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Mapping Dynamics of land utilization and its changing Patterns of Purba Medinipure District -W.B

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Abstract:

The land is considered as fundamental base for the economic growth and development of human society. The people of purba Medinipur, W.B. are highly dependent on agriculture land which is of only monocropped, and less diversified. Resource is indispensable to human existence. Humans are bound to their physical and biological resources in terms of their shelter, food and sustenance. The natural resources in the form of land, water, vegetation, mineral etc. form the backbone of an economy. Availability and achievability of these resources are the pre-requisite for the economic strength and prosperity of civilization develops and rests upon the land for its survival. It also offers a number of opportunities foods, fodder, fiber, etc. land, a major component of Economic resources, influences almost every, activities of man. Agriculture, a major claimant and occupier of land determines people's socio-economic conditions of any agrarian society. Land, by its, very nature influences agriculture and agriculture by its productive capability shapes human society. Therefore, an understanding of land and its impact and people is essential in modern day planning.

Land differs markedly in their values. Land use continues to be influenced by varied, competing and offer conflicting interest. Land use pattern generally follows qualities of land, which include relief, slope, soils and its various properties. All these qualities of land, offer opportunities as well as greater understanding of the exploitable nature, limitation and upgrading the qualities of life are extremely necessary. Therefore, the greater part of this valuable resource is devoted to agriculture, the primary, and activity of people. Land use pattern is dynamic. Man through his scientific pursuits can alter, shape and redesign traditional land use pattern. So, apart from land, cultural landscape also plays an important role in exploitation of land potentially.

In the present paper an attempt has been made to examine the land-people interaction of Purba Medinipur district.

Keywords: Mono cropped, Land use pattern, cultural landscape, natural resources.

1.Introduction

The general objective of this research paper is to improve the understanding of the existing land use systems and the range of livelihood options of local resource users in the Purba Medinipur district. To understand the dynamics of the resource use pattern, and the factors which are the drivers of change is a prerequisite for planners and decision makers to be able to come up with zoning recommendations, design management plans and determine levels of use and introduce effective control mechanisms to ensure sustainability and protection of the natural resources.

The distribution of the particular types of land use in Purba Medinipur district depends largely on natural factors like the distribution of water, soil and range land quality (Langdale-Brown & Spooner, 1963), and the presence of vector-borne diseases (tsetse flies), but is also strongly related to the traditional preferences of different ethnic groups for particular economic activities (Bendsen & Gelmroth, 1983). Furthermore, government policies and the zoning and land use planning decisions made by district and tribal authorities have influenced the spatial coverage of different land use activities.

Land use and land cover changes have been extensively researched (Lambin et al., 2001) due to its key role in environmental goods and services. The large-scale results show that, due to increasing deforestation, forests are rapidly decreasing even as farmlands extend. Land use change is the modification in the purpose and usage of the land, which is not necessarily only the change in land cover but also changes in intensity and management (Verburg, et al, 2000). Information about land use change is necessary to update land cover maps and for effective management and planning of the resources for sustainable development (Alphan 2003; Muttitanon and Trpathy 2005). Early settlements were established on the coastal areas for both commercial and naval purposes (Nurlu and Erdem 2002). Over the years, remote sensing has been used for land use/land cover mapping in different parts of India (Gautam and Narayanan, 1983; Sharma et al., 1984; Jain, 1992; Brahabhatt et al., 2000). Accurate and upto date land cover change information is necessary to understanding and assessing the environmental consequences of such changes (Giri et.al, 2005). With the development of economy, the social economy condition of Purba Medinipur District has changed a lot. Land use change is the most remarkable among the changes which has deep influence on economy development, ecology change, and land sustainable development, et al, especially on the urbanization, more direct and remarkable.

This study presents the underlying dynamics of land use change at the micro watershed level, which can further contribute to policy development in conservation and development at the macro-scale.

2.Study Area

Purba Medinipur district is a part of the Lower Ganga Plain (Coastal Belt on the Bay of Bengal), West Bengal, India and its geographically location laying between 21° 36' 35"N to 22° 02' 23"N and 87° 22' 48"E to 88° 01' 12"E, and its covering an area of 4295.00 sq km.

