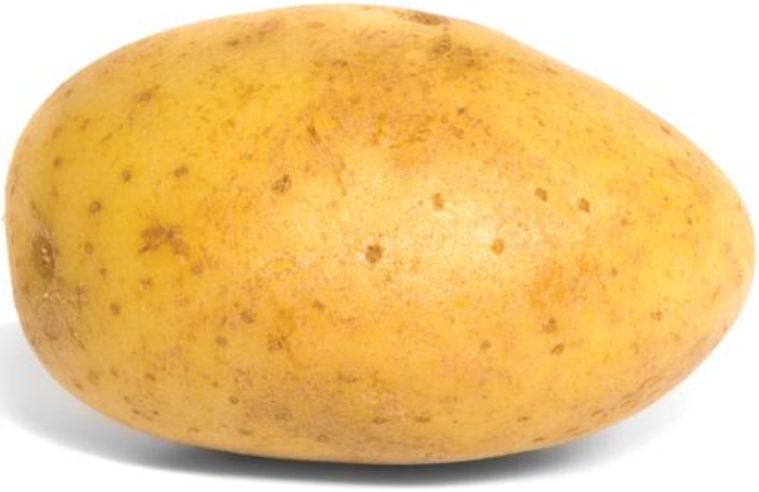
CHAPTER–III

General Description of the Study Area



GENERAL DESCRIPTION OF THE STUDY AREA

3.1 Location

The study area includes the districts of Burdwan, Bankura, Paschim Medinipur, Hooghly and Howrah which constitutes one of the most extensive and productive potato growing regions of West Bengal. The geographic extent varies from $21^{o}48'02''N$ to $23^{o}52'58''N$ latitude and $86^{0}33'46''E$ to $88^{0}30'24''E$ longitude, covering total area of 27,911 sq. km. It is bounded in the north by Birbhum and Murshidabad district, east by Nadia, North 24 Parganas, and South 24 Parganas, south by Purba Medinipur, South 24 Parganas and state of Odisha and in the west by Purulia and state of Jharkhand. Out of the total geographical area 3425 sq km is forest and 17577 sq km is agricultural land of which potato constitutes 2659 sq km.

