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Issue of food security in the perspective of changing land-use- a study on Nabadwip Community Development Block, Nadia, West Bengal, India

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Abstract

In anthropogenic era when human beings consider themselves as the supreme power of the Earth, population explosion like issues making continuous and nutrient food supply before a big question mark. Present piece of research work will focus on a fertile zone within Gangetic delta with high potential for spontaneous food production. The selected study area is Nabadwip Community Development Block within Nadia District of West Bengal India. Population growth, tourism development concentrating the religious place of Mayapur, shift of arable lands into built up zone are all the events experienced by the study area. To cope up with rising demands for supply of food, several procedures are being adapted in expense of elements of the natural environment including soil and ground water. This research paper runs with the aim to focus on issue of food security for such growing population zone mentioning all the prospects and limitation for future.

Keywords: LULC change, food security, population growth, natural environment

Introduction:

The term 'food security' is considered as the representation of several factors including physical availability of food, purchasing power, food utilization and stability of all the three mentioned factors(Group, 2024). It ensures the supply of food to each individual as per their nutritional need. With progress of civilization and rapid population growth rate the way we utilise land and the way we concentrate on agricultural production are changing. The issue is true for Nadia District (Sk, 2019)and particularly for Nabadwip CD Block. The obvious impact of land-use change is evidenced on decrease in agricultural land (Deb2*, 2012) directly and on food production as well as on food security indirectly. Present article focuses on one of the most fertile land area within the world i.e. the Ganga Delta region with a micro level study concentrating on Nabadwip Community Development Block under Nadia District of West Bengal state in India. The study focuses on a change of two decades with the extension of 2004 to 2024.

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Location map of the study area

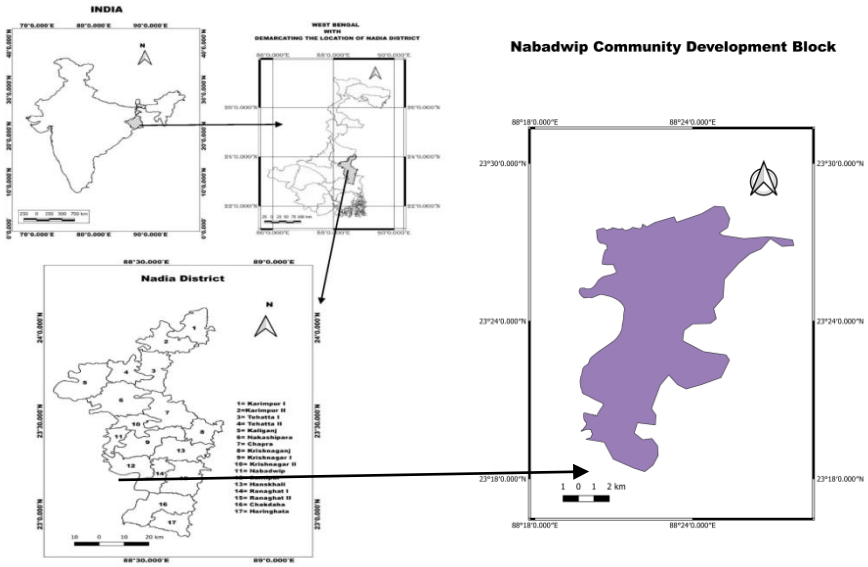

Figure-1

About the study area:

The study area is with latitudinal and longitudinal extension of 23°21'9"N, 88°19'16"E to23°27'36"N, 88°48'33"E.From Geomorphic point of view it is within the flood plain of the river Bhagirathi and Jalangi with an average altitude of about 12 m and sloping towards south direction. Presence of several abandoned channels, point bars, marshy land and wet lands provide the region a perfect identity of its location in moribund portion of Ganga Delta. The region is covered with alluvial deposits. The physical condition of this area is truly suitable for agriculture.From administrative point the area covers 11.66 sq km of urban area with the existence of Nabadwip Municipality and rural area of 96.39 sq km covers 8 Gram Panchayets(GPs). The urban and rural areas within the study unit experience population density of

Objective:

Present research runs with the aim to focus on:

- Changing Land-use, Land-cover (LULC) scenario of the study area.
- Impact of such change on food security.

Methodology:

The study is done based on secondary data sources with the steps of:

- LULC maps are prepared based upon LANDSAT-7 and LANDSAT-8 data downloaded from USGS and classification is done using QGIS-3.22.
- Analysis of statistical data collected from District Statistical Hand Book Nadia-2009, 2014 and 2017.

