ARTH GANGA

NORTH 24 PARGANA DISTRICT

Submitted By

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EXECUTIVE SUMMARY

North 24 Parganas is a district in southern of eastern India. North 24 Parganas extends in the tropical zone. It is West Bengal's most populous and second most populated district in India. It is the tenth-largest district in the state by area.

Agriculture is the backbone of the economy of North 24 Parganas. The highest agricultural crop production of the district are rice, jute, coconuts, potatoes, wheat, and rapeseed. The district's agriculture industry is characterised by a high proportion of small and marginal farmers, with per capita land holdings of less than one hectare. Non-traditional veggies such as baby corn, brussels sprouts, gherkin, and broccoli are also grown by the farmers. These high revenues of crops should be encouraged in this area. The main problems which hinder the development of farming in this District are small landholdings, a resurgence of insect pests, poor marketing facilities, and on and often natural calamities like drought, flood, hailstorm, and breach of the embankment of rivers in coastal areas and overall huge population growth, etc. Horticultural crops are the most important in this region. The district is diverse, producing significant amounts of vegetables, fruits, nuts, spices, and other foods under a variety of agro-climatic conditions. Farmers must be provided with a Suitability Calendar based on agro-climatic conditions for various horticultural crops in order to select the suitable horticultural crops. The development of certification programmes should also be incorporated to assure the availability of high-quality supplies.

The location has an abundance of banana, papaya, and mango trees. The main problems that hinder the development of farming in this district are small landholdings, a resurgence of insect pests, poor marketing facilities, and often natural calamities like drought, flood, hailstorm, and breach of the embankment of rivers in coastal areas. It is recommended to do collective farming on a bigger scale. Cropping intensity may be improved through better exploitation and management of surface and ground water resources, as well as crop diversification with less water-intensive and profitable crops including pulses, oil seeds, and vegetables.

The district has a diverse range of trees and herbs. Total 35 identified tree species and 24 herb species have been recorded in the district. The district covers two of the most important forest areas: Sundarbans Reserved Forest and Bibhutibhushan Wildlife Sanctuary. Sundarban is Estuarine Coastal Wetland covered with Mangrove forests. However, because these forests are located in the world's largest delta, they play a critical role in preserving the ecological balance of the state's southern region. Although the district covers a huge range of forest areas, it currently does not hold effective schemes for joint forest management. Diverse forest owners are encouraged to communicate and collaborate, and develop the

network of stakeholders participating in forest conservation and risk and crisis management on a daily basis. It is recommended to develop regional multi-risk decision support systems for forest owners so they can more readily integrate hazards into their forest management. As new trees grow fast and fallen leaves accumulate on the forest floor, planting trees on marginal agricultural land improves carbon sequestration at a rapid pace. Reforestation of depleted forest stands can also help remaining forests sequester more carbon.

In the district, coal is the primary source of electricity generation. Given that access to electricity is a key driver of growth, the district's power penetration is low, as evidenced by just 20.1 percent of rural houses being electrified (Census 2011). However, a proposal to construct a 1200 MW Solar PV Power Project has also been proposed to provide clean pumping power to current and forthcoming pumped storage systems. North 24 Pargana produces biomass waste in large quantities. The district does not have any running scheme for biomass energy production. So, it is important to set up biomass energy plants; it will generate electricity and create employment opportunities for the villagers. The district should focus on reducing the $CO_{2\ by}$ increasing the grid power generation from renewable sources and replacing the use of grid power for certain end-uses through low temperature solar thermal – e.g. water heating.

The district has potential for religious, historical, nature and wildlife tourism also. Mandarmani beach near Mandarmani village, famous for water sports with the clear blue water of the Bay of Bengal and Frazerganj beach near Narayantala village, famous for its whitish silver sand, umpteen exotic and migratory birds, pristine, and tranquil seascape. A well structured water sports and other activities can be attractive to the tourists. These villages have the potential of ecotourism with the involvement of local communities. Different ecosystems like ghats, nature and wildlife along with historical monuments must be preserved, maintained. Since there is a demand for religious, historical and ecotourism, necessary policy decisions must be made to develop the said types of tourism along with their ecosystems.

District Overview

North Twenty-Four Parganas district is located in the southern side of West Bengal. It is West Bengal's most populous district. Geographically, the district lies at 22°71' N latitude, 88°71' E longitude and 13 m altitude. In the year 2019, there was a total 17.66% forest area of total geographical area. The district encompasses a geographical area of 4,094 Km^2. and it has direct shared borders with Bangladesh. District also comprises Sundarbans Reserve Forest and Bibhutibhushan Wildlife Sanctuary.

The district lies within the Ganga–Brahmaputra delta. The major distributary of river Ganga that is river Hooghly flows along the western border of the district. There are many other distributary branches, sub-branches of Ganga river and other local rivers, which include the Ichhamati, Jamuna, and Bidyadhari.

People are mainly engaged in farming, fishing and other agricultural activities. The average size of agricultural landholdings is about 3.2 Bighas. North 24 Parganas is one of the less economically backward districts of West Bengal, but there is chronic poverty in the southern half of the District (the Sundarbans area).

In the year 2013-14 the gross domestic product of the district was Rs 85,11,682 lakhs at Current Price. The Net Domestic Product in the district during the period 2013-14 was Rs. 76,71,631 lakhs. The Per Capita Income or NDDP, At Factor Cost in the district during the period 2013-14 was Rs 66,384.

Fig 1

Population	1,00,09,781
Population Density	2445 / Km^2
Sex Ratio	955
Literacy	84.06 4
Occupation/Livelihood	Agriculture

Table 1: Demography of the District 2011

Source: Census of India 2011

District Headquarter	Barasat
No. of Subdivisions	5
No. of Blocks	22
No. of Villages	1527

Table 2: Administrative Division 2019

Source: http://north24parganas.gov.in/

1. Economic Profile of the District

The Army and Airforce cantonment dominates the town of North 24 Parganas environment, although agriculture is the subdivision's primary source of revenue. Floriculture, fisheries, and horticulture have all thrived in the town. The Central Inland Fisheries Research Institute was founded in Barrackpore to improve fish productivity in ponds and rivers. To encourage agriculture, the neighbourhood has built a well-developed irrigation system. Low-interest loans have also been utilised to help farmers expand their operations and build agricultural infrastructure.

Jute processing is the main industry of Barrackpore, which is based on a number of jute mills along the river's edge. Rifle Factory Ishapore is one of India's most prominent armaments manufacturers, and Hindustan Aeronautics Limited, one of Asia's leading aerospace companies, has a division at North 24 Parganas that manufactures the Cheetah Chetak helicopter. Mulazore Thermal Power Plant in Shyamnagar was one of India's first power plants, however it was decommissioned in 2004. Exide's dry cells and Nicco's cables are two examples of industrial goods.

2. Culture and Heritage

Many prominent participants of the Indian independence movement lived in North 24 Parganas, and tributes to them can be found throughout the subdivision. Barrackpore was home to Surendranath Banerjee, known as the "Father of the Indian Nationalist Movement." The Mahadevananda Mahavidyalaya and Netaji Subhas Open University have been established in Surendranath's home in Monirampur, Barrackpore. Mulajore was home to Bengali novelist Bharat Chandra Ray Gunakar, who is best known for his mediaeval novel Annada Mangal.

Quantitative Data Analysis

2.1. Agriculture

Agriculture is the main occupation of the people in the district; it accounts for only 11 percent of Net District Domestic Product for 2013-14. The soil type ranges from sandy to clay sandy loam, with a high: medium: low land ratio of 17:33:39. The soil in the district's northern half is sandy, sandy with clay loam in the central region, and clay loam in the southern half. The district's physiographic structure is primarily plain.

The district's principal crop is rice. It accounts for a sizable share of the total sown area. Wheat is the district's next most important crop. In select areas of the district, maize is also grown. Non-cereal crops such as potatoes and sugarcane are grown. The district is known for its bananas and mangoes, which are exported throughout the state. Improved agriculture methods have been adopted due to the green revolution movement, including better agricultural instruments, certified seeds, and pesticides. At the rural level, the government has taken many steps to train farmers and provide them with the necessary crops and fertilisers.

Agricultural items grown in the region are not only consumed by the district's residents, but some of its processed products (such as wheat flour, rice and rice flour, mango, and so on) are also sold outside the district, state, and country. Primary crop production, such as rice and wheat, had a favourable trend until 2011-12 when it began to fall. In the years 2009-10 to 2012-13, the area used for maize production increased at a positive pace (Table 3). With slight fluctuations of overall output, the total area employed in wheat production decreased significantly from 8.6 to 7.2 thousand hectares. In 2012-13, the district's total rice output was 97 percent, while the area used was 3.52 percent of the overall area used for rice cultivation, which was also 97 percent (Table 4). Similarly, wheat output accounted for 3% of total wheat production in 2012-13. (Table 3).