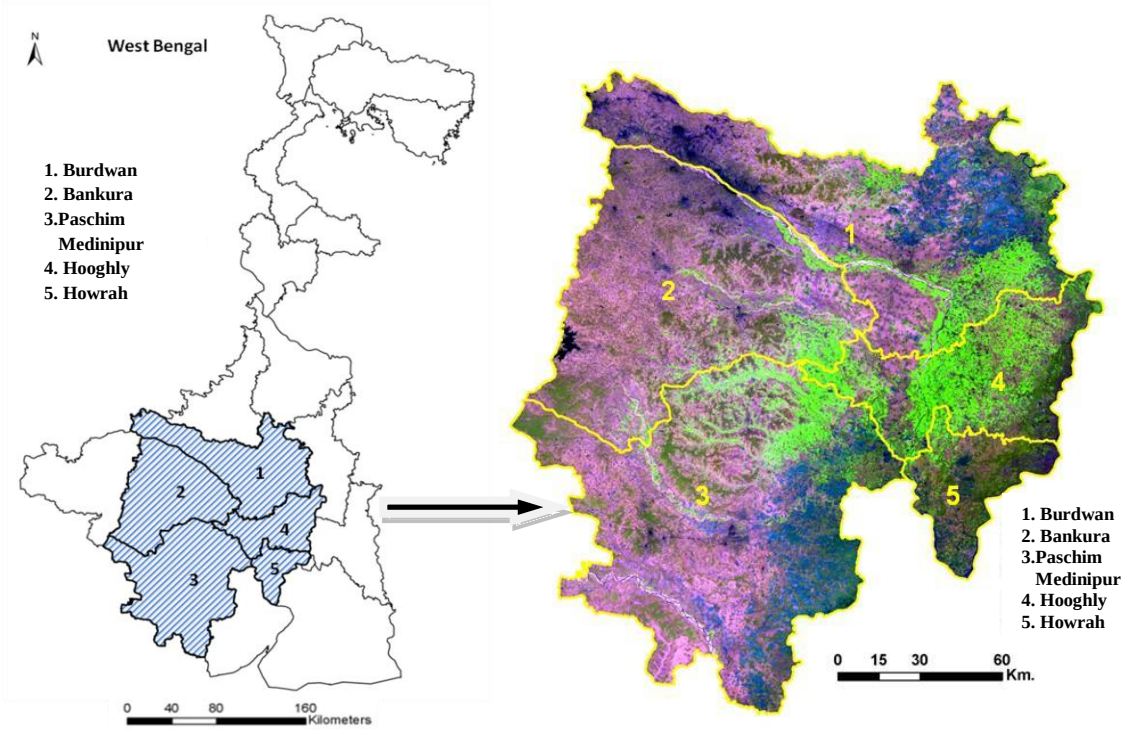


Figure 3.1: Location of the Study Area with Satellite View

3.2 Climate

The climate of this region is mainly of tropical humid type. The main seasons include summer, monsoon season, a short autumn and winter. The temperature of this area normally

varies from 24^0C to 40^0C in summer whereas the average maximum and minimum temperatures during winter months are 32^0C and 12^0C respectively, however, in some occasion the minimum temperature during January reaches upto 8^oC. In summer the western part is notably hot and dry whereas in lower Gangetic delta temperature is comparatively low with excessive humidity. Average rainfall is 1750 mm with highest during August-September. The district wise monthly mean temperature and rainfall is given in Table 3.1 (a-e) and 3.2 (a-e) respectively.

Table 3.1a: Mean Monthly Temperature (^{0}C) of Bankura District (2009 to 2014)

Month	2009		2010		2011		2012		2013		2014	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
January	28	14	26	10	26	8	25	13	25	10	26	13
February	33	16	31	15	31	12	31	15	29	14	29	15
March	36	20	38	21	36	18	36	19	36	19	34	19
April	41	24	42	25	36	20	38	22	39	23	41	24
May	37	25	36	24	36	22	40	24	37	24	39	25
June	38	28	37	24	34	22	39	26	34	24	38	26
July	33	26	33	23	33	22	34	25	33	24	33	26
August	33	26	34	23	32	22	33	26	32	23	33	26
September	33	25	32	22	31	23	NA	NA	33	25	33	26
October	33	21	32	20	33	22	33	22	31	23	32	23
November	30	18	31	16	31	18	29	17	30	17	31	16
December	28	13	26	9	31	8	26	12	27	13	27	12

Source : Meteorological Department, Govt. of India; NA = not available

Table 3.1b: Mean Monthly Temperature (^{0}C) of Burdwan District (2009 to 2014)

Month	2009		2010		2011		2012		2013		2014	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
January	26	14	24	10	25	12	26	14	25	11	25	12
February	31	15	29	16	32	16	30	15	29	15	28	15
March	34	20	36	22	35	21	35	20	34	20	33	19
April	38	24	40	26	36	23	37	24	37	24	38	26
May	35	24	37	25	36	25	39	26	37	25	39	26
June	37	26	37	26	35	26	38	27	36	26	37	26
July	32	25	35	26	34	26	34	26	35	26	32	26
August	33	25	34	27	33	26	34	26	34	26	31	26
September	32	25	33	26	33	26	NA	NA	35	26	32	25
October	NA	NA	33	23	33	24	34	22	34	24	31	24
November	NA	NA	31	19	31	18	32	17	31	17	NA	NA
December	26	14	26	13	31	7	28	12	28	14	24	12

Source : Meteorological Department, Govt. of India; NA = not available

Table 3.1c: Mean Monthly Temperature (^{0}C) of Hooghly District (2009 to 2014)