Purba Medinipur district is surrounded by Paschim Medinipur and Howrah in north, Bay of Bengal in the south, South 24 Parganas and Howrah in east and also Orissa state in the west. Total population is 5,094,238. Population density 1076 km² (census, 2011). This district formed by the 25 block and 5 municipality area.

Topographically, the district can be divided into two parts. (a) almost entirely flat plains on the east, and west and north. (b) the Contai coastal plain on the south. Rupnarayan, Kasai-haldi, Keleghai, Chandia and Rosulpur are the main rivers of the district. The elevation of the district is within 10 m. from m.s.l. The vast expanse of land is formed of alluvium and is composed of younger and coastal alluvial (entisols). Coastal alluvial is saline and saline-alkali nature. The climate of Purba Medinipur district is Monsoon type. The annual rainfall varies from 1400 mm. to 1600 mm. Contai littoral part receives high rainfall which gradually decreases towards the north-west. The average annual temperature is about 26.50 c.

3.Objectives Of Study

The objective of the present study includes the analysis the cause the change of land uses. There are find out the relation between economic development and change of land use and also check out the degradation of bio-diversity for the land use change. Another aim of this study is examine the levels of region development considering the social, economical and demographical indicator. Finally to make suggestions for balanced regional agricultural development which are the basic prerequisites for socio-economic development.

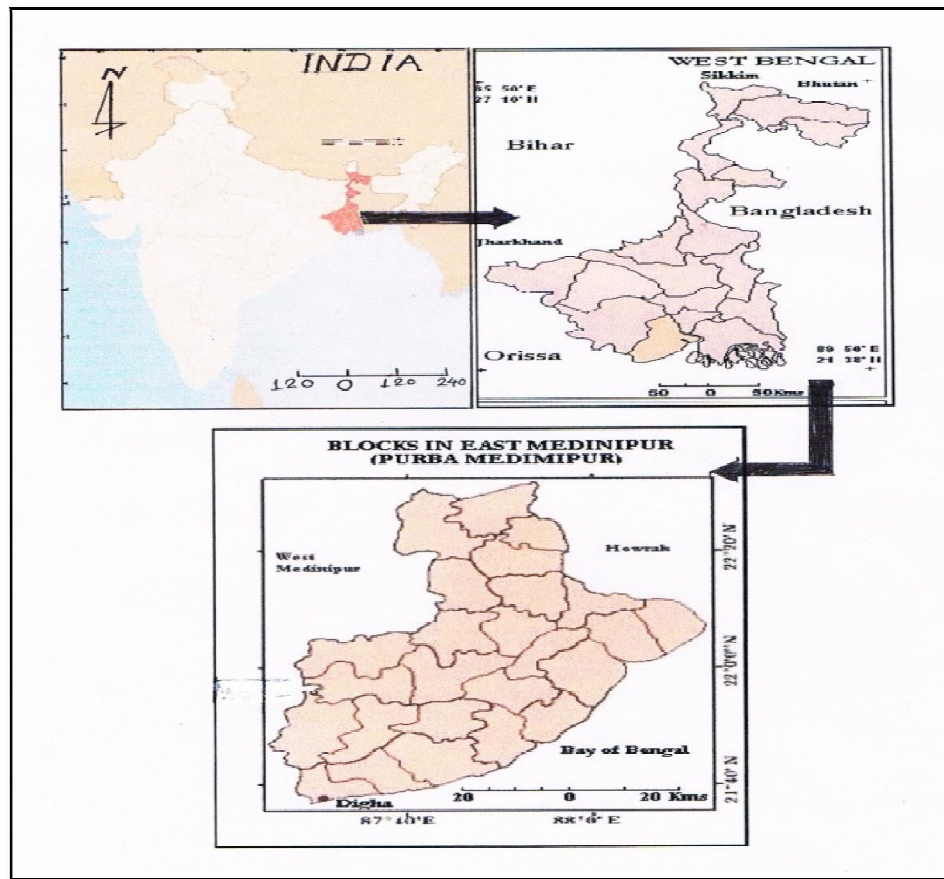


Figure 1: Location Map Of Purba Medinipur District.

