.2
2010-11	68.6	57.6	38.3	164.5

Source: Statistical Hand Book, Bardhaman District, 2010-11

Irrigation is the most momentous ingredients of modern farming system. There are several irrigation system in West Bengal. These are canal irrigation, tank irrigation, deep tube well, shallow tube well river link irrigation etc. Although water level has gone down, necessity of irrigation is increasing day to day. So the excess demand of water has been met by other sources of irrigation like tank irrigation, drop irrigation etc. It is worth mentioning that crisis of irrigation has started after huge cultivation of Boro paddy. This paddy cultivation is completely

Table 4.13: Area Irrigated by different sources in the district of Bardhaman (in thousand hectares)

Year	Area irrigated									
	Govt.Canal	Tank	HDTW	MDTW	LDTW	STW	RLI	ODW	Others	Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
2006-07	296.00	-	19.75	2.25	1.74	0.12	11.79	-	-	331.65
2007-08	308.51	-	18.37	0.79	2.76	-	11.54	-	-	341.97
2008-09	279.39	-	20.87	0.82	1.23	0.08	11.19	-	-	313.58
2009-10	294.46	-	6.70	0.75	11.59	-	11.77	-	-	325.27
2010-11	245.63	-	7.82	0.75	11.78	-	12.00	-	-	277.98

Source: 1. Principle Agricultural Office, Dakshin Dinajpur

2. Asstt. Engineer, (Agri.Mech) & (Agri. Irri.)

3. Irrigation and Waterways Directorate, Govt. of West Bengal

Note: HDTW- High Capacity Deep Tube well , MDTW- Middle capacity Deep Tube well, LDTW- Low capacity Deep Tube well, STW – Shallow Tube well, RLI- River Lift Irrigation, ODW- Open Dug well, DTW- HDTW+MDTW+LDTW

Dependenton different types of irrigation system. Because rain water is not sufficient to irrigate this Boro Paddy. Available data shows that tank irrigation and open dug well (ODW) irrigation system is absent in this district. Canal irrigation is covering major portion of total required irrigation. Other available system of irrigation such as High Capacity Deep Tube Well (HDTW), Middle Capacity Deep Tube Well (MDTW), Low Capacity Deep Tube Well (LDTW), Shallow Tube Well (STW) and River Lift Irrigation (RLI) has played vital role in irrigation in this district.

Table 4.14: Principle Crops Producing in Bardhaman, Area in Thousand Hectares and Production in Thousand Tonnes

	Principle crops producing in Bardhaman			
	2000-01		2010-11	
Crops	Area	Production	Area	Production
Rice	582.7	1571.4	562.9	1665.9
Wheat	6.3	15.3	1	2.3
Other cereals	0.1	0.2	0.4	0.8
Total cereals	589.1	1589.9	564.3	1669
Pulses	5.4	6	3.2	3.2
Total foodgrains	594.5	1592.9	567.5	1672.2
Oilseeds	56.2	38.4	39.5	37.6
Jute	10.5	190.4	12.6	265.7
Potato	42.1	1115	18	506.7

Source: Economic Review, Govt. of West Bengal, 2011-12

Different types of crops are produced in this district. Among all these crops we have shown data of some principal crops like rice, wheat, other cereals, pulses, oil seed, jute and potato in the above Table. We have taken data of 2000-01 and 2010-11 to give the idea of production level. The existing data in the above table shows that area of rice cultivation slightly has decreased but production level has increased from 1571.4 thousand tones to 1665.9 thousand tones. But for wheat cultivation both area and production has decreased.

Only area and production for jute cultivation has increased. Production of other crops say potato, pulses, oil seeds has decreased.

V. AGRICULTURE IN DAKSHIN DINAJ PUR

Dakshin Dinajpur is a non-industrial district having no large industry. The first medium scale industry which is Rice Mill had been introduced in 2003. Bengali is the principal language of this district. Hinduism and Islam are the two major religion living in this district. Dakshin Dinajpur is agriculturally rich. Production of paddy, wheat and vegetable are leading crops produced in this district. Geographical area of this district is only 4 per cent of the state's geographical area. More than 16 lakh people depend on this available land. Since this district is not much sound in industrial sector, economy is agricultural based. Total available land of this district is not fully fertile rather few lands are acidic in nature. That is why cost of cultivation is much higher in those areas. The area under irrigation is only 34 per cent. A large part of this area is flood or inundation prone. Fragmented land covering 80 per cent belongs to marginal landholding categories is a big hurdle towards the adoption of improved and mechanized farming system. The irrigation potential is not being used properly in this district. Although there is large opportunity to expand ago-based industry, we found only some rice industries in some areas. Rice cultivation is becoming costlier because of higher price of fertilizer, pesticide, and high cost oriented irrigation system. Once upon a time jute was one of the leading crops throughout the district. But low price because of availability of substitute of Jute made things has damaged the prospect of cultivation of this crop.