Month	2009		2010		2011		2012		2013		2014	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
January	NA	NA	20	10	22	11	24	13	NA	NA	23	13
February	NA	NA	29	15	26	16	28	15	NA	NA	27	17
March	NA	NA	33	23	30	18	33	20	NA	NA	33	20
April	NA	NA	38	26	32	23	34	23	NA	NA	39	27
May	NA	NA	36	27	33	25	38	26	NA	NA	38	29
June	NA	NA	34	26	32	26	36	26	NA	NA	35	28
July	NA	NA	30	25	31	25	34	25	NA	NA	33	26
August	NA	NA	32	26	30	25	33	26	NA	NA	33	26
September	30	26	30	25	30	25	NA	NA	34	25	33	28
October	NA	NA	30	23	31	25	33	23	31	23	32	25
November	28	21	29	20	28	19	28	18	29	19	28	20
December	22	12	23	12	24	12	27	12	26	15	24	15

Source : Meteorological Department, Govt. of India; NA = not available

Table 3.1d: Mean Monthly Temperature (^{0}C) of Howrah District (2009 to 2013)

Month	2009		2010		2011		2012		2013		2014	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
January	21	13	21	9	25	9	25	13	23	11	NA	NA
February	26	15	27	13	30	13	29	13	29	15	NA	NA
March	33	19	35	22	33	17	34	19	33	21	NA	NA
April	34	24	36	24	35	20	36	21	34	25	NA	NA
May	33	23	35	23	36	21	38	23	37	26	NA	NA
June	34	25	34	24	34	23	36	24	32	26	NA	NA
July	30	23	33	23	33	23	33	23	31	27	NA	NA
August	30	24	32	24	33	23	33	23	31	27	NA	NA
September	NA	NA	33	23	32	22	NA	NA	33	27	NA	NA
October	NA	NA	32	21	34	21	32	22	30	26	NA	NA
November	NA	NA	31	18	31	16	29	12	29	20	NA	NA
December	NA	NA	26	10	27	11	26	14	27	15	NA	NA

Source : Meteorological Department, Govt. of India; NA = not available

Table 3.1e: Mean Monthly Temperature (^{0}C) of Paschim Medinipur District (2010 to 2014)

Month	2009		2010		2011		2012		2013		2014	
	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
January	27	15	24	11	25	12	25	15	24	13	24	13
February	31	17	30	17	30	17	30	16	28	16	28	16
March	35	22	36	23	34	21	34	22	35	21	33	21
April	39	26	39	26	34	23	37	25	37	24	38	25
May	36	26	35	25	36	25	38	27	36	27	37	27
June	36	28	35	27	34	26	37	28	33	27	35	27
July	32	26	32	26	32	26	33	26	32	26	32	27
August	32	26	32	26	31	26	32	26	32	26	33	26
September	32	26	32	26	32	26	NA	NA	32	26	33	26
October	32	22	31	24	33	23	32	23	30	24	31	24
November	29	19	31	21	30	19	28	18	29	18	30	17
December	27	14	26	14	26	14	26	14	27	14	26	13

Source : Meteorological Department, Govt. of India; NA = not available

Table 3.2a: Mean Monthly Rainfall (mm) Distribution of Bankura District (2009 to 2014)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2009	4.8	0	27.9	0.7	196.7	56.8	307.3	325.9	311.7	55.2	13.1	0	1300.1
2010	4.8	33.9	31	31.4	118.4	188.6	180.7	135.7	199.5	71.4	7.4	37.8	1040.6
2011	5.1	0.7	33.7	122.3	146.3	544.1	183.6	394.3	416.7	30	3.8	0	1880.6
2012	43.9	16.4	7.9	85.9	44.6	173.2	301.4	345.8	242.7	35.9	38	15	1350.7
2013	0.9	15	22.9	72.6	342.4	369.7	289.8	368.4	260.8	398	0	0	2140.5
2014	0.8	38.3	8	3.3	84.7	85.7	313.7	323.4	164.1	53.2	0	0.3	1075.5