4.Database And Methodology

The present paper intended to be empirical study designed for a micro-level investigation this involves gathering of information and collection of data at both case study and survey method. Degree of land use change will be analysed from the household interviews, participatory social mapping, land use mapping, policy review and census data and its impact will be drawn through the intensive field survey.

4.1.Socio-economic Survey

A socio-economic survey was carried out in through:

- collecting secondary data from government agencies on population, the area of cultivated fields and food production.
- Interviewing key informants including government officials about state land use strategies, policy planning and implementation related to land resources, land use

planning and development interventions; local people about historical events and land use change trends.

- Participatory mapping where the survey team worked with local people to produce time lines, land use sketch maps and land use transects and land tenure maps. Topographic and land use maps were used in the field to facilitate these discussion with farmers and officials on past land use practices, present land use conflicts and plans for the future.

4.2. Index Of Change In Land Use

A formula from Wang (2000) was used to quantify the degree of land use change. The degree of individual land use dynamics is calculated through the numerical change in particular land use dynamics multiplied by the length of time of the study. The formula is:

$$LC = \frac{U_b - U_a}{U_a} \times \frac{1}{T} \times 100\%$$

In the formula, LC represents the degree of land use change, U_a the amount of the particular land use at beginning of year 'a', U_b the amount at the end of year 'b' and T represents the length of time. When the unit of T is set as a year, LC indicates the degree of annual individual land use dynamics. The degree of integrated land use dynamics is defined by the integrated numeric changing of all the categories of land use during the length of time of the study in the area. Its formula is as follows:

$$LC = \frac{\sum_{i=1}^n \Delta LU_{i-j}}{2 \sum_{i=1}^n LU_i} \times \frac{1}{T} \times 100\%$$

Where LU_i represents the area of category i at the beginning year of the study, ΔLU_{i-j} the amount of category i converted to other categories and T represents the length of the study. When the unit of T is set as a year, LC indicates the degree of annual integrated land use dynamics

5. DISCUSSION

5.1. Spatial Pattern Of Land Utilization

Land use pattern of hold world very adynamic in the modern development society. There are developing countries like India's land use pattern morally deserted. Land use pattern of Purba Medinipur district are very uncommon respect to another district of West Bengal. There are forest area only 0.22% of the total land of state, but 13.48% and 22.66% area

forest cover West Bengal and India respectively. Area under non-agricultural use of Purba Medinipur are very high 24.57% and there are 18.52% and 7.70% area West Bengal and India respectively. Burren and un-culturable land cover of this district only 0.11% but 0.31% and 6.29% land cover West Bengal and India respectively. Fallow land other than current fallow cover 0.078% of Purba Medinipur district, 0.25% of West Bengal and 3.33% of India. Purba Medinipur district cover current fallow land very low 0.795 respect the India 4.83% . But the net sown area is very high of this district 73.41% respect the India 46.07%.

	Forest area(%)	Area under non-agricultural use (%)	Barren & Un culturable land (%)	Permanent pasture & other grazing land (%)	Land under misc trees & groves not included (%)	Culturable waste land (%)	Fallow land other than current fallow(%)	Current fallow (%)	Net area sown (%)
Purba Medinipur	0.22	24.57	0.11	00	0.73	0.078	0.078	0.79	73.41
West Bengal	13.48	18.52	0.31	0.06	0.67	0.40	0.25	3.84	62.47
INDIA	22.66	7.70	6.29	3.56	1.10	4.46	3.33	4.83	46.07