Discussion:

The discussion will run under following heads:

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a) Land-use Land-cover scenario of the study area:

The LULC maps prepared for the study area from 2004 to 2024 with an interval of twenty years show the following results:

The report as per classification prepared in QGIS is as follows:

Table-1: Comparative study of LULC Change in twenty years interval

LULC	2004			2024		
	Pixel Sum	Percentage %	Area [metre^2]	Pixel Sum	Percentage %	Area [metre^2]
Water body	47794	38.29	43014600	15236	12.21	13712400
Agricultural land	47818	38.31	43036200	69150	55.4	62235000
Current fallow	11301	9.05	10170900	19592	15.7	17632800
Orchard and vegetation	7131	5.71	6417900	7591	6.08	6831900
Built-up land	10773	8.63	9695700	13248	10.61	11923200
Total	124817	100	112335300	124817	100	112335300

Data source: LANDSAT-8 data processed under QGIS-3.22

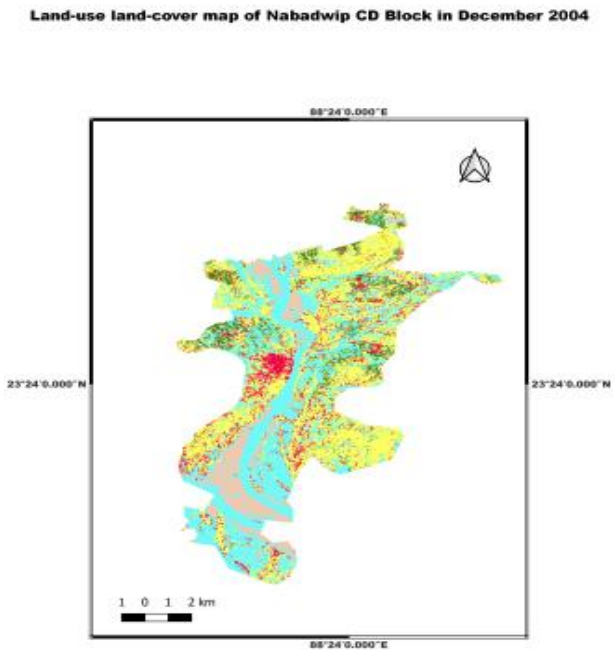

Figure-2

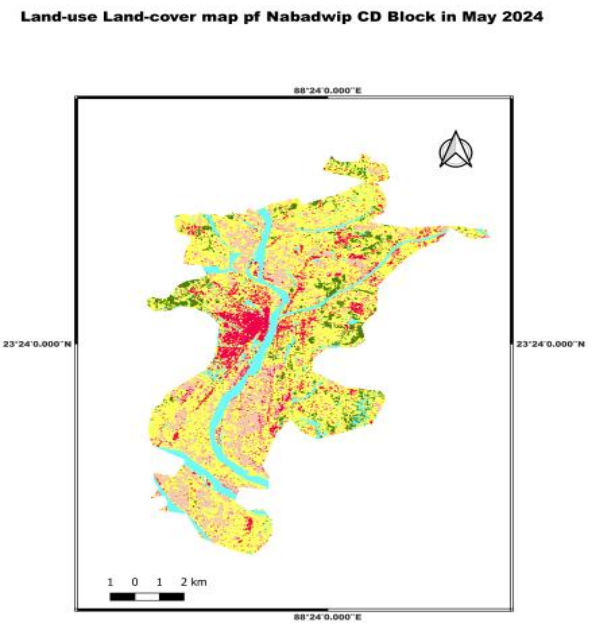

Figure-3

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Major changes found in land-use character are:

- Loss of water bodies.
- Conversion of wetlands into agricultural use (either at present use or in the form of current fallow).
- Maximum utilization of arable lands which were under current fallow in a significant count in twenty years earlier.
- Expansion of built-up area (mostly in expense of agricultural land)
- Increase in areas under orchards and vegetation at a minimum level.

b) Changes observed in crop production:

Reports placed in District Statistical Hand Book the scenario of agricultural change for the CD Block reveal following figure:

Table-2: Comparative study on production of major crops in eight years interval

Indicators	Major crops	Year	
		2008-09	2016-17
Area under production in acre	Cereals	4882	5321
	Pulses	513	1628
	Oil seeds	2646	2618
	Potato	349	305
Production in kg	Cereals	13.343	23.983
	Pulses	0.392	1.422
	Oil seeds	1.842	2.736
	Potato	5415	4717

Data source: Nadia District Statistical Hand Book-2009, 2017

The above mentioned report indicates toward:

- Increase in gross cropped area in an interval of nine years for major crops.
- Increase in total production for major crops.
- A greater dependence on crop diversification.(Supriya Das1, 2023)

c) Demographic change:

Rising population and changing demographic nature is a continuous issue for the district (Ghosh, 2014).Demographic change for the block during this period indicates towards following heads:

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Table-3: Gram Panchayet and Municipality level change in population scenario at twenty years interval

Municipality/Gram Panchayet	Change in population in %		Population density	
	1991-2001	2001-2011	1991	2011
Nabadwip M	-8.01	9.15	9864	10,767
Mahishura	24.76	13.88	498	646
Bablari	18.86	3.78	1019	1264
Char Majdia Char Brahmanagar	10.61	6.2	1304	1531
MajdiaPansila	33.19	8.19	1341	1933
MayapurBamanpukur-I	15.14	14.31	1188	1597
MayapurBamanpukur-II	10.88	12.62	519	648
FakirdangaGholapara	13.48	32.67	502	756
Swarupganj	9.59	6.73	4954	5794
Mean	**14.28**	**11.95**	**2354.33**	**2770.67**
Standard Deviation	**11.37**	**8.57**	**3135.93**	**3392.03**
Coefficient of variation	**79.61**	**71.76**	**133.20**	**122.43**

Data source: Census report 1991, 2001, 2011 and the computation done by the researcher

Massive change in population density is observed in GPs like Mahishura, Mayapur-Bamanpukur-I, Mayapur-Bamanpukur-II and Fakirdanga-Gholapara regions during twenty years interval of 1991 to 2011. Rapid growth of population in the riverine island Fakirdanga shows a change of land-cover from wetland dominated character to a land recently used for residential and agricultural purpose. The availed census data is of almost thirteen years earlier, study of land-use change till recent past shows a more relevant data.

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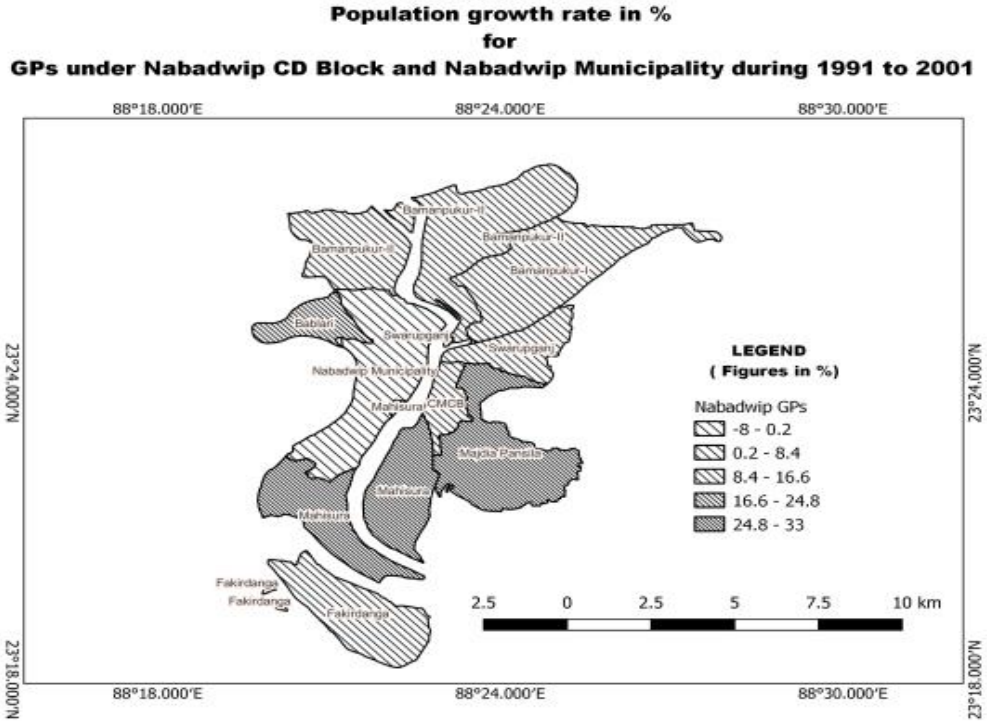