Source : Meteorological Department, Govt. of India

Table 3.2b: Mean Monthly Rainfall (mm) Distribution of Burdwan District (2009 to 2014)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2009	0	0	21.3	0.3	228.8	48.6	254.4	371.3	302.7	69	0.2	0	1296.6
2010	0	8.2	10	13.1	110	223.2	190.8	122.8	209.1	49.9	8.3	43.8	989.2
2011	0	0.7	27.1	55.4	116.8	417	259.5	348.8	240.3	51.4	0.6	0	1517.6
2012	31.1	7.8	3.2	63.3	39.4	133.9	424.5	277.9	194.6	57.2	37.5	6.2	1276.6
2013	6.8	17.5	4.6	41.5	175.1	210.2	145.5	341.1	250.7	342.5	0	0	1535.5
2014	1.1	35.1	32	0.7	74.6	233.9	280.6	256.5	195.3	23.9	0	0.7	1134.4

Source : Meteorological Department, Govt. of India

Table 3.2c: Mean Monthly Rainfall (mm) Distribution of Hooghly District (2009 to 2014)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2009	0	0	25.4	0	194.5	79.8	202.9	332.3	242.6	72.3	6.2	0	1156.0
2010	0	30.7	4	18.4	171.1	186.2	135.5	190.4	209.5	64.8	4.2	18.7	1033.5
2011	1.9	0.4	42.5	37.9	121.7	351	245.5	429	234.6	20.6	0.1	0	1485.2
2012	41.3	14.6	1.8	40.8	56	170	273	199.5	183.8	47.9	51.5	9.6	1089.8
2013	2.1	8.9	2.4	56.5	93.7	223.9	221.4	287	186.6	282.8	0	0	1365.3
2014	2.1	8.9	2.4	56.5	93.7	223.9	221.4	287	186.6	282.8	0	0	1365.3

Source : Meteorological Department, Govt. of India

Table 3.2d: Mean Monthly Rainfall (mm) Distribution of Howrah District (2009 to 2014)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2009	0	0	4	0	328	43.9	371.3	195.7	298.6	65.8	0	0	1307.3
2010	0	11	0	2.2	106.8	175.3	212.8	350.6	204.3	160.1	3	18.8	1244.9
2011	4.9	5.3	29.2	38	127.3	292.8	255.9	433.7	251.5	23.9	0	0	1462.5
2012	81	14.5	0	34.4	18.3	226.5	240.8	155.2	256.7	111.9	26.3	40.3	1205.9
2013	5.8	9.6	9.9	40.2	99.4	228.1	310.2	550	249.1	352.6	0	0	1854.9
2014	0.1	54.2	19.5	0	103.6	161.8	224.9	362.6	280.4	24	0	1.2	1232.3

Source : Meteorological Department, Govt. of India

Table 3.2e: Mean Monthly Rainfall (mm) Distribution of Paschim Medinipur District (2009 to 2014)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
2009	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2010	NA	NA	0.5	1.3	178.2	178.9	221.5	145.1	193.4	93.7	3.7	16	1032.3
2011	4.2	8.1	70.9	81.3	107.5	444	138.9	489.4	327	6.3	0	0	1677.6
2012	47.7	32.1	1.9	84.4	57	150.5	287.3	217.5	276.6	41	51.4	61.2	1308.6
2013	0.2	10.8	5.9	52.4	218.9	197	400.9	353.9	321	391.7	0	0	1952.7
2014	0	52.5	19.6	6.3	142.4	158.4	288.3	282.4	165.7	71.4	0	0	1187