Table 1: Compare study the spatial pattern of land use

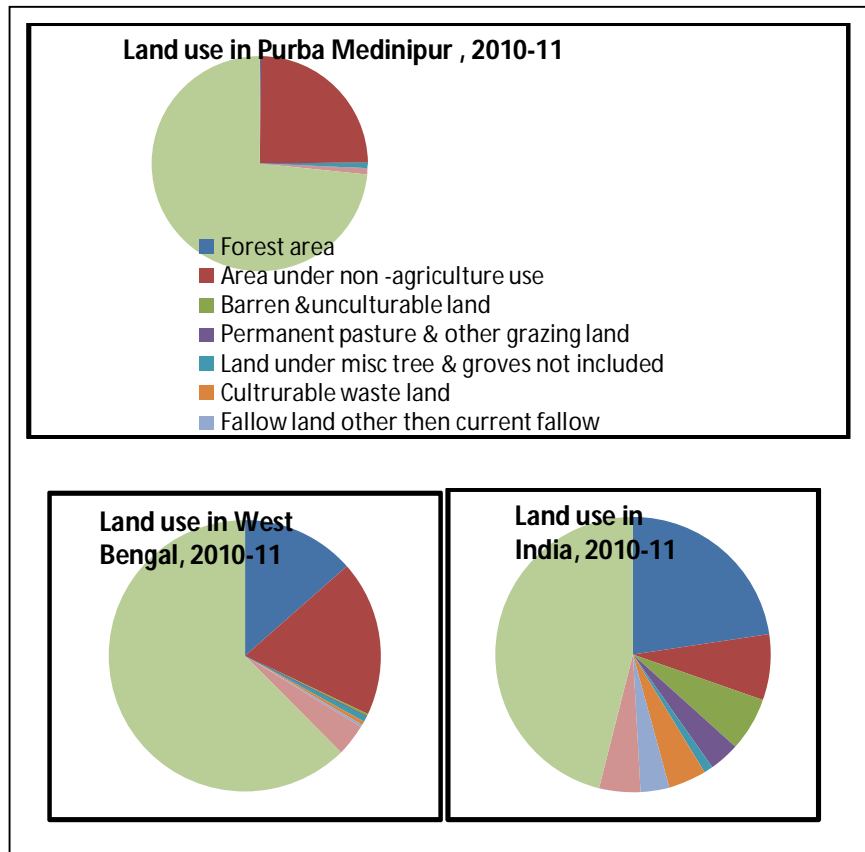


Figure 2: Land use pattern of Purba Medinipur, West Bengal and India

5.2. Changing Pattern Of Land Use

Table 2 show the changing pattern of land use of the Purba Medinipur didtrictfrom2001 to 2011.Changes over the 10- year period show that forest area cover only 0.9 thousand hectares from 2001 to 2011 .But there are area under the non-agricultural land cover 82.54 thousand hectares 2001 and increasing 99.36 thousand hectares of 2011.The Barren & unculturable land are decreased 0.81 thousand hectares 2001 to 0.52 thousand hectares on 2011.Permanent pasture & other gazing land, culturable waste land and current fallow land very increased from 2001 to 2011 .Other wise land under mise trees &groves not including land, fallow land other then current fallow , net area sown land mostly decreased from 2001 to 2011 like 3.21,0.68 and 307.04 thousand hectares to 2.41, 0.41 and 289.57 thousand hectares respectively.

Year	Total area (in ,000 hectares)	Forest area	Area under non-agricultural use	Barren & unculturable land	Permanent pasture & other grazing land	Land under misc trees & groves not included	Culturable waste land	Fallow land other than current fallow	Current fallow	Net area sown
2001	396.59	0.9	82.54	0.81	0.25	3.21	0.26	0.68	0.9	307.04
2002	396.59	0.9	85.24	0.91	0.17	3.11	0.17	0.54	0.91	304.64
2003	396.59	0.9	91.7	1.73	0.07	3.19	0.06	0.15	0.78	297.29
2004	396.6	0.9	90.63	1.66	0.01	3.3	0.37	0.12	2.11	297.5
2005	396.6	0.9	92.49	0.95	0.05	3.6	0.25	0.37	3.93	294.06
2006	396.6	0.9	97.44	0.45	0	2.89	0.31	0.31	3.14	291.16
2007	396.61	0.9	96.69	0.37	0.05	2.78	0.15	0.19	2.75	292.73
2008	396.61	0.82	98.35	0.35	0.06	2.62	0.25	0.15	2.65	291.36
2009	396.61	0.9	98.32	0.36	0.52	2.36	0.34	0.25	2.59	290.97
2010	396.61	0.9	99.21	0.41	0.42	2.54	0.28	0.25	2.12	290.48
2011	396.62	0.9	99.25	0.48	0.51	2.65	0.31	0.31	2.35	289.86