Table 3: Production of Principal Crops in the district of North 24 Parganas
(Thousand hectares)

	Crops	2008 - 09	2009 - 10	2010 - 11	2011 - 12	2012 - 13
	Foodgrains :					
1	**Rice**	**737.0**	**658.4**	**606.6**	**597.5**	**649.2**
	Aus	59.4	50.5	42.0	42.9	36.1
	Aman	406.2	331.2	303.0	329.0	364.0
	Boro	271.4	276.7	261.6	225.6	249.1
2	Wheat	19.0	20.9	19.7	20.3	19.8
3	Barley	–	–	–	–	–
4	Maize	0.3	0.8	0.4	0.5	0.5
5	Other Cereals	–	–	–	–	–
	Total Cereals	**756.3**	**680.1**	**626.7**	**618.3**	**669.5**

Table 4: The Area under Principal Crops in the district of North 24 Parganas *(Thousand hectares)*						
	Crops	**2008 - 09**	**2009 - 10**	**2010 - 11**	**2011 - 12**	**2012 - 13**
Foodgrains :						
1	**Rice**	**274.5**	**235.1**	**223.7**	**221.5**	**217.5**
	Aus	22.1	18.8	18.5	15.8	13.9
	Aman	157.2	127.6	127.6	133.7	133.1
	Boro	95.2	88.7	77.6	72.0	70.5
2	Wheat	8.6	7.4	7.4	7.1	7.2
3	Barley	–	–	–	–	–
4	Maize	0.1	0.3	0.1	0.2	0.2
5	Other Cereals	–	–	–	–	–
	Total Cereals	**283.2**	**242.8**	**231.2**	**228.8**	**224.9**

2.2. Horticulture

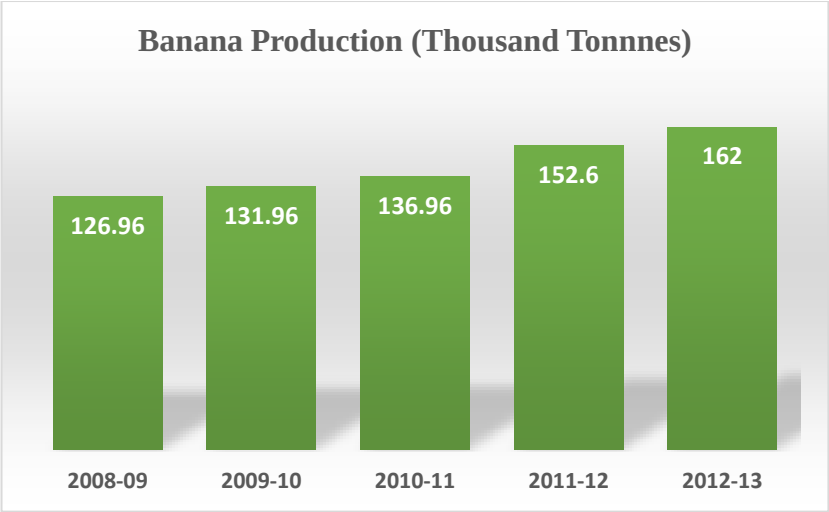
Horticulture includes a wide range of fruits, vegetables, flowers, medicinal and aromatic plants, plantation crops, spices, mushrooms, and decorative plants, among other things. Coconut, sapota, jackfruit, areca nut, and other fruits are grown extensively in the district's northern reaches. Betel vine is a commercial plantation crop. Mango, guava, litchi, banana, papaya, and other smaller fruits such as karamcha, citrus, jamun, star-apple, sapota, and others are grown in the southern regions.

Chilli, Brinjal, Tomato, Pea, Cabbage, Cauliflower, Pointed Gourd, Water Melon, and various other vegetables are cultivated. Recently, high-value vegetables such as cabbage, cauliflower, brinjal, lettuce, and others have become more popular, and their growing areas have expanded.

It was discovered that the district did not perform better in producing fruits than in the production of cereals. The region has long been noted for its fruit varieties. The location has an abundance of banana, papaya, and mango trees. The tables below show the area and production of the region's major fruit products.

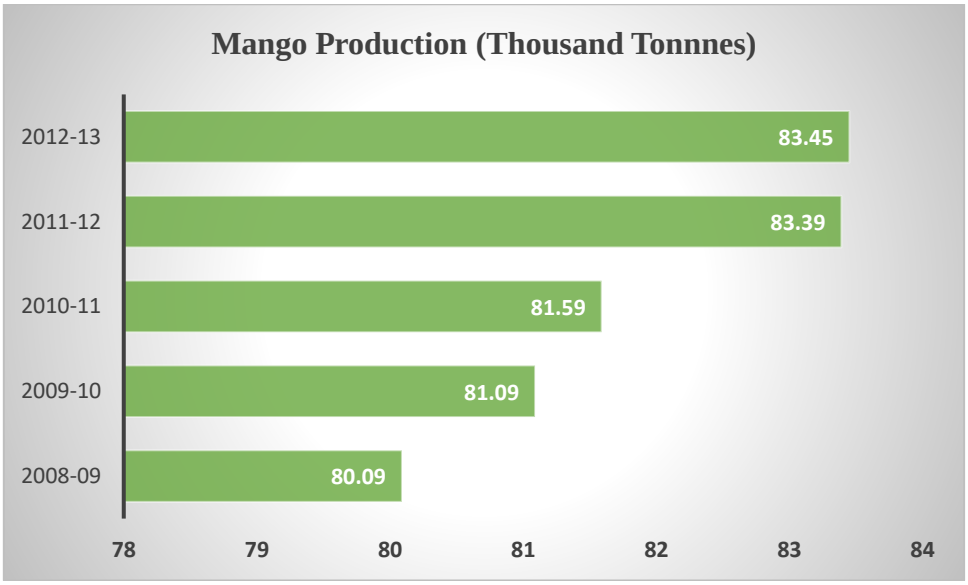
1. Banana

Out of the total fruits produced in the district, bananas accounted for around 44 percent in 2012-13. Banana types such as Alpon, Chini Champa, and Malbhog are farmed in the district.



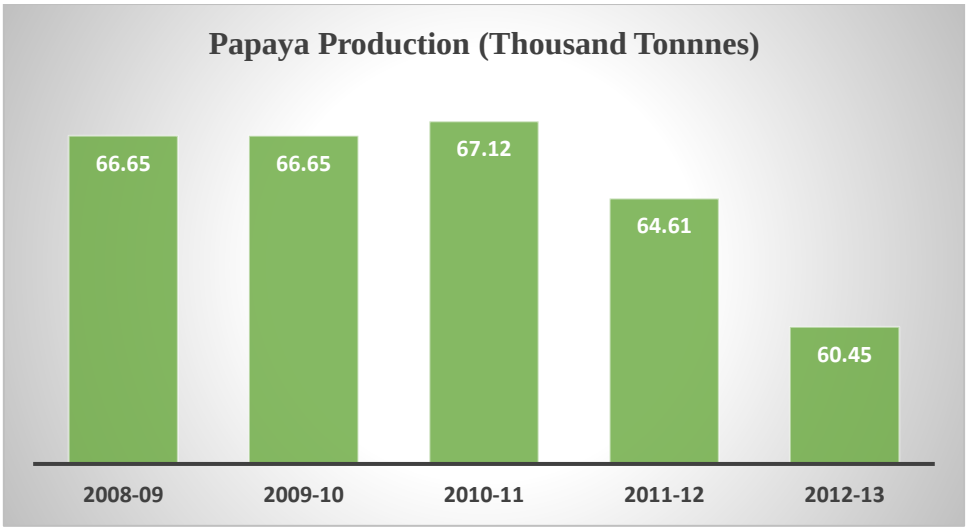
2. Mango

Mangoes account for around 23 percent in 2012-13 of all fruits produced in the area. Mangoes come in a variety of shapes and sizes throughout the region .



3. Papaya

West Bengal is the country's fourth-largest papaya producer, accounting for 8.7 percent of total papaya production (Table 5). The largest papaya producing belt in the state is the North 24-Paraganas, which account for about 17 percent of total fruits output on an area of 0.01 m. ha. and productivity of 29 t/ha.



