Land-use status of Jalpaiguri district and compare it to state and nation

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Abstract
Today the rational use of land has great importance due to growth of population, as well as the increasing demand of food grain. The importance that the question has gained today is the consequence of years of socio-economic development and of a new agriculture order and the generation of new agrarian surpluses. Jalpaiguri is poised for further and rapid advance into a new phase of industrial modernization, urbanization and diversification into different forms of non agriculture economic activity. In the permanently settled parganas of the district most of the available land is under cultivation and there is not much room for extension. This paper will show us the land use pattern of the district as well as its further recommendation.

Key words: ***1.*** *Land use, 2.Net area sown, 3.Forest, 4.Current Fellow.*

Objective

The objective of study is to show the land use pattern of the district, compare to state and nation with further development.

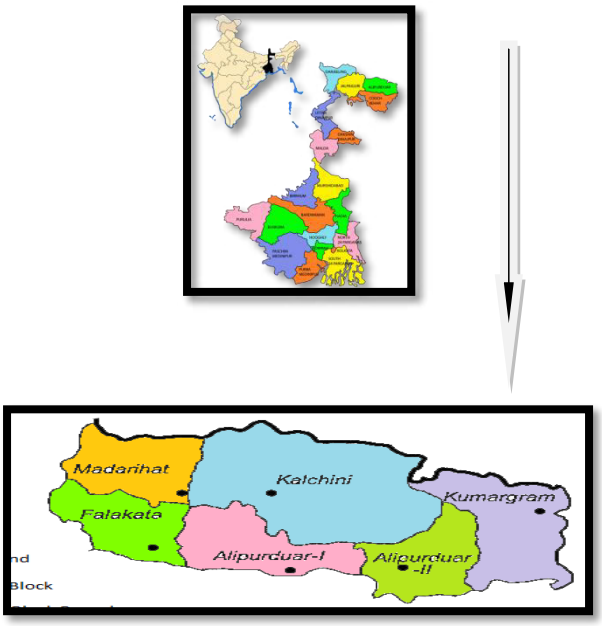
Database and methodology

Land use statistics in West Bengal at the Block and higher administrative levels are available by the standard nine-fold classification. These data are collected by the Department of Land and land Reform under the establishment for an Agency for Reporting Agriculture Statistics (EARAS) scheme. Under this scheme plot- wise information on land use and cropping pattern are recorded by the Amins and Bhumisahayaks in 15 percent of the Mouzas in each block in the district. The final estimated of area are calculated by the Department of Agriculture. The entire information of the paper is collected from District statistical Hand Book (2008).

Methodology applied in the study are totally depends statistical analysis by tables, charts, interpretation, projection. Some basic information are taken from internet and few literature have been studied for prepare the papers.

Study area

The study area comprises districts of Jalpaiguri, west Bengal bounded by the latitude of 26° 16' to 27° 13' North and the longitudes of 87° 59' to 89° 53' East. The region covers an area 6227 sq.km. This is 10.56% of the total geographical area of the state and inhabited by 3869675 persons (2011).The district situated in the northern part of West Bengal has international border with Bhutan and Bangladesh in the north and south respectively and district borders with Assam and the Darjeeling hills in the east, west and northwest.



Jalpaiguri District

Introduction

Land use is the human use of land. Land use involves the management and modification of natural environment or wilderness into built environment such as fields, pastures, and settlements. It has also been defined as "the arrangements, activities and inputs people undertake in a certain land cover type to produce, change or maintain it" (FAO- 1997)

Land cover refers to the physical and biological cover over the surface of land, including water, vegetation, bare soil, and/or artificial structures (Ellis, 2010).

Land use means use of land in various purposes of a region. The utilization of land depends upon physical factors like topography, soil and climate as well as upon human factors such as the density of population, duration of occupation of the area, land tenure and technical levels of the people. There are spatial and temporal differences in land utilization due to the continued interplay of physical and human factors (Khuller, 2007).