*Table 2: Land use pattern of Purba Medinipur District
(Data sources : District statistical handbook, Purba Medinipur)*

Table 3 shows the pattern of land use in the Purba Medinipur District in 2001 to 2011. Changes over the 10- year period shows that the land use has become more fragmented. Net sown land remains the principle cover in the district decreasing from 77.42 thousand hector of the total area in 2001 to 73.00 thousand hector in 2011. The second most cover is non-agricultural land, which reduced from 20.81 thousand hector of the area in 2001 to 25.02 thousand hector in 2011. The changes in land use from 2001 to 2011 have been quite diverse. The change index ranges from only 2.02 for rural settlement to -4.07 for barren land. Other significant changes include a 13% decrease in cropping land and a 10% increase in current fallow.

Year	Area (ha)		Area change (ha)	Percent of total area		Change %	Annual land use change index
	2001	2011		2001	2011		
Forest area	0.9	0.9	0	0.226935	0.226917	-1.71651	-0.00076
Area under non -agriculture use	82.54	99.25	16.71	20.81243	25.02395	4.21152646	2.023563
Barren & unculturable land	0.81	0.48	-0.33	0.204241	0.121023	-0.08321851	-4.07452
Permanent pasture & other grazing land	0.25	0.51	0.26	0.063037	0.128587	0.065549163	10.39846
Land under misc tree & groves not included	3.21	2.65	-0.56	0.8094	0.668146	-0.14125430	-1.74517
Culturable waste land	0.26	0.31	0.05	0.065559	0.07816	0.012601566	1.922175
Fallow land other than current fallow	0.68	0.31	-0.37	0.171462	0.07816	-0.09330125	-5.44152
Current fallow	0.9	2.35	1.45	0.226935	0.592507	0.365572064	16.10914
Net area sown	307.04	289.57	-17.47	77.42001	73.00943	-4.41057586	-0.56969
Total area (in ,000 hectares)	396.59	396.62		100	100		

Table 3: Land use change between 2001 to 2011 in the Purbe Medinipur district.

Annual land use change index very clearly explain the land use changing pattern of Purba Medinipur district. There are show that land use changing pattern between 2001 to

2011. Forest cover area is decadal change -1.716% and annual land use change index is -0.00076. Area under non -agriculture use is decadal change 4.211% and annual land use change index is 2.023. Barren & unculturable land is decadal change -0.083% and annual land use change index is -4.074. Permanent pasture & other grazing land is decadal change 0.065% and annual land use change index is 10.398. Land under misc tree & groves not included is decadal change -0.141% and annual land use change index is -1.745. Cultrurable waste land is decadal change 0.012% and annual land use change index is 1.922. Fallow land other then current fallow is decadal change -0.093% and annual land use change index is -5.441. Current fallow is decadal change 0.365% and annual land use change index is 16.109. Net area sown is decadal change -4.41% and annual land use change index is -0.569.