Name of Fruits	(Table 5) Area of Fruits in the district *(thousand hectares)*				
	2008-09	2009-10	2010-11	2011-12	2012-13
Fruits :					
Mango	6.61	6.80	6.95	7.10	7.20
Banana	5.93	6.13	6.28	6.40	6.65
Pineapple	0.09	0.09	0.09	0.08	0.04
Papaya	2.14	2.14	2.15	2.07	1.98
Guava	0.90	0.90	0.90	0.95	0.97
Jackfruit	1.34	1.34	1.34	1.36	1.38
Litchi	0.71	0.71	0.71	0.71	0.71
Mandarin Orange	-	-	-	-	-
Other Citrus	1.19	1.19	1.19	1.19	1.18
Sapota	0.26	0.27	0.26	0.27	0.26
Others	0.49	0.48	0.49	0.80	0.85
Total	**19.66**	**20.05**	**20.36**	**20.93**	**21.22**

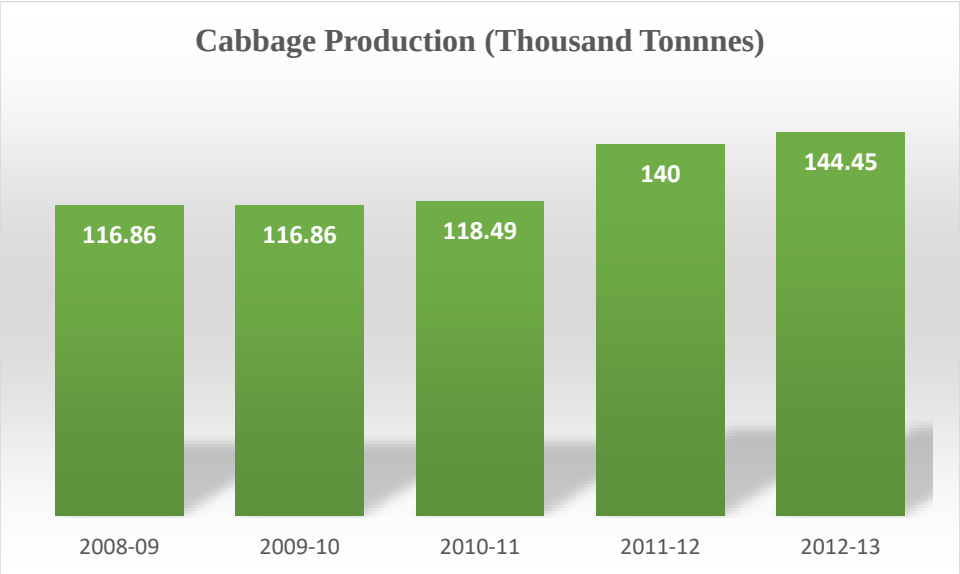
Name of Fruits	(Table 6) Production of Fruits in the district *(thousand tonnes)*				
	2008-09	2009-10	2010-11	2011-12	2012-13
Fruits :					
Mango	80.09	81.09	81.59	83.39	83.45
Banana	126.96	131.96	136.96	152.60	162.00
Pineapple	1.93	1.93	1.93	1.66	0.72
Papaya	66.65	66.65	67.12	64.61	60.45
Guava	13.75	13.75	13.75	13.85	13.95
Jackfruit	18.09	18.09	18.09	18.10	19.50
Litchi	6.97	6.97	6.97	6.80	6.90
Mandarin Orange	-	-	-	-	-
Other Citrus	10.44	10.44	10.44	10.41	10.20
Sapota	1.97	1.97	1.97	1.94	2.50
Others	4.22	4.22	4.27	7.00	8.50
Total	**331.07**	**337.07**	**343.09**	**360.36**	**368.17**

4. Brinjal

West Bengal is the leading producer of brinjal in the country, accounting for 26.61 percent of total brinjal output. On an area of 0.1165 hectares, the state produces 2.76 million metric tonnes of brinjal, with a yield of 17.8 t/ha. In 2012-13, the district produced 201.30 thousand tonnes. Brinjal is the district's most popular veggie. Hooghly, 24-Parganas, and Burdwan are the main brinjal-producing areas in the state.

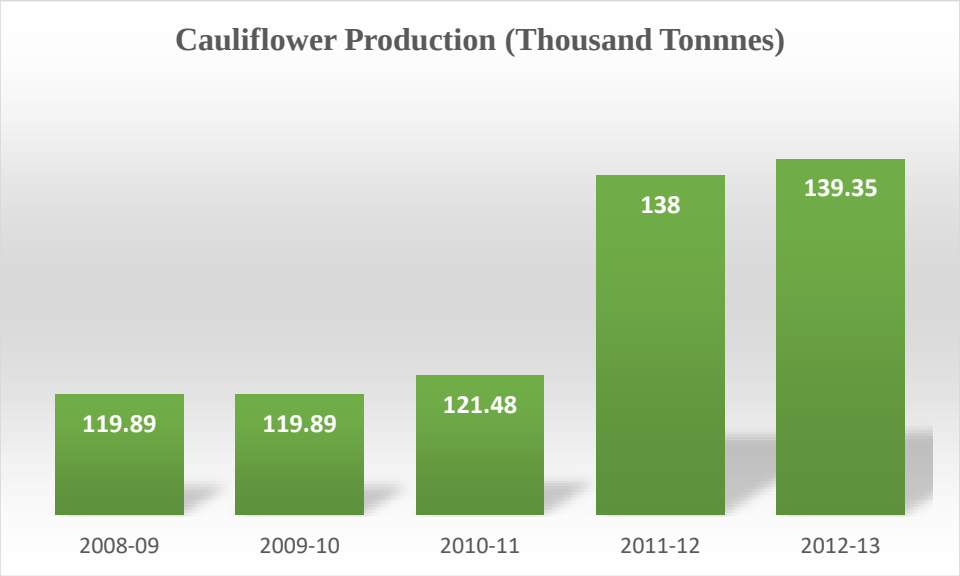
5. Cabbage

West Bengal produces the most cabbage in the country, accounting for 29.7% of total cabbage output in the country. With a 27.6 t/ha yield, the state produces around 2.0242 million MT of cabbage over an area of 0.07 million hectares. In 2012-13, the district produced around 144.45 thousand tonnes of cabbage. Cabbage output has grown significantly over the years.



6. Cauliflower

The district cauliflower production was around 139.35 in 2012-13. It is the 4th highest vegetable production out of total vegetable production. West Bengal is the country's leading cauliflower producer, accounting for 26.7 percent of the country's total cauliflower production. With an area of 0.07 million hectares and productivity of 25.4 tonnes per hectare, the state produces around 1.70 million metric tonnes of cauliflower.



(Table 7) Area and Production of Fruits and Vegetables in the district of North 24 Parganas

Name of Vegetables	Area *(thousand hectares)*					Production *(thousand tonnes)*				
	2008-09	2009-10	2010-11	2011-12	2012-13	2008-09	2009-10	2010-11	2011-12	2012-13
Cabbage	4.50	4.50	4.56	4.85	5.00	116.86	116.86	118.49	140.00	144.45
Cauliflower	4.71	4.71	4.76	4.98	5.10	119.89	119.89	121.48	138.00	139.35
Peas	1.17	1.17	1.19	1.28	1.31	10.52	10.52	10.84	11.70	12.10
Brinjal	9.74	9.74	6.60	9.91	10.06	157.88	157.88	101.08	185.40	201.30
Onion	1.11	1.11	1.13	1.31	1.41	14.01	15.01	15.43	18.20	20.20
Cucurbits	8.26	8.26	8.38	8.40	8.45	107.03	108.03	111.63	116.77	116.90
Ladies Finger	4.89	4.99	5.05	5.01	4.84	66.10	70.10	71.81	70.70	69.86
Radish	1.94	1.94	0.32	1.95	1.96	30.87	30.87	3.71	30.40	30.55
Others	28.57	28.57	37.04	29.55	29.43	203.99	203.99	298.50	262.10	253.25
Total	**68.69**	**68.79**	**72.87**	**71.16**	**71.56**	**909.10**	**916.10**	**937.00**	**1076.07**	**1095.21**

2.3. Forestry

The region accounts for 14 percent of West Bengal's total forest cover, with a high biodiversity of species. More than 1000 species of bacteria, algae, fungus, bryophytes, pteridophytes, and angiosperms have been identified in the state, while more than 3000 species of animals have been identified.

Total geographic area of the district is 4094 Km^2. As per 2019 Forest survey of India assessment, the district has a total 17.66% of forest area of total geographic area. The total forest cover in the district is 722.98 Km2. From this total area 13.02 Km2 comes under very dense forest (VDF) category, 184.98 Km2 is moderately dense forest (MDF), and 524.98 Km2 area is open forest (OF).