Figure-4

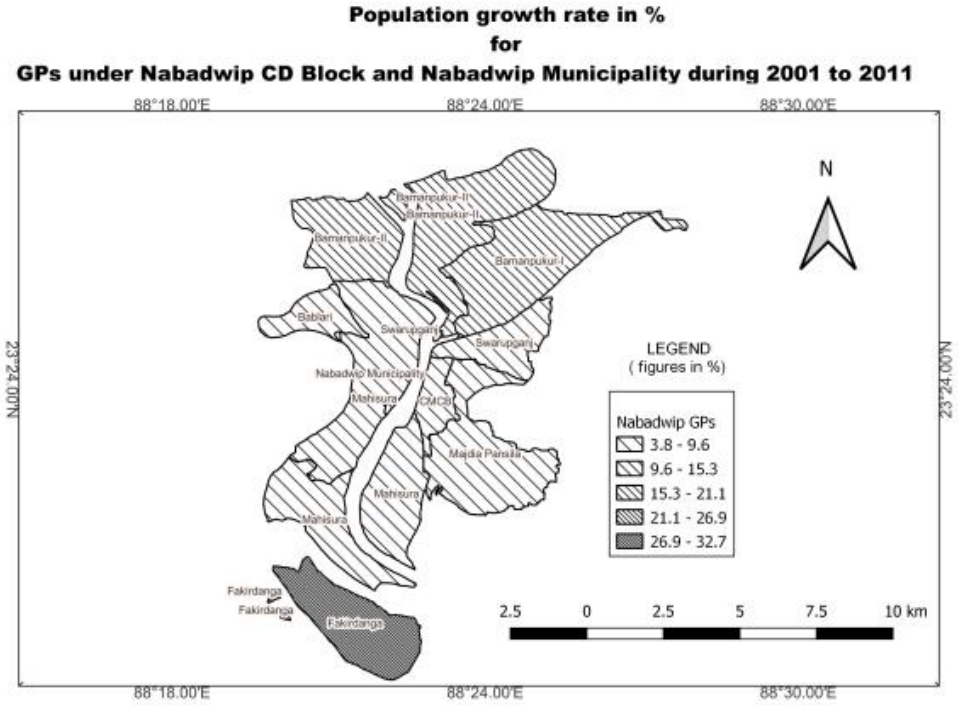

Figure-5

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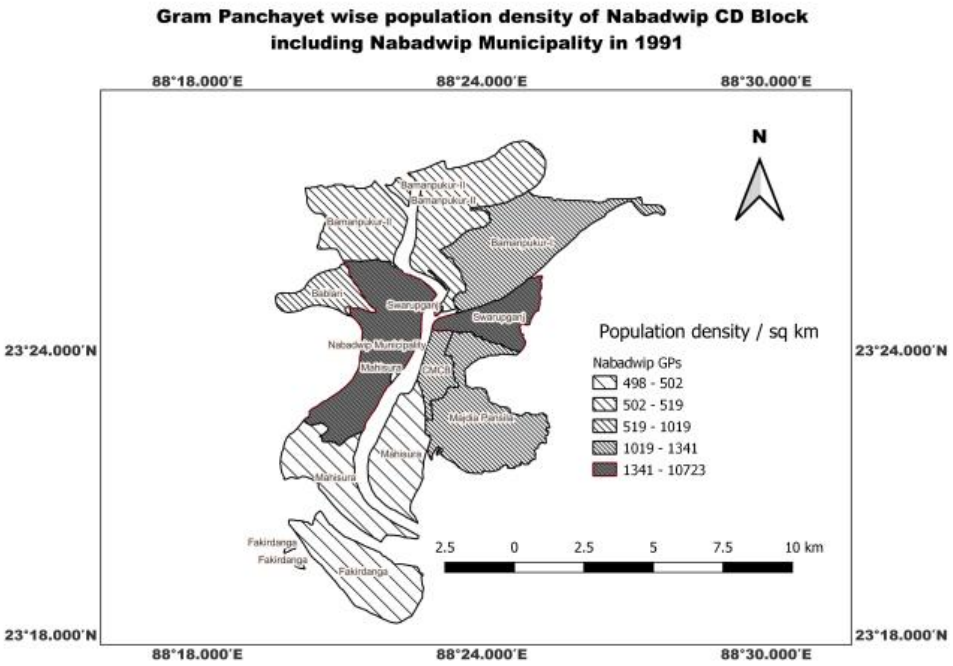