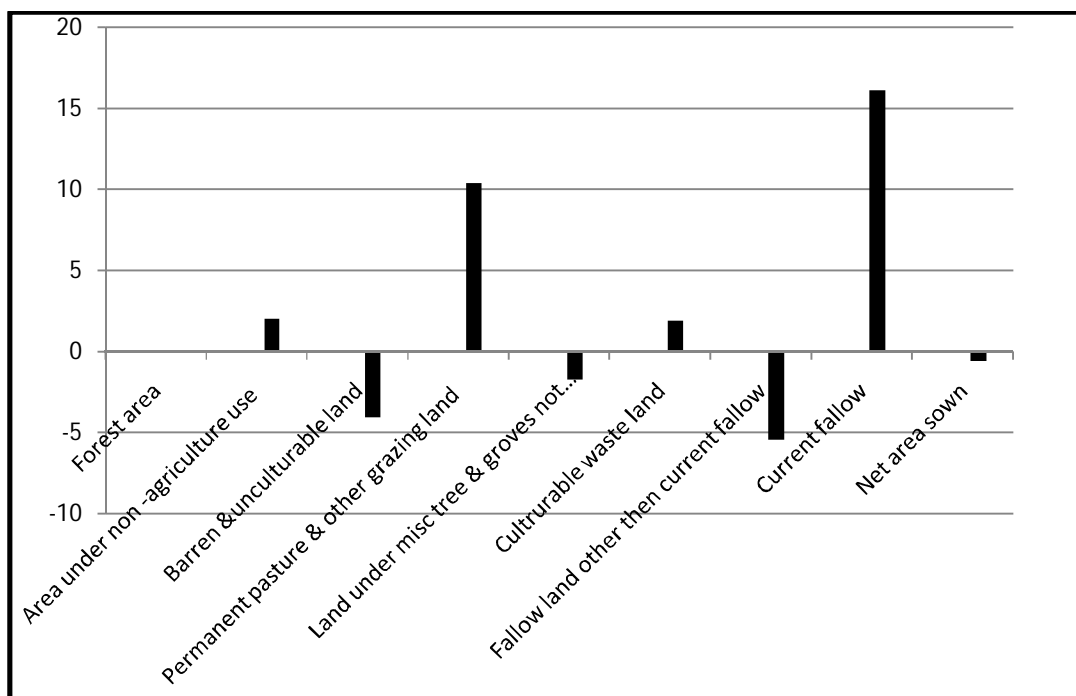


Figure 3: Annual land use change index of purba Medinipur District

6. Finding

The level of agricultural development in the study area is not satisfactory. On the other hand, population pressure on land is increasing in a slow but steady rate. As a result of which their already impoverished socio – economic status deteriorates day by day. There are a number of problems which has been found as the major obstacles for poor quality of life of the study area. These are: Lack of infrastructure facilities like irrigation and

cannel system is a major problem of the study area. High diversification of cropping pattern of the study area. A considerable area of the district is inundated during rainy seasons. Even during normal rainfall water logging in the low land areas is a major problem. The major part of agricultural land of the district has been transformed into piscicultural which is environmental unsustainable. Apart from agriculture, poor development of non-agricultural activates is another problem which needs to be addressed seriously.

7.Conclution

The regional mapping of land cover/land use is necessary as a major first step to understanding and checking land use change in the study area in a bid to mitigate adverse effects. The land use dynamics of the region was studied using time series of survey data, with settlement expansion emerging as the major force driving land use change. The impact of such changes were examined, the most significant being forest degradation. Agricultural bad practices like cultivation in slope direction and bush burning were also observed during fieldwork for which corrective measures are required to enforce a change in order to minimize impact on the ecosystem.

The regional mapping of land cover/land use is necessary as a major first step to understanding and checking land use change in the study area in a bid to mitigate adverse effects. The land use dynamics of the region was studied using time series of survey data, with settlement expansion emerging as the major force driving land use change. Agricultural bad practices like cultivation in slope direction and bush burning were also observed during fieldwork for which corrective measures are required to enforce a change in order to minimize impact on the ecosystem. Purba Medinipur coastal plain has created conflicts between various resource users and interest groups, between developers and ecologists/environmentalist, engineers and geoscientists and land owners and economic men. The principles of land use are not scientifically followed in this region, a number of local communities are still unemployed, and infrastructure does not follow the sustainable development concept. Studies on land use have revealed that significant changes have taken place over the last two to three decades, particularly in the tropics. The findings of the present study have supported that fact. Also, this study revealed a high rate of land use change in the Purba Medinipur district, West Bengal. A major change was noted with respect to the change from forest to other land uses between 2001 and 2011. There is a high rate of change of high forest to other land uses. If such rate

continues, there may be no high forest in the catchment in the next 50 years. This is against the concept of sustainable development and may trigger off other environmental problems like erosion, flooding and increase carbon dioxide in the atmosphere which could contribute to global warming. Hence, reforestation should commence in earnest, particularly in the lower part of the catchment. Also, the current ban on logging of wood from the forest in Purba Medinipur district, West Bengal State by the state government should be enforced comprehensively for some time. This would reduce the rate of current tree removal and encourage sustainable development within the district.

8.Acknowledgement

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