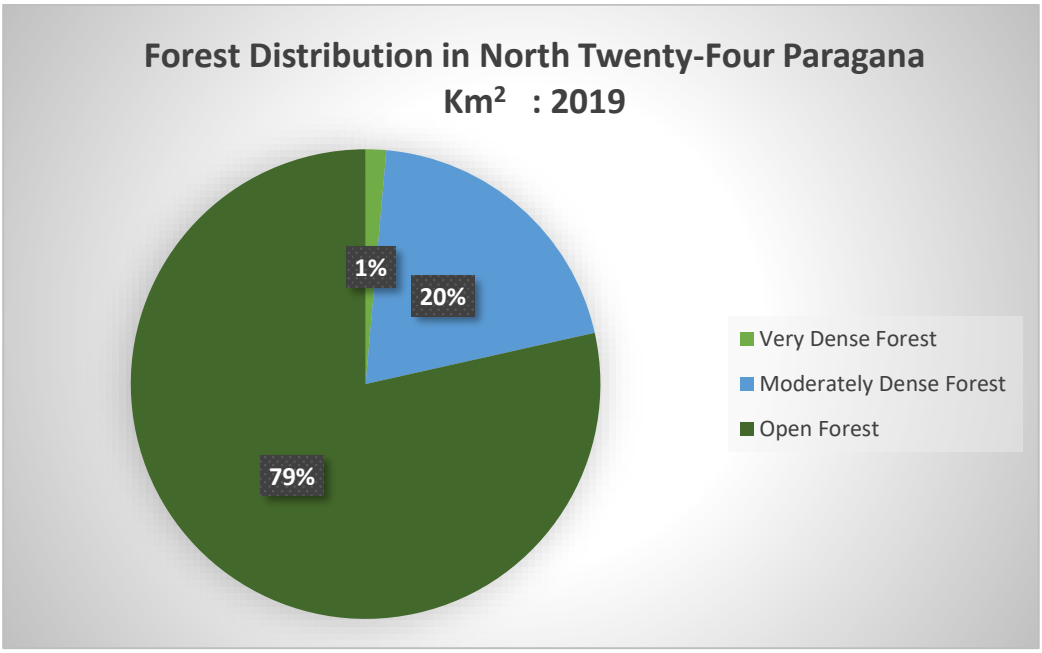


Table 8: Forest Survey of India 2019 West Bengal vs North Twenty-Four Parganas Comparative Assessment

Area	Geographical Area	Very Dense Forest	Moderately Dense Forest	Open Forest	Total	% of Geographical Area
North Twenty-Four Parganas	4094	13.02	184.98	524.98	722.98	17.66%
West Bengal	88752	3,018.52	4160.26	4160.26	4160.26	19.04%

2.4. Energy

Given that access to electricity is a key driver of growth, the district's power penetration is low, as evidenced by the fact that just 20.1 percent of rural houses are electrified (Census 2011). In the state, coal is the primary source of electricity generation. The yearly energy output objectives are being hampered by a coal

shortage, with just around 2,000 tonnes of coal available versus a demand of 6,000 tonnes. In the North 24 Parganas region of West Bengal, a proposal for the construction of a 1200 MW (3 x 300 MW) Solar PV Power Project has also been proposed to provide clean power to current and forthcoming irrigation systems.Rooftop Solar PV Projects have been implemented by WBSEDCL at government and government-aided schools and institutions. A total of 100 rooftop solar PV plants with a capacity of 10 kW have already been installed in various areas.

2.4.1. Biogas

Biogas plants data is unavailable for the district; however, biogas potential can be calculated by knowing the livestock population in the district.

Table 9: Biogas potential from agricultural waste.

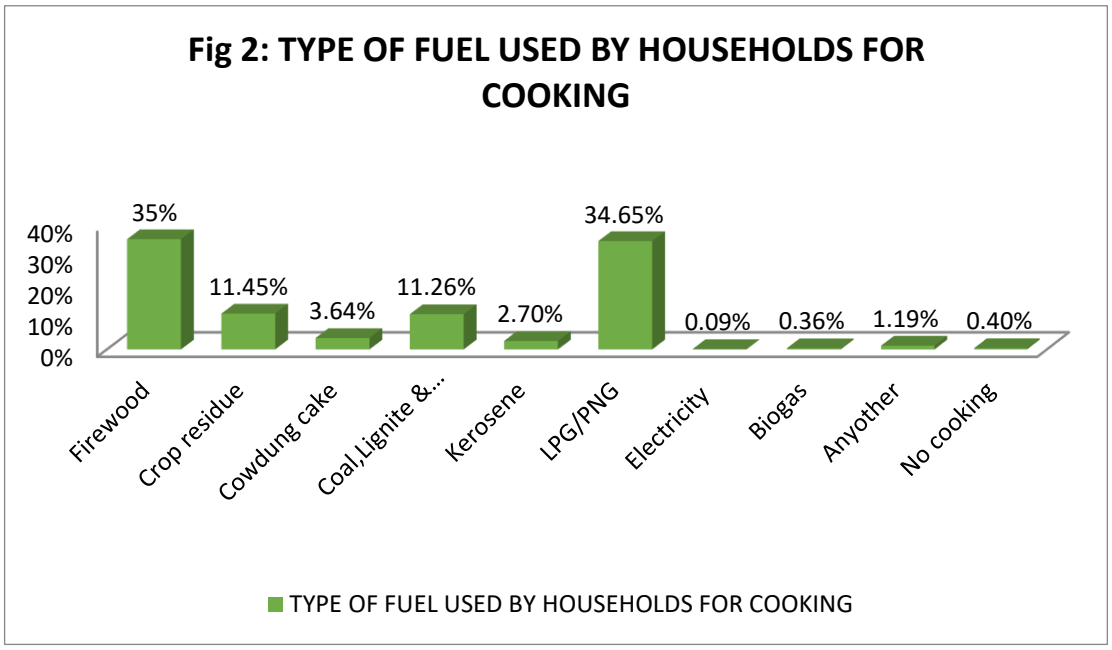
Crop	residue type	Total crop production (tons) (2012-13)	Residue production ratio	Residue amount (tons)	Average collection (70%)	Moisture content	Residue amount after removing moisture (tons)	Biogas potential [m3/(tons of dry matter)]	Overall biogas potential (m3)
Maize	straw	500	1.5	750	525	15	446.25	800	357000
Wheat	straw	19800	1.5	29700	20790	30	14553	800	11642400
Sugarcane	Bagasse	72300	0.33	23859	16701.3	80	3340.26	750	2505195

Crop data source: http://data.icrisat.org/dld/src/crops.html

2.4.2. Biomass Energy

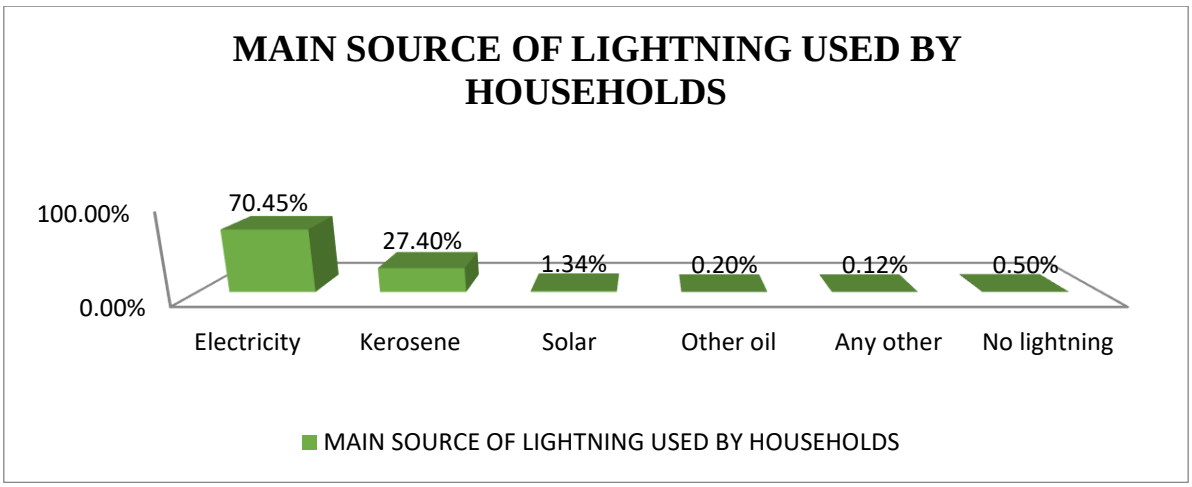
West Bengal Renewable Energy Development Agency (WBREDA) is the nodal agency which has a mandate to promote Renewable Energy Technologies and create an environment conducive to their commercialization through innovative projects. In North 24 Parganas no biomass plants have been reported. Although the state has made schemes for biomass energy and is running Biomass Gasifier Power Plants in some of the villages, North 24 Pargana does not have any. The people in the district mainly use firewood followed by LPG/CNG for cooking as depicted in the graph given below. Crop residue, Coal and lignite are also used by quite a few people. People should be urged to use fuel produced by unconventional sources of energy. The cropping intensity of the district is 201% with gross cropped area of 520410 ha which is considered to be very good. The district produces 718650 tonnes of wheat, 12730 tonnes rice, 45350 tonnes oil

seeds, 952500 tonnes jute and 150000 tonnes potato. These are the major field crops of the district which produce high potential biomass.