Source : Meteorological Department, Govt. of India; NA = not available

3.3 Physiography and Soils

Most of the area belongs to old Gangetic plain with nearly level to gently sloping lands. The Ganga and Hooghly rivers drain into the Bay of Bengal and forms this vast fertile alluvial plain. In micro-physiographic perspective Howrah, Hooghly, Burdwan district is under the proper delta of Gangetic plain and Bankura, Paschim Medinipur is under the 'Rarh' plain. Agro climatic region of 'Rarh' and Eastern Plateau spread over the part of Paschim Medinipur, Bankura whereas Burdwan, Hooghly, Howrah is under the alluvial regime. The soils of the eastern part consist of deep alluvium while the western part of Burdwan, Bankura and Paschim Medinipur consists of red and lateritic soils, Vindhyan alluvial soil and recent alluvium. The soil of eastern part is classified as Aeric Haplaquepts, Typic Fluvaquents, Typic Haplaquepts, Typic Ustochrepts type and western part as Aeric Ochraqualfs, Typic

Ustifluvents and Typic Haplustalfs. Soil nutrients of this region are rated as medium, medium and high in terms of Nitrogen, Phosphorus and Potash respectively.

3.4 Drainage System

Most of the rivers in the study area flow from north-west to the south-east direction. Kangsabati, Silabati, Subarnarekha, Dulongs, Keleghai and their tributaries are the main rivers draining Paschim Medinipur. Damodar, Dwarakeswar, Shilabati, Kangsabati, Sali, Gandheswari, Kukhra, Birai, Jaypanda and Bhairabbanki are the major river flowing through the Bankura district. The river system in Burdwan includes innumerable river and natural canals. Major rivers and canals include Damodar, Bhagirathi, Barakar, Ajay, Dwarakeswar, Nonia, Singaram, Tamla, Kukua, Kunur, Tumuni, Khari, Banka, Chanda-kanki nala, Behula, Gangur, Brahmani, Khandesvari, Karulia nala, Dwaraka or Babla, Koiya nala, Kandarkahal, Kanadamodar, Kananadi, Ghea, Kakinadi etc. Damodar, Mundeswari, Darakeswar, Sankari, Ghea-Kunti, Dakntia, Kana-Julkia, Saraswati, Ilsurah-Kedarmoti, Cut-Kunti Channel, Dankuni Khal, Ghungir Khal, Baidyabati khal are the major drainage system of Hooghly district. The agricultural area of Burdwan and Hooghly district is irrigated by Damodar Valley Corporation command. The eastern, northern, southern and central areas of the Burdwan district are extensively cultivated but the soil of the western portion being of extreme lateritic type and is unfit for cultivation except in the narrow valleys and depressions having rich soil and good moisture. The cultivation in the district has improved since 1953 with the implementation of the irrigation projects undertaken by the Damodar Valley Corporation. Upto 1953 the cultivation was entirely dependent on the monsoon, and irrigation facilities were rather inadequate and more or less primitive. The situation has since been changed and an all-round agricultural development has been in practice. Though agriculture is largely regulated by rainfall as in the other districts of the state, the developing irrigation system has been very helpful in minimizing the effects of the vagaries of nature. The Howrah district is bordered by the Hooghly River in the east and the Rupnarayan in the western part.

One of the earliest canal namely Midnapore Canal was taken up in 1866 and irrigation commenced in 1871. The canal originally was part of Orissa Canal Scheme. The water supply is drawn from the river Kangsabati at Mohanpur where there is a regulating weir with head works and the canal extends to Uluberia on the river Hooghly crossing the Rupnarayan and Damodar rivers en route. The total command area of the scheme is 49,879 ha.