Figure-6

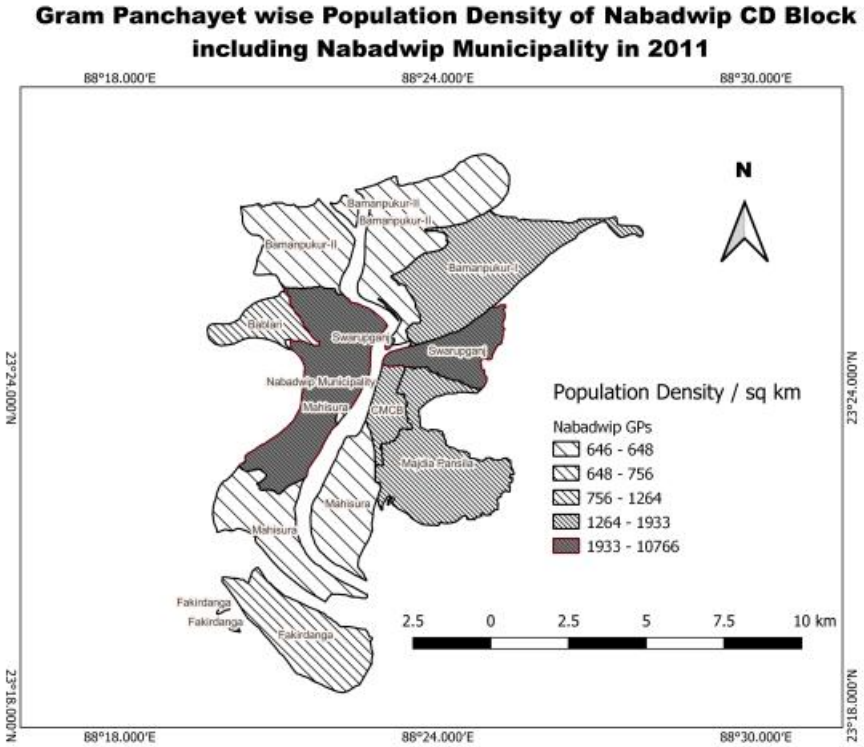

Figure-7

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Changes in irrigation facility:

Table-4: Changes in irrigation scenario at eight years interval

Year	River Lift Irrigation		Deep Tube Well		Shallow Tube well		Others	Total
	Number	Area	Number	Area	Number	Area	Area	Area in hectare
2008-09	6	181	23	696	24	144	260	1281
2016-17	13	119	12	222	0	0	NA	341

Data source: District Statistical Hand Book, Nadia-2009, 2017

The above mentioned report only indicates towards irrigation facilities provided at Government level, field study reveals that use of shallow tube well at private level has raised day after day.

Ground water scenario:

Ground water recharge of the study area as shown in the article 'Study on Estimation of Nadia District's Ground Water Recharge' (Ghosh*, 2023) presents that among the geographical area of 24955.43 ha recharge of 58.39571 million cubic metre is happening in Nabadwip Block during the study of 2012 to 2021. As per the Report on THE DYNAMIC GROUND WATER RESOURCES OF WEST BENGAL as on 31st March, 2023 the study area is under following condition:

Table-5: Ground water scenario of Nabadwip CD Block at a glance

Block	Recharge worthy area in ha	Total Annual Ground Water Recharge (Ham)	Annual Extractable Ground Water Resource (Ham)	Ground Water Extraction for Irrigation Use (Ham)	Total Extraction (Ham)	Net Ground Water Availability for future use (Ham)
Nabadwip	9739	4857.94	4615.05	3331.20	3824.10	726.48

Along with losing ground water depth arsenic contamination in ground water is a leading problem for this region; it is also evident for Nabadwip block (Mohammad Mahmudur Rahman a, 2013).

Soil quality assessment:

Continuous agricultural practice is the trend of today's agriculture to fulfil the demand of food production. Dependence on chemical fertilizers is the obvious need to continue the practice throughout the year.

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Findings from the study:

The above mentioned discussion focuses on some important issues which directly influence food-security, such issues are as follows:

- The fallow lands, mainly situated as the sand bars are now used as arable land.
- To cope with the demand gross cropped land and gross production has increased for major food crops.
- Areas under vegetation and orchard have increased to some extent and it is mainly the extension of orchard in expense of wetlands and arable lands.
- Loss of area under water bodies and wetlands is the alarming threat against environmental sustainability and food security.
- Expansion of built-up zone in Nabadwip Municipality is quite natural phenomenon from point of urbanization.Rapid population growth and increase of land-use under built-up purpose is observed for Gram Panchayets like Majdia-Pansila, Mahisura and Fakirdanga. In most of the cases the present built-up lands have grown in expense of wetlands, water bodies and fallow lands.

Conclusion:

The above study focuses on the issue that adaptation of new agricultural techniques, encroachment of low depth wetlands presently for agricultural purpose may be supporting present agricultural production.Such practices could not support agricultural system in a long term. Obvious issues of arsenic contamination in ground water and its influence into crop production is the obvious phase for agricultural practice in present study area. Overdependence on chemical fertilizers and making the lands for multiple crop production are other challenges for this area. To sustain soil fertility over use of land will not provide a sustained food security. From several aspects it may be concluded that food security is within a threat for the study area.

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