Land available in the district is being covered for different purposes. Some areas are used for forest resource. On the other hand, current fallows also covered a portion of available land. Beside industries and institutions also take away parts of total land of the district. To give clear idea regarding land utilization we have classified available land into six categories. According to these categories we have shown percentage of lands used for various purposes in the following Table.

Table 4.15: Details of Land Utilisation in Dakshin Dinajpur (in hectare)

Classification of land	Land Utilization in Dakshin Dinajpur					
	2009-10			20010-11		
	Area	Percentage	Total Area in WB	Area	Percentage	Total Area in WB
Area according to village papers	221909	2.55	8684113	221909	2.55	8684113
Area not available for cultivation	32470	1.78	1820274	34181	1.85	1839970
Others uncultivated land excluding current fallows	1336	1.19	111635	1595	1.51	105008
Area under forest	932	0.07	1173669	932	0.07	1173669
Current fallows	1465	0.45	322728	1586	0.27	574244
Net sown area	185706	3.53	5255807	183615	3.67	4991222

Source: Agricultural Census, Govt. of West Bengal, 2011

In the above Table we have shown the pattern of land utilization of this district. According to the available data of two periods 2009-10 and 2010-11 total recorded land exists in this district is 2.55 per cent out of total land existing in West Bengal. Area available for forest is negligible having only 0.7 per cent out of total available forest land of West Bengal. Present data of year 2009-10 shows that 1.78 per cent land is not accessible for cultivation where this percentage is 1.85 in 2010-11. We can see that net area sown of the year 2009-10 is 3.53 per cent and is 3.67 per cent in 2010-11.

People living in Dakshin Dinajpur mostly depend on agriculture due to lack of industrialization. As a result of this population pressure in farm sector mitigates level of landholding for cultivation. Farmers are cultivating different required crops on their small arable lands. Table-3P given below we have presented statistics related to land holding of Dakshin Dinajpur of the year 2000-01 and 2005-06 respectively. We have classified landholding into four categories and each category is being divided to number of landholder and area of landholding.

Table 4.16: Details of Landholding of Dakshin Dinajpur (in hectare)

Year	Land holding of Dakshin Dinajpur District											
	Marginal		Small		Semi-medium		Medium		Large		Total	
	No.of holdings	Area of holdings	No.of holdings	Area of holdings	No.of holdings	Area of holdings	No.of holdings	Area of holdings	No.of holdings	Area of holdings	No.of holdings	Area of holdings
2000-01	150949	88720	40388	66011	12739	34696	1143	5792	10	117	205229	195336
2005-06	157078	84092	40049	63721	16335	43412	536	2578	9	114	214007	193917

Source: Agricultural Census, Govt. of West Bengal, 2009

Note: Marginal- Below 1.0 hectare. Small- 1.0 hectare and above but less than 2.0 hectare. Semi-medium- 2.0 hectares and above but less than 4.0 hectare. Medium – 4.0 hectare and above but less than 10.0 hectare. Large- 10.0 hectare and above

In the above Table we can see that number marginal and semi-marginal landholder has increased over the period 2000-01 to 2005-06. It is showed in the Table that number of small, medium and for large landholder has decreased. On the other hand, marginal and semi-medium landholder has increased. Both result shown in the above happened due to population pressure on agriculture sector.

In case of irrigation system available in Dakshin Dinajpur district we that two system of irrigation say Canal irrigation and Other Dug Well (ODW) is completely missing. Total irrigation is depends on other existing irrigation system showing in the following table. It is noticeable that Tank irrigation has played important role in this district. On the other hand irrigation under River Lift system also covering major portion of the arable land of this district.

Table 4.17: Area Irrigated by different sources in the district of Dakshin Dinajpur (in thousand hectares)

Year	Area irrigated by									
	Govt.Canal	Tank	HDTW	MDTW	LDTW	STW	RLI	ODW	Others	Total
2006-07	-	10.36	8.46	0.55	0.32	5.67	10.13	-	-	35.49
2007-08	-	10.36	5.38	0.34	0.32	5.71	5.87	-	-	27.98
2008-09	-	10.36	5.38	0.34	0.32	5.71	5.87	-	-	27.98
2009-10	-	10.36	5.38	0.34	0.32	5.71	5.87	-	-	27.98
2010-11	-	10.36	4.94	0.18	1.41	10.33	19.72	-	-	46.94

Source: 1. Principal Agricultural Office, Dakshin Dinajpu

2. Asstt. Engineer,(Agri.Mech)&(Agri. Irri.).

3. Irrigation and Waterways Directorate, Govt. of West Bengal.

Note: HDTW- High Capacity Deep Tube well. MDTW- Middle capacity Deep Tube well.LDTW- Low capacity Deep Tube well. STW – Shallow Tube well. RLI- River Lift Irrigation.ODW- Open Dug well. DTW- HDTW+MDTW+LDTW

Two types of fertilizer say chemical and organic are being used on agricultural land to get higher productivity. Farmers who has bullock to till their land or who has cow to get milk generally use organic chemical along with chemical fertilizer. On the other hand most of the farmers are using different types of chemical fertilizer. Complete organic farming is rare in present farming technique. Because modern farming system is accustomed to with use chemical fertilizer. In the following Table we have shown some statistics of chemical fertilizer consumption of Dakshin Dinajpur. We have found that three types of chemical fertilizers used in this district. These are Nitrogen whose consumption level is 27.7 thousand tones, Phosphate whose level of consumption is 15.0 thousand tones and Potash whose consumption level is 11.2 thousand tones. It is noticeable that consumption of Nitrogen and Phosphate has increased over the mentioned years. But consumption of Potash has slightly decreased.