Land use is a more complicated term. Natural scientists define land use in terms of syndromes of human activities such as agriculture, forestry and building construction that alter land surface processes including biogeochemistry, hydrology and biodiversity. Social scientists and land managers define land use more broadly to include the social and economic purposes and contexts for and within which lands are managed (or left unmanaged), such as subsistence versus commercial agriculture, rented vs. owned, or private vs. public land. While land cover may be observed directly in the field or by remote sensing, observations of land use and its changes generally require the integration of natural and social scientific methods (expert knowledge, interviews with land managers) to determine which human activities are occurring in different parts of the landscape, even when land cover appears to be the same. For example, areas covered by woody vegetation may represent an undisturbed natural scrublands, a forest preserve recovering from a fire (conservation), re growth following tree harvest (forestry), a plantation of immature rubber trees (plantation agriculture)

According to Agriculture department of India land are use mainly nine purposes that are given below 1.Forest area 2.Area under non agriculture use 3.Barren and uncultivable land 4.Land under miscellaneous and grooves not include in net sown area 5.Cultureable waste land 6.Fallow land other than current fallow 7.Current fellow 8.Permanent pasture and other grazing land 9.Net area sown. This paper will show us the land use Jalpaiguri district compare to West Bengal, India.

Land-use and land-cover change (LULCC); also known as **land change**) is a general term for the human modification of Earth's terrestrial surface. Though humans have been modifying land to obtain food and other essentials for thousands of years, current rates, extents and intensities of LULCC are far greater than ever in history, driving unprecedented changes in ecosystems and environmental processes at local, regional and global scales. These changes encompass the greatest environmental concerns of human populations today, including climate change, biodiversity loss and the pollution of water, soils and air. Monitoring and mediating the negative consequences of LULCC while sustaining the production of essential resources has therefore become a major priority of researchers and policymakers around the world.

Land-use and land-cover change with its scientific significance

Satellite image of deforestation in the Amazon region, taken from the Brazilian state of Para on July 15, 1986, the dark areas are forest, the white is

deforested areas, and the gray is re-growth. The pattern of deforestation spreading along roads is obvious in the lower half of the image. Scattered larger clearings can be seen near the center of the image (NASA). **Land cover** refers to the physical and biological cover over the surface of land, including water, vegetation, bare soil, and/or artificial structures. **Land use** is a more complicated term. Natural scientists define land use in terms of syndromes of human activities such as agriculture, forestry and building construction that alter land surface processes including biogeochemistry, hydrology and biodiversity. Social scientists and land managers define land use more broadly to include the social and economic purposes and contexts for and within which lands are managed (or left unmanaged), such as subsistence versus commercial agriculture, rented vs. owned, or private vs. public land. While land cover may be observed directly in the field or by remote sensing, observations of land use and its changes generally require the integration of natural and social scientific methods (expert knowledge, interviews with land managers) to determine which human activities are occurring in different parts of the landscape, even when land cover appears to be the same. For example, areas covered by woody vegetation may represent an undisturbed natural shrubland, a forest preserve recovering from a fire (use = conservation), regret following tree harvest (forestry), a plantation of immature rubber trees (plantation agriculture), Sweden agriculture plots that are in between periods of clearing for annual crop production, or an irrigated tea plantation. As a result, scientific investigation of the causes and consequences of LULCC requires an interdisciplinary approach integrating both natural and social scientific methods, which has emerged as the new discipline of **land-change science**.

Influence on environment

Changes in land use and land cover date to prehistory and are the direct and indirect consequence of human actions to secure essential resources. All of these causes and their consequences are observable simultaneously around the world today.

- **Loss of biodiversity**

Biodiversity is often reduced dramatically by LULCC. When land is transformed from a primary forest to a farm, the loss of forest species within deforested areas is immediate and complete. Even when unaccompanied by apparent changes in land cover, similar effects are observed whenever relatively undisturbed lands are transformed to more intensive uses, including livestock grazing, selective tree harvest and even fire prevention.