3.5 Flora and Fauna

The study area is mixed up with various types of arborescent species which supports the small industries as a resource. Major shrub species include *Glycosmis, Polyalthia suberosa, Clerodenaron infortunatum, Solanum torvum* etc. In the western part of the study area the larger trees like Papal, Banyan, Red cotton tree (*Bombax malabaricum*), Mango (*Mangifera indica*), Jiyal (*Odina Wodier*), *Phoenix dactylifera*, and *Borassus flabellifer* are also available. The forest area contains *Wendlandia exserta, Gmelina arborea, Adina Cordifolia, Holarrhena antidysenterica, Wrightia tomentosa, Vitex negundo, Stephegyne parvifolia* with scrub jungle of Zizyphus and other thorny species in upland areas. Some of common trees such as Alkushi (*Mucuna pruriens*), Amaltas (*Cassia fistula*), Asan (*Terminalia tomentosa*), Babul (*Acacia arabica*), Bair (*Zizyphus jujuba*), Bael (*Aegle marmelos*), Bag bherenda (*Jatropha curcas*), Bichuti (*Tragia involucrate*), Bahera (*Terminalia belerica*), Dhatura (*Datura stramonium*), Dhaman (*Cordia macleoidii*), Gab (*Diospyros embyopteris*), Harra (*Terminalia chebula*), Imli (*Tamarindus indica*), Kuchila (*Strychnos nux vomica*), Mahua (*Bassia latifolia*), Palas (*Butea frondosa*), Sajina (*Moringa pterygosperma*), Kend (*Diospyros melanoxylon*), Mango, Date-palm, Neem, Papal, Banyan, Red cotton tree are also available of economic importance. In the north eastern part Simul (*Salmalia malabarica* Schott. & Endl.), Neem (*Azadirachta indica*), Amlaki (*Phyllanthus embica*), *Lannea coromandelica* Merr., Coconut (*Cocos nucifera*), Khejur (*Phoenix dactylifera* L.), Tal (*Borassus flabellifer* L.), Bat (*Ficus bengalensis* L.), Asvattha (*Ficus religiosa* L.), Palas (*Butea frondosa*) , Krishnachuda (*Caesalpinia pulcherrima*), Mango (*Mangifera indica* L.) and shrubby species such as Ashsheoda (*Glycosmis pentaphylla* Corr.), Onion, Garlic, Tube rose (*Polyanthes tuberosa* Willd.), Ghentu or Bhat (*Clerodendron infortunatum* Gaertn.), Kurabaka (*Barleria cristata*), Gulancha (*Tinospora cordifolia*), Tulsi (*Ocimum sanctum*), *Solanum torvum* SW., *S. Verbascifolium* L., *Trema orientalis* Bl., Shiora (*Streblus asper* Lour.) and Dumur (*Ficus hispida* L.) are available which are used as medicine. In the other part common marsh weeds and aquatic species can be seen in the jheels. Beside those, Keshe (*Saccharum spentaneum*), Bena (*Andropogon squarrosus*), Ganj or pata-sola (*Vallisneria spiralis* L.), Jhangi (*Hydrilla verticillata* lasp.), Pond weed (*Potamogeten indicus* Roxb. and *P. crispus* L.), Kesar-dam (*Jussiaea repens* L.), Kush (*Eragrostis cynosuroides*), common Jhangi (*Utricularia stellaris* L.F. and *U. flexuosa* Vahl.), Pana (*Lemna pancicostata* Hegelm), Mootha (*Cyperus rotundus*), Water hyacinth (*Eichornia crassipes*), *Ottelia Alismoides* pers., Bara-pana (*Pistia*

stratiotes L.), Hogla (*Typha angustata* Chub. & Bory) and Padma (*Nelumbium speciosum*) is also available.

The carnivore of this region comprises wolf, hyena, jackal and other smaller species. Wolves are scarce and mostly found in western part near Jharakhand state. Wild pigs are also available in the whole forest region. In the Burdwan, Bankura, Paschim Medinipur occasionally python may be found but several types of poisonous snakes are common including many types of Cobra, Karait and the deadly Russell's Viper all over the region. Many types of colourful birds like Peacock, Crow, Pigeon is also abundant in the region.