Table 4.18: Fertilizer Consumption in Dakshin Dinajpur (in thousand tonnes)

Year	Nitrogen (N)	Phosphate (P)	Potash (K)	Total
(1)	(2)	(3)	(4)	(5)
2006-07	17.5	10.9	8.0	36.4
2007-08	21.8	7.8	7.0	36.6
2008-09	20.2	10.9	9.8	40.9
2009-10	22.7	11.9	15.6	50.2
2010-11	27.7	15.0	11.2	53.9

Source: Directorate of Agriculture, Govt. of West Bengal, 2012

Irrigation system is very poor in Dakshin Dinajpur district. Only 34 per cent area is irrigated and 66 per cent area depends on rain water. So productivity of all crops are hampered due to this insufficient irrigation system. Among all produced crops rice, wheat, jute, pulses potato etc. has occupied major role. In the following Table we can see that total rice production has increased from 467.4 thousand tones to 655.3 thousand tones. Similarly area of cultivation of this also has increased from 210.7 thousand hectare to 249.5 thousand hectare. But a dramatic change has taken place in the production of wheat. Production of wheat level has increased more or less fourfold which is 25.2

Table 4.19: Principle crops producing in Dakshin Dinajpur, area in thousand hectares and production in thousand tonnes

	Principle crops producing in Dakshin Dinajpur			
	2000-01		2010-11	
Crops	Area	Production	Area	Production
Rice	210.7	467.4	249.5	655.5
Wheat	10.2	25.2	36	98.3
Other cereals	0.1	0.2	27.3	157.7
Total cereals	221	492.6	312.8	911.5
Pulses	4.1	2.4	4.6	3.3
Total food grains	225.1	495	317.4	914.8
Oilseeds	22.6	21	44.6	36.5
Jute	15.1	146.1	43.6	564.3
Potato	4.8	87.8	11.3	338.8

Source: Economic Review, Govt. of West Bengal, 2011-12

thousand tones in 2000-01 to 98.3 thousand tones in 2010-11. Area of cultivation also changed from 10.2 thousand hectare in 2000-01 to 36 thousand hectare in 2010-11. Production of other cereals also draw great attention by producing 0.2 thousand tones in 2000-01 to 157.7 thousand tones. It is only maize which has covered large part of other cereals production. Area of production of maize has also changed from 0.1 thousand hectare to 27.3 thousand hectare. But production of pulses not much increased over this two periods. On the other hand in case of production of jute and potato area and production of both has increased. Similarly, production of oilseeds also increased from 21 thousand tones in 2000-01 to 36.5 thousand tonnes in 2010-11 and area has increased from 22.6 thousand hectare in 2000-11 to 44.6 thousand hectare in 2010-11.

VI. SUMMARY

In our above analysis we can see agriculture is the main sector on which economy of the state is dependent. It is the main stay of 62.7 per cent of rural work force, and about 70 per cent of the rural population. In West Bengal area of agriculture has been reducing gradually due to overpopulation and urbanization. Net cropped area in hectare was 5463424 hectare in 1990-91 which decreased to 4991222 hectare in 2010-11. Similarly, gross cropped area in hectare has reduced after 1996-97 to 2010-11 from 9032936 hectare to 8832348 hectare. But the cropping intensity has increased to 177 in 2010-11 from 159 in 1990-91. Although it was better in some years especially in 2007-08 and in 2008-09 with 184 and 185. We can see on the basis of land ownership the percentage of marginal farmers is 81.17 having less than 1 hectare land and percentage of land under operation for the same category is 50.65. Small farmers having 1 to 2 hectare land occupied 14.38 per cent land as land ownership and 28.87 lands as land under operation. Percentage of semi-medium having 2 to 4 hectare land, medium having 4 to 10 hectare land and large having above 10 hectare land is very less. On this small arable lands farmers of the state is producing different crops. Among all these crops rice is the leading crop of West Bengal. Mainly three types of rice is being produced in the state namely, Amon, Boro and Aus among which Amon is in leading position. Intensity of Boro production has been decreasing because of higher cost. As a substitute of Boro production Wheat and Maize is playing a vital role in state. In our study we found Bardhaman is developed in both sector of industry and agriculture. The farmers of this district have been producing different crops using modern technique. On the other hand, people living in Dakshin Dinajpur district is mostly dependent on farm sector.