2.4.3 Solar Energy

The data from the website of WBREDA gives the idea that home lightning systems and solar water heating systems have been installed in the district. A power plant has also been installed at North 24 Pargana Zila Parishad Bhawan, Barasat of 50 kWp where the net metering has been done by West Bengal Green Energy Development Corporation Limited. WBREDA has proposed a list of some schools for the Roof-Top Solar Project. Along with the Solar PV systems Improved Chulha shall be installed for preparation of Mid Day Meal by reducing fuel consumption. WBREDA has got the project sanctioned from MNRE, Government of India under Jawaharlal Nehru National Solar Mission. According to which 90% of the cost of the project will be taken up by MNRE, Government of India.



The data from the 2011 census gives an account of the main source of lightning used by households in the district is represented in the graph above. 70.45% use electricity, 27.40% use kerosene and only 1.34% use solar as the source of lightning.

2.5. Wetlands

There are many wetlands in the region, but some important wetlands are like Ramchakibil. The region has a large number of tanks and ponds, and they also have coastal wetlands. The data in Table 7 represent the number of wetlands and their area representation in the district. There are around 748 wetlands sized greater than 2.25 Ha and 3634 less than 2.25 Ha areas. The region consists of variable-sized wetlands, generally less than 200 Ha in the area, but there are 21 wetlands with areas of more than 200 Ha and 8 even more than 1000 Ha.

Wetland Types	Total Number of												
	Wetlands:			Area (ha)									Aquatic Vegetation
Natural Wetlands	NRCD	NWIA	Diff.	<2.25	<5	<10	<20	<50	<200	<500	<1000	>1000	
Lake/ponds	81	90	9	0	1	6	19	22	21	4	4	4	39
Ox-bow lakes/cut off meanders	131	139	8	0	15	26	34	35	19	2	0	0	62
High altitude Wetlands	0	0	0	0	0	0	0	0	0	0	0	0	0
Riverine Wetlands	12	13	1	0	0	3	2	4	3	0	0	0	8
Waterlogged	192	206	14	0	18	43	43	40	31	7	6	4	71
River/Stream	0	27	27	0	0	0	0	0	0	0	0	0	0
Man-made Wetlands	NRCD	NWIA	Diff.	<2.25	<5	<10	<20	<50	<200	<500	<1000	>1000	AV
Reservoirs/Barrages	0	0	0	0	0	0	0	0	0	0	0	0	0
Tanks/ponds	256	257	1	0	112	93	38	13	0	0	0	0	42
Waterlogged	14	14	0	0	2	4	2	6	0	0	0	0	4
Salt pans	2	2	0	0	0	0	1	1	0	0	0	0	0
Total (4382)	**688**	**748**	**60**	**3634**	**148**	**175**	**139**	**121**	**74**	**13**	**10**	**8**	**226**

Table 10: Wetland Data of North 24 Parganas District

Source: NRCD (National River Conservation Directorate)-NWIA Inventory Data 2007, NWIA Wetland Atlas report

- The district comprises 4382 wetlands; most of them are lakes, meanders and tanks. The lake and waterlogged wetland types have a large wetland size of more than 1000 Ha found in the region.
- The wetland size is small in general, but 31 are greater than 200 Ha
- The number of natural wetlands is more than man-made.
- Many natural wetlands have aquatic vegetation also.
- The region has both terrestrial and coastal wetlands.

2.6. Tourism

Table 11. SGDP of West Bengal and GDDP of North 24 Praganas

Year	GDDP at constant prices	WB GDP at constant prices	Share % of GDDP to WB GDP at constant prices(2004-05)
2004-05	24416.69	208656.36	11.7
2005-06	27157.76	221789.46	12.24
2006-07	29049.04	239077.12	12.15
2007-08	32131.75	257632.18	12.47
2008-09	34747.10	270248.26	12.86
2009-10	36706.81	291954.96	12.57
2010-11	38989.62	308837.05	12.63
2011-12	41335.55	323419.50	12.78
2012-13	44705.65	345156.29	12.95

(Compiled from Bureau of Applied Economics and Statistics, Department of Statistics and Programme Implementation, GoWB, 2015)

So far, the contribution of the district to the state economy is about 13 percent, which is the highest among all the districts in the state, with an annual average growth rate in GDP by 7.87 percent at 2004-05 constant rate during 2005-06 to 2012-13. Like most of the states of India, the share of the tertiary sector in the state GDP is the highest and is still continuing. However, during 2004-05 to 2012-13, the share of the primary sector has decreased around 8 percent in 8 years (Table 12). Every year, the share of the primary sector decreases by 1 percent on average and the share of the Tertiary sector gains by almost the same percentage. This clearly shows a tradeoff between Primary and Tertiary sector which has long term consequences. The average growth rate of primary sector is 2.48 percent whereas the average growth rate of Tertiary sector is almost 4 times, i.e. 8.87 percent at 2004-05 constant prices. However, although the contribution of Trade, Hotel and Restaurant (THR) to the tertiary sector is showing a decreasing trend, it is still contributing about 16 percent to the state GDP, whereas the primary sector is contributing a little more by about 18 percent. By observation, we can conjecture that both the sectors can have synergizing effects provided a well thought policy linkage between the two sectors.

Table: 2 Percentage Share of Sectoral Contributions to the State GDP, WB

Year	Primary % of Total	Secondary % of Total	Tertiary % of Total	% Share of Trade, Hotel & Restaurant to Tertiary sector	Share of THR to the total SGDP
2004-05	25.29	20.29	54.40	28.83	15.69
2005-06	24.30	19.76	55.93	28.47	15.92
2006-07	23.05	19.97	56.96	28.42	16.19
2007-08	22.49	20.04	57.46	27.64	15.88
2008-09	20.99	18.72	60.27	26.37	15.89
2009-10	20.71	19.10	60.18	27.04	16.27
2010-11	19.14	19.20	61.64	28.51	17.58
2011-12	18.53	17.85	63.61	25.30	16.09
2012-13	18.01	17.42	64.56	24.86	16.05
2013-14	17.49	17.45	65.04	24.49	15.93

(Compiled from Bureau of Applied Economics and Statistics, Department of Statistics and Programme Implementation, GoWB, 2015)

In comparison to the State figures, the contribution of the primary sector is lesser and that of the tertiary sector is much more. The tertiary sector contributes about 74 percent of the district GDP. However, the share of Trade, Hotel and Restaurant is decreasing in the NDDP as well as towards the tertiary sector over the years. Although, there are many tourist interests like Kachuadham, Dakshineswar, Adyapeeth, Gobardanga, Basirhat, Panihati, Khardah, Nawabganj, Taki, Gandhi Ghat, Rabindra Tirth and Sunderbans. Hence, appropriate pro tourism policy must be developed to harness tourism potential of the district and earn tourism exchequer.

In this regard, site specific and district specific tourism related projects specially at Taki and Sundarban, Bangram and Bibhuti Bhusan area can be developed to look at the integrated tourism and development of tourism circuits in the district in line with an already proposed circuit from Jangalmahal to Sagar Island in South 24 Praganas in 2015. Moreover, there is potential of river tourism on Icchamati and Hoogly. Necessary institutional mechanism and infrastructure is suggested to be listed and developed further.

Table: 3 Sectoral Contribution to the NDDP

Years	% Share of Primary Sector	% Share of Secondary Sector	% Share of Tertiary Sector	% Share of Trade, Hotel and Restaurant to NDDP	% Share of THR to Tertiary Sector
2004-05	18.62	19.51	61.85	16.49	26
2005-06	18.65	20.27	61.07	15.96	26.14
2006-07	16.47	19.76	63.76	16.24	25.47
2007-08	15.84	19.32	64.83	15.69	24.20
2008-09	14.57	17.83	67.59	15.5	22.94
2009-10	14.15	16.74	69.10	15.84	22.93
2010-11	12.75	17.31	69.93	16.88	24.14
2011-12	11.95	15.37	72.67	15.19	20.90
2012-13	11.28	14.32	74.39	14.99	20.16

(Compiled from Bureau of Applied Economics and Statistics, Department of Statistics and Programme Implementation, GoWB, 2015)

Qualitative Data

1. Geography

- The district is split into three segments geographically:

    1. A huge riverine belt in the southern portion of Basirhat Sub-Division (Sundarban region).

    2. The industrial and urbanised zone of Bidhannagar and Barrackpore Sub-division.

    3. Large cultivable plain area in the Bongaon Sub-division and neighbouring Barrackpore, Barasat, and northern Basirhat Sub-Divisions.