3.6 Agriculture

Agriculture is the main source of livelihood in the region. The major cash crops of this area are rice and potato. Other important food crops are wheat, oil seeds, vegetables etc. The total agricultural area of this region is 15867 sq km (57.26% of geographic area) in 2011-12 of which potato is cultivated in 16.22% of agricultural area. In 2012-13 total agricultural area is 15916.7 sq km (57.44% of geographic area) and potato growing area is 15.69% of agricultural area. The net agricultural sown area in 2013-14 is 16069.2 sq km (57.99% of geographic area) whereas potato cropping area is 2562.7 sq km (15.95% of agricultural area). Rice is the most important crop in the alluvial plains. Many types of rice varieties are cultivated in this region which can be broadly grouped under the three categories viz. Aus, the Aman (winter) and the Boro (summer) rice. The Aus paddy is transplanted in the month of July and harvested in the month of November. In the double crop areas Aus and Aman rice is common practice. In the triple crop cultivated land besides rice potato, oilseeds, wheat and many types vegetable is also sown. The potato crop is sown in the month of November and harvested in the month of March. The average crop duration of potato crop is 95-105 days. District-wise potato growing areas is given in Table 3.4 (a-c). It is evident from the table that Hooghly, Paschim Medinipur and Burdwan having high potato growing area.

Table 3.3: Year-wise Potato Production in West Bengal

Year	Area ('000 Ha)	Production ('000 MT)	Average Productivity (MT/Ha)
2011-12	377	9693	28.6
2012-13	387	11591	
2013-14	400	12000	

Source: Horticulture Statistics Division, D/o Agriculture & Cooperation, M/o Agriculture, Govt. of India

Table 3.4a: District-wise Agricultural Land use and Potato Growing Area (2011-12)

Districts	Total area ('000 ha)	Agricultural Area ('000 ha)	Potato growing area ('000 ha)
Bankura	688.0	329.29	30.29 (4.40%)
Burdwan	698.8	451.97	53.05 (7.59%)
Hooghly	317.09	211.27	100.41 (31.67%)
Howrah	138.67	82.79	8.89 (6.41%)
Paschim Medinipur	928.58	511.38	64.68 (6.97%)

Source: *Director of Agriculture (Evaluation), Govt. of West Bengal*
Figures in the parenthesis represents the % of district area

Table 3.4b: District-wise Agricultural Land use and Potato Growing Area (2012-13)

Districts	Total area ('000 ha)	Agricultural Area ('000 ha)	Potato growing area ('000 ha)
Bankura	688.0	331.19	26.28 (3.82%)
Burdwan	698.8	452.88	56.91 (8.14%)
Hooghly	317.09	212.09	100.16 (31.59%)
Howrah	138.67	82.81	7.78 (5.61%)
Paschim Medinipur	928.58	512.70	58.61 (6.31%)

Source: *Director of Agriculture (Evaluation), Govt. of West Bengal*
Figures in the parenthesis represents the % of district area

Table 3.4c: District-wise Agricultural Land use and Potato Growing Area (2013-14)

Districts	Total area ('000 ha)	Agricultural Area ('000 ha)	Potato growing area ('000 ha)
Bankura	688.0	336.35	29.73 (4.32%)
Burdwan	698.8	453.79	57.82 (8.27%)
Hooghly	317.09	212.57	99.83 (31.48%)
Howrah	138.67	87.84	7.59 (5.47%)
Paschim Medinipur	928.58	516.37	61.30 (6.60%)

Source: *Director of Agriculture (Evaluation), Govt. of West Bengal*
Figures in the parenthesis represents the % of district area

3.7 Demography

The total population of this region is 2,75,96,868 (as per 2011 census) of which male population is 1,41,28,341 (51.19%) and female population is 1,34,68,527 (48.80%). The overall sex ratio is 1000:954 (male: female) and the literacy rate is 77.92% (Table 3.4).

Table 3.5: District-wise Demographic Profile (as per 2011 census)

Districts	Total Population	Male	Female	Sex Ratio	Literacy (%)
Bankura	3,596,674	1,838,095	1,758,579	957	70.26
Burdwan	7,717,563	3,966,889	3,750,674	945	76.21
Hooghly	5,519,145	2,814,653	2,704,492	961	81.80
Howrah	4,850,029	2,500,819	2,349,210	939	83.31
Paschim Medinipur	5,913,457	3,007,885	2,905,572	966	78.00

Source: *http://www.census2011.co.in*