- Due to unplanned human activities and some natural changes such as river silting, the drainage capacity of canals, rivers, and other bodies of water has been diminished. As a result, floods and significant water logging have become a yearly occurrence in the majority of the aforementioned sub-divisions.

    - In the riverine belts of the Basirhat subdivision, cyclones and high tides are prevalent. Surprisingly, numerous focal areas of the Gaighata Block in the Bongaon sub-division have been affected by tornadoes in the past.

2. Agro-Climate Conditions

Soils produced from alluvial deposits in the area are azonal, with little or no profile development. The most common kind is clay loam. Swamps and alluvial lakes have clays with or without muck soils. These soils were created by tidal currents bringing sediments with them.

3. Agriculture

The district's agriculture industry is characterised by a high proportion of small and marginal farmers, with per capita land holdings of less than 1 hectare. Rice is the most important crop in the fluvial and coastal zones, whereas horticultural crops are the most important in the hill and terai regions. Despite a lack of available land for agriculture, the district's high levels of ground water extraction on the alluvial plains have allowed it to produce the most rice in the country.

The main problems which hinder development of farming in this District are small landholdings, resurgence of insect pests, poor marketing facilities and on

and often natural calamities like drought, flood, hailstorm and breach of embankment of rivers in coastal areas and overall huge population growth etc.

4. Horticulture

Horticulture is a growing industry. The district is diverse, producing significant amounts of vegetables, fruits, nuts, spices, and other foods under a variety of agro-climatic conditions.

Non-traditional veggies such as brussels sprouts, gherkins, and broccoli are also grown by the farmers. The district's horticultural product productivity has risen significantly throughout the years.

The State Government operates two horticultural farms where planting materials, demonstration trials, and other research projects are carried out. These farms are being renovated in order to teach farmers and entrepreneurs in contemporary agricultural techniques, including pre- and post-harvest management and organic farming.

5. Forestry

The state of West Bengal has a diverse range of trees and herbs. Total 113 identified tree species and 65 herb species have been recorded in the state. The district covers two of the most important forest areas 1) Sundarbans Reserve Forest 2) Bibhutibhushan Wildlife Sanctuary. The south-eastern part of this district falls under the Sundarbans Biosphere Reserve and Sundarban National Park. Sundarban is Estuarine Coastal Wetland covered with Mangrove forests. These forests are an important natural habitat for a variety of flora and fauna. A recent study published about Sundarbans mangrove forests in Bangladesh stated a variety of minor forest products. These include Fish, Honey, Bee's wax, Shrimps, Prawns, Fuelwood, Crab, Medicinal Plants, etc. The medicinal Plants found in the research area are Basok (Adhatoda vasica), Bahera (Terminalia belerica), Haritaki (Terminalia chebula), Arjun (Terminalia arjuna), Amloki (Phyllanthus embellica), Bel (Aeglemar melos), Supari (Oroxylum indicum (L.) Vent), Shimul (Bombax ceiba L.), Mehedi (Lawsonia inermis L), kool (Ziziphus jujuba Mill), Peyara (Psidium guajava L.), Khejur (Phoenix sylvestris), Tetul (Tamariandus indica), Neem (Azadirachta indica) (Md. Akramul Islam, 2020).

Dalbergia sissoo, Mangifera indica, Butea frondose, Eucalyptus species, Cocos nucifera are some of the most occurring tree species across the state. The major NTFP based plants in the state are Sal (Shorea robusta), Mahua (Madhuca indica), Behada (Terminalia bellirica), Arjun (Terminalia arjuna), etc.

Presently state government runs the West Bengal state forest development agency (WBSFDA), this agency primarily focuses on eco-tourism. Eco-tourism Centres

are established for involvement, education, and awareness creation among the general public about the importance of nature conservation and wildlife preservation. Agency also accepts online booking for eco-tourism, Elephant rides and car safari in the forest zones. This agency is also responsible for new schemes and policies in the state. West Bengal has a joint forest management program under this, agro-forestry, promotion of small-scale cottage industry, development of marketing facilities, and value addition of NTFP products are primarily focused. WBSFDA is the implementing Agency of Green India Mission for the State. Till 2019-20 an allocation of Rs.242.47 lacs was made to the Divisions for entry point activities. Department of AYUSH, Ministry of Health has also provided funds for the project "Socio-Economic Upliftment of JFMC through Conservation of Medicinal Plants, Value Addition & Marketing of Medicinal plant", this scheme deals with emphasising the importance of medicinal plants, their cultivation, production, and marketing and strengthening the natural product-based system for health and welfare. During the year 2019-20 WBSFDA were received funds of Rs. 127 lakhs for Conservation and Management of Sundarban Mangroves. But the district of North 24 Paragana currently holds no schemes under joint forest management.

6. Energy

6.1 Biogas

Biogas production in this district can be a major source of energy and economy, however, there is no data available for biogas production and biogas plants installation for this district.

West Bengal Renewable Energy Development Agency (WBREDA) gained authorization from the Ministry of New and Renewable Energy (MNRE) of the Government of India to build 18000 domestic type biogas plants in West Bengal and 3000 domestic type biogas plants in Bihar during the fiscal year 2011–12. Out of 18,000 installations, roughly 11,000 in West Bengal and 1,200 in Bihar had been finished as of December 2011. WBREDA has received three new bids for the state's Institutional Biogas Program. The following are the institutions:

- ✓ Peerless Abasan in Panihati Municipality has a 40-cubic-meter biogas plant.
- ✓ A ten-cubic-meter biogas plant is being built at Jalpaiguri Govt. Engineering College, Jalpaiguri, using kitchen waste from the hostels.
- ✓ A 15-cubic-meter kitchen waste biogas plant for three Central Jails: Alipore Central Jail, Dum Dum Central Jail, and Presidency Jail. Phoenix India Research & Development Group, the first in Eastern India, has established a plant in Gunduba village, Birbhum's Dubrajpur police station, and will be supplying biogas cylinders to distributors in the state. As a result, residents will be able to get cooking gas for as little as Rs 300.

6.2 Biomass Energy

North 24 Pargana produces biomass waste in large quantities. The district does not have any running scheme for biomass energy production. Although the district is highly potential but needs an infrastructure that would support the district in utilizing its useful waste and residue. The district produces rice, wheat, jute in large quantities and has a number of jute mills. But these mills have not adopted any method to process the waste. People here need to get aware of the benefits of biomass energy. If biomass energy plants are set up in the villages it would increase the employment opportunities. Also it would fulfil the electricity needs in the district. This way more and more people will be inclined towards setting up mills hence people in villages can establish cottage industries and share the profit.

6.3 Solar Energy

In the district North 24 Parganas, the government has done a lot of work from its side. But attention has not been paid on the solarization of economic activities. There is no data giving information about solarizing agriculture or the industrial sector. The use of solar energy by people themselves should be encouraged. The district has witnessed solarisation of schools, street lights etc., and most of the households are also electrified in the district. A few villages have also been electrified under Deendayal Upadhaya Gram Jyoti Yojana (DDUGJY) that means feeder segregation and metering has been done in the villages of the district. This means that the district has a set base and needs to build up wisely.

7. Tourism

The southern part of the district has potential for nature/marine tourism which hosts Mandarmani beach near Mandarmani village, famous for water sports with the clear blue water of the Bay of Bengal and Frazerganj beach near Narayanatala village, famous for its whitish silver sand, umpteen exotic and migratory birds, pristine, and tranquil seascape. Hence, both Mandarmani village and Narayanatala village have the potential of ecotourism with the involvement of local communities. Moreover, Dakshineswar Kali ghat, Ganga river ghat, Kolkota, Daspara Ganga ghat, Barrackpore, Barrackpore Ferry ghat, Champalata Ganga ghat, Sri Sri Radhaballav Jiu Ganga ghat, AlamBazr ghat and Bagbazar ghat are the major ghat tourism destinations in the district.

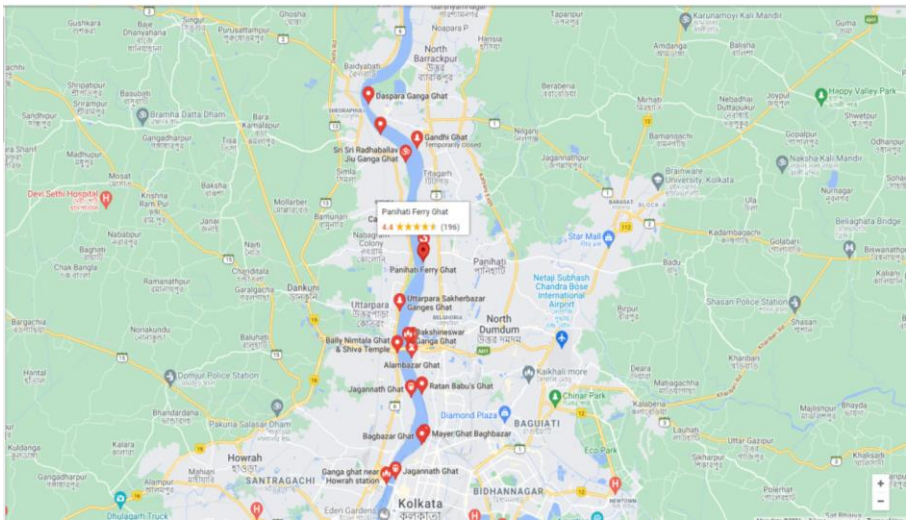


Figure 2. Ghats in North 24 Praganas

The district has potential for religious, historical, nature and wildlife tourism also.

Religious Tourism: Tourism at places like Dakhineswar, Kachuadham, Dakshineswar, Adyapeeth, Gobardanga, Basirhat, Panihati, Khardah, Nawabganj.

Ghat Tourism: Dakshineswar Kali ghat, Ganga river ghat, Kolkota, Daspara Ganga ghat, Barrackpore, Barrackpore Ferry ghat, Champalata Ganga ghat, Gandhi Ghat, Sri Sri Radhaballav Jiu Ganga ghat, Alam Bazar ghat and Bagbazar ghat.

Historical and Educational Tourism: Chandraketu Garh, Barrackpore, Baranagar, Baraha Mihirer Dhipi, Rabindra Tirtha, Dum Dum, Clivehouse, the Indian Statistical Institute at Baranagar.

Potential of Ecotourism: Taki Town, bordering Bangladesh- Icchamati River (during Dussehra) and Sunderbans, Bongaon/ Banagram (Bibhuti Bhusan Wildlife Sanctuary)- Bank of Ichhamati river, Nicco park- joy rides, Nalban boating complex, the Aquatica.

Action Plan Development

1. Agriculture

A. Irrigation and flood management project

Because of its geographical location, the district of North 24 Parganas is extremely prone to disaster. Natural disasters like floods, Cyclone Threaten the whole North 24Parganas area. There are, in fact, High-Risk Multi-Hazard Zones. To deal with these challenges, there is a need for the development of flood management and irrigation project. This project will improve irrigation service delivery, strengthen flood risk management through building canals, wells and tanks. About 1.2 million farmers of the Bengal districts would benefit from the project, which will provide better irrigation services and enhanced flood protection to reduce the impact of climate change on a 2,00,000hectares region.

B. Setting up of Microfinance Institutions

Microfinance efforts and environmental projects, in particular, frequently require strong organizations with a strong organizational belief. ZBNF, Manuvikasa, Art of Living, and Lok Bharti are some of the partners that will assist us in building the groundwork. Only after a lot of hard work will people have faith in the items, which will lead to market demand. Farmers will want assistance till then. In this aim, microfinance and PKVY incentives should be used liberally.

C. Aquaculture Projects

Fish farming is the most common type of aquaculture, however other ways may be classified as mariculture. Fish farming is the practice of commercially growing fish in tanks or cages for the purpose of food production. Aquaculture is divided into two types: vast aquaculture, which relies on local photosynthetic output, and intense aquaculture, which relies on an external food source. These two types of aquaculture systems are managed in entirely different ways.

With an annual growth rate of 10 percent since 1984, aquaculture has become the world's fastest expanding food-producing sector. China, India, Japan, the Republic of Korea, the Philippines, Indonesia, and Thailand account for about all of the world's aquaculture production. More aquaculture projects need to be developed in the north 24 parganas region.

D. Soil Nutrients Management

To combat soil nutrient insufficiency across the state, implement efficient soil nutrient management that includes the delivery of the appropriate nutrient at the right time and in the right place for the least amount of money. For example, in the Terai area, there is a deficit in lime, zinc, and boron owing to leaching. It was also discovered that green manuring, such as organic soil enrichment by planting

a range of crops on the land and then ploughing the green matter back into the soil, may enrich the soil in 150 days.

2. Horticulture

A. Protection from Extreme Weather

Horticulture crops are very sensitive to temperature, so intervention of proper overhead shade to fruit trees and construct greenhouses for vegetables are needed, wherever the temperatures are exceeding the tolerance level of plants. Set up weather stations with high spatial resolution to collect weather data at the village level, analyse it at a nearby agriculture university, and forecast it. Educate the farming community of the dangers of bad weather. This technology should also assist farmers in making crucial farming decisions that will result in more effective crop management techniques.

B. Focusing on Research

In the long run, when it comes to introducing new kinds to maintain the livelihood stability of the poor who rely on agriculture, the focus should be on increasing production while minimising losses. The discovery of novel cultivars resistant to greater temperatures, water stress, and elevated CO2 concentrations will rely heavily on research and development. To adapt to the rising winter temperatures, developing the short rotation vegetable varieties are very important.

3. Forestry

The district should come up with the forest conservation project to regenerate the degraded forest with joint arrangement of local population; strip plantations and expand the coverage of farm forests. Special action plans should be included in the project to increase forestry research and plant propagation, teach all forestry employees, support the joint management process through training and funding for NGOs, and improve wildlife and protected area management. Under the project, mangrove plantation of mangrove should be implemented.

The goal should be to establish corridors to allow flora and fauna to migrate and adapt to climate change, particularly for species with restricted dispersion capacity. Connecting fragmented woods using ‘Canopy Corridors' and ‘Flyways' to aid species migration is one approach to achieve it. Local stakeholders will prioritize and manage corridors. Rapid agency responses to crop-raiding, man-animal conflict, crop-insurance, and hassle-free compensation would be some of the major interventions for people living in these corridor areas. Special studies

are needed to determine the feasibility of constructing such corridors and their efficacy in comparison to natural displacing factors.

North Twenty-Four Pargana is an area neighboring one of the largest Mangrove forests. Sundarbans forest is the mangrove forest, home to the famous royal Bengal tiger and a variety of different tree species. Mangroves offer a large variety of NTFP, but these products have remained undervalued. Mangrove NTFPs have been recognized to have high potential toward inclusive development and poverty alleviation. 2020 study about Mangrove NTFP discussed NTFP products and its management and actions needed for development of Mangrove NTFP based economy. Mangrove NTFP includes fodder for livestock, sustainable firewood, Fisheries products and local herbs and tea species (Adolphe O. Debrot, 2020). These products can be made available on WBSFDA website for buying online. The District Government needs to provide a product–market chain for all the local NTFP. As the state runs social forestry schemes, more native, herbal and product-based trees should be available in nursery for plantation.

In the north area, catastrophes in the form of landslides due to landslides in West Bengal and the saline coastal areas, disasters in the form of landslides owing to landslides in the saline coastal areas, heavy rains, coastal erosion, and storm surges from cyclones are all contributing to sea level rise and coastal erosion. Their severity is anticipated to increase. Therefore, afforestation activities on slopes strengthen the forest area. It is also important to establish mangroves in deteriorated regions along the shore. In addition, the plans for hydroelectric projects along the Teesta in the northern highlands are also in jeopardy.

Afforestation on the riverbanks, wastelands, and open public spaces is another option that suits the district. The Miyawaki afforestation method has been adopted by many urban authorities in the world. This technique helps to build dense, native forests. This method ensures that plant growth is 10 times faster and the resulting plantation is 30 times denser than usual. It involves planting native species in the available area and becomes maintenance-free after the first three years (Miyawaki Afforestation, 2019). Some of the major Indian cities like Mumbai, Chennai have also adopted this technique for the afforestation (Indian Express, 2021). Afforestt is the firm which works in the development of Miyawaki Forest.

4. Energy

1. Installments of Solar Power

There is an urgent need to install the solar powers in the district. The district administration could install floating solar panels around the region as it does not require the large tract of land. The opportunity should be explored and the administration should try to install around 10MW of solar panels on ponds, canals

and water reservoirs. This will not only generate clean energy but it will also in saving the water of ponds from the drought.

2. Biogas

Biogas is a combination of gases generated when organic matter is broken down in the absence of oxygen. Biogas is a renewable energy source. be made from agricultural waste, manure, municipal trash, plant material, sewage, green waste, or food as a raw material waste. Biogas is a renewable source of energy. Bio-energy has the potential to significantly reduce greenhouse gas emissions since it may be used to generate electricity, lowering the demand for fossil fuels. The planet is maintained clean by offering a non-polluting, renewable energy source. free of hazardous emissions. Biogas is also an excellent approach to ensuring that everyone in a given region has access to power. Biogas, being a relatively inexpensive source of electricity, has the potential to deliver adequate energy to the globe.

3. Biomass Energy

The district produces jute, rice, wheat etc. abundantly, locally available biomass resources can be utilized for biomass based electricity systems which can provide electricity to villages especially to jute mills. This would aid the small weavers to process the material locally. This will create thousands of weaving microenterprises regionally in the district. This would also benefit the farmers directly. Hence, in-district jute processing would increase. Power plants would also generate employment. Availability of electricity would improve in the district. Besides, briquette manufacturing centres should also be started.
The administration should start a biomass cogeneration programme which suits best to the district. The above plan would utilize the biomass in generating electricity which would aid in setting up small village-based industries.

Integrated Model Framework

1. Agriculture and fisheries are the main source of livelihood for more than half of the population in the district. Most of them are marginal farmers /fishermen. Enhancement in their quality must be one of the key goals. The challenge in these sub-sectors is the environmental externalities. Apart from very high-water

consumption there are land usage, soil degradation issues related to agriculture. Fisheries have issues related to aquatic ecosystems and water quality.

Thus, the way out is:

- zero waste farming, low water techniques
- crop diversification particularly high value low water usage crops.
- Development of wetlands for fish farming.

2. Tourism sector has high livelihood implications particularly artisans and direct and indirect employment generation through tourism. The challenges in this sector are twofold:

A. There is a carrying capacity of the environment for the tourists, which is particularly critical for the eco-sensitive zones.

B. The high influx of tourists can affect flora and fauna.

Thus, to counter these challenges in tourists' activities, focusing less on environmentally sensitive types of tourism such as religious and historical tourism while limiting the footfall for nature and adventure tourism, focusing on eco-tourism, agro-tourism and reducing the aqua tourism in rivers should be considered.

3. This sector has a very high positive environmental impact even though they are low on the livelihood generation. Most of renewable energy and biodiversity and forestry falls in this category. This is perhaps the most critical category for conservation and long-term sustainability. To deal with the challenges in this sector are:

A. Improving solar electrification through aggressive rooftop installations in all government buildings and business installations like petrol pumps, solar pumps etc.

B. Exploring floating solar installations in large wetland regions where synergies in fishing and energy production can be exploited.

C. Setting up biomass plants and solar energy plants.

Recommendations

1. Agriculture

- Cropping intensity may be improved through better exploitation and management of surface and ground water resources, as well as crop diversification with less water-intensive and profitable crops including pulses, oil seeds, and vegetables.
- Adoption of a micro irrigation system allows for rational use of groundwater resources. Promotion of rainwater collecting buildings for ground water recharge and supplementary irrigation, particularly in red laterite zones.
- Enhancing extension mechanisms with a focus on active participation of informal channels for technology diffusion, such as NABARD-supported Farmers' Clubs, farmers' SHGs, and proactive NGOs.
- Establishment of exclusive cold storage facilities for potato seed and development of location-specific technologies for potato seed multiplication.
- Wide opportunities for increasing the seed production base through setting up more hatcheries to meet the increasing demand.
- Identifying potential zones for establishing multipurpose cold storage facilities and food processing units either through private sector investment or PPP mode with the government providing basic infrastructure.
- The major crops being cultivated are rice, wheat, fruits, and vegetables. This area frequently suffers disasters and extreme weather events. There is a need for irrigation project development; currently, irrigation is done mainly by deep tube wells.
- The yield of crops cultivated during the Rabi season has decreased. The main reason for this is less rainfall and poor irrigation facilities.
- The District's soil health is worsening, needing external nutritional supplements.
- Jute processing is the primary industry of Barrackpore, which is based on many jute mills along the river's edge. The jute-based product should be encouraged to use in the nearby area, which also increases the revenue.
- The production of mango in the District is high, and there is a year-wise increase in the area under mango. The area under banana production has increased, and almost all the fruits show an increasing trend.
- Non-traditional veggies such as baby corn, brussels sprouts, gherkin, and broccoli are also grown by the farmers. These high revenues of crops should be encouraged in this area.

- The District's agriculture industry is characterized by a high proportion of small and marginal farmers, with per capita land holdings of less than 1 hectare. Combined farming should be introduced in this area.
- The main problems which hinder the development of farming in this District are small landholdings, a resurgence of insect pests, poor marketing facilities, and on and often natural calamities like drought, flood, hailstorm, and breach of the embankment of rivers in coastal areas and overall huge population growth, etc.

2. Horticulture

- Farmers must be provided with a Suitability Calendar based on agro-climatic conditions for various horticultural crops in order to select the suitable horticultural crops.

- To assure the availability of high-quality planting supplies, certification programmes should be developed.

- Each district should have at least one model nursery.

- Increase the amount of land covered by horticulture crops by using micro-irrigation techniques.

- Watershed programmes should be used to improve soil and water conservation in the regions.

- Self-Help Groups should be trained in small-scale processing and the sale of processed goods at the village level.

3. Forestry

- Encourage diverse forest owners to communicate and collaborate, and develop the network of stakeholders participating in forest conservation and risk and crisis management on a daily basis.

- Consolidation and enhancement of risk perceptions throughout the community (including the public and local councilors).

- Develop regional multi-risk decision support systems for forest owners so they can more readily integrate hazards into their forest management.

- As new trees grow fast and fallen leaves accumulate on the forest floor, planting trees on marginal agricultural land improves carbon sequestration at a rapid pace. Reforestation of depleted forest stands can also help remaining forests sequester more carbon.

- North Twenty-Four Parganas is one of the most populous districts in the country. The main occupation among the locals is agriculture. Agroforestry and afforestation are the suitable options for this district. With the presence of mangroves, mangroves based NTFP can be promoted to the tourist visiting the Sundarbans National Park.

- Local tree species can be promoted through nursery. These species include Arjun, Sal, Indian Rosewood, Mango, Mahua, and Behada. This way the citizens can earn extra income through these forest products such as fruits, flowers, and beekeeping. Agroforestry information centres and forest product processing clusters can be established.

4. Energy

- The district should focus on reducing the $CO_{2\ by}$ increasing the grid power generation from renewable sources.

- Replacing the use of grid power for certain end-uses through low temperature solar thermal – e.g. water heating.

- State should provide adequate financial incentives for lowering specific consumption.

- State-led adoption for enabling critical volumes of devices and technologies in the local market and breaking current cost barriers.

- Risk mitigation of anticipated impacts from Climate change through improved risk assessment of supply infrastructure (including lifeline infrastructure) for likely scenarios of climate change and investment and implementation of infrastructure-strengthening initiatives to cope with extreme events.

5. Tourism

- The district has potential for religious, historical, nature and wildlife tourism also. Mandarmani beach near Mandarmani village, famous for water sports with the clear blue water of the Bay of Bengal and Frazerganj beach near Narayantala village, famous for its whitish silver sand, umpteen exotic and migratory birds, pristine, and tranquil seascape. A well structured water sports and other activities can be attractive to the tourists. These villages have the potential of ecotourism with the involvement of local communities.

- ➢ Different ecosystems like ghats, nature and wildlife along with historical monuments must be preserved, maintained. Since there is a demand for religious, historical and ecotourism, necessary policy decisions must be made to develop the said types of tourism along with their ecosystems.
- ➢ Different activities like holy dip, pilgrimage, swimming, hiking, wildlife watching attract tourists for ghat destinations. However, tourists do not have to pay anything for performing these activities. Hence, payment mechanisms must be in place to safeguard the ecosystems of ghats and raise sustainable finance for undertaking different recreational and religious activities.

Discussion during the Report Presentation

- The efforts will be taken up for implementing Namami Gange interventions in the Rural Area.
- The district is focused on water treatment and Solid Waste Management
- Further discussion will be taken up for Delhi Haat
- The IIML Report for Arth Ganga should be a regular Agenda item for next 6-8 DGC meetings.
- Hon'ble PM during the post-Budget webinar on Tourism had spoken about market potential of destination weddings. It was suggested that suitable Ashrams in Ganga Basin may be identified for such purpose to promote blissful experience, cost reduction, livelihood opportunities and better upkeep.
- Allocate separate space for Namami Gange Awareness and Jalaj Marketing kiosk in Melas/Congregatios/Fairs for providing better marketing opportunities to the Jalaj products.
- As Dilli Haat Centre – Namami Gange Awareness and Marketing Centre – is being launched soon, it was requested that every district to identify niche products with a creative story and link it with Jalaj in their area.
- To identify Arth Ganga Tourist Trails and organize Ganga Guide training
- Promotion of Natural Farming in Ganga Basin and training workshops should be organized on a regular basis. NMCG is supporting this initiative in coordination with MoA& FW and NCOF.
- Make plans for reuse of treated waste water for agriculture, industrial etc. purpose and also the sludge.
- Training of volunteers for Ganga awareness & Aarti workshops to promote regular aartis on Ghats.

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