- **Impact on climate**

LULCC plays a major role in climate change at global, regional and local scales. At global scale, LULCC is responsible for releasing greenhouse gases to the atmosphere, thereby driving global warming. LULCC can increase the release of carbon dioxide to the atmosphere by disturbance of terrestrial soils and vegetation, and the major driver of this change is deforestation, especially when followed by agriculture, which causes the further release of soil carbon in response to disturbance by tillage. Changes in land use and land cover are also behind major changes in terrestrial emissions of other greenhouse gases, especially methane (altered surface hydrology: wetland drainage and rice paddies; cattle grazing), and nitrous oxide (agriculture: input of inorganic nitrogen fertilizers; irrigation; cultivation of nitrogen fixing plants; biomass combustion).

- **Land cover change and pollution**

Changes in land use and land cover are important drivers of water, soil and air pollution. Perhaps the oldest of these is land clearing for agriculture and the harvest of trees and other biomass. Vegetation removal leaves soils vulnerable to massive increases in soil erosion by wind and water, especially on steep terrain, and when accompanied by fire, also releases pollutants to the atmosphere. This not only degrades soil fertility over time, reducing the suitability of land for future agricultural use, but also releases huge quantities of phosphorus, nitrogen, and sediments to streams and other aquatic ecosystems, causing a variety of negative impacts (increased sedimentation, turbidity, eutrophication and coastal hypoxia).

- **Other impacts on environment**

Other environmental impacts of LULCC include the destruction of stratospheric ozone by nitrous oxide release from agricultural land and altered regional and local hydrology (dam construction, wetland drainage, irrigation projects, increased impervious surfaces in urban areas). Perhaps the most important issue for most of Earth's human population is the long-term threat to future production of food and other essentials by the transformation of productive land to nonproductive uses, such as the conversion of agricultural land to residential use and the degradation of rangeland by overgrazing.

Methods to estimate the change

The methods of land-change science include remote sensing and geospatial analysis and modeling, together with the interdisciplinary assortment of natural and social scientific methods needed to investigate the causes and consequences of LULCC across a range of spatial and temporal scales.

- **Remote sensing**

Remote sensing is an essential tool of land-change science because it facilitates observations across larger extents of Earth's surface than is possible by ground-based observations. This is accomplished by use of cameras, multi-spectral scanners, *RADAR and LiDAR sensors mounted on air- and space-borne platforms, yielding aerial photographs, satellite imagery, RADAR and LiDAR datasets.* Data available from remote sensing vary from the very high-resolution datasets produced irregularly over extents no larger than a single state or province (by aerial photography, imaging, LiDAR, and by high resolution satellite sensors such as IKONOS and Quick bird), to regional datasets produced at regular intervals from satellites (e.g., Landsat, SPOT), to the lower-resolution (> 250 m) datasets now produced across the entire Earth on a daily basis (e.g., MODIS).

- **Geospatial interpretation**

Maps and measurements of land cover can be derived directly from remotely sensed data by a variety of analytical procedures, including statistical methods and human interpretation. Maps of land use and land cover (LULC) are produced from remotely sensed data by inferring land use from land cover (e.g., urban = barren, agriculture = herbaceous vegetation). Conventional LULC maps are categorical, dividing land into categories of land use and land cover (thematic mapping; land classification), while recent techniques allow the mapping of LULC or other properties of land as continuous variables or as fractional cover of the land by different LULC categories, such as tree canopy, herbaceous vegetation, and barren (continuous fields mapping). Both types of LULC datasets may be compared between time periods using geographic information systems (GIS) to map and measure LULCC at local, regional, and global scales.

- **Assessing the driving forces**

Assessing the driving forces behind LULCC is necessary if past patterns are to be explained and used in forecasting future patterns. *Driving forces on LULCC can include almost any factor that influences human activity, including local culture (food preference, etc.), economics (demand for specific products, financial*

incentives), environmental conditions (soil quality, terrain, moisture availability), land policy & development programs (agricultural programs, road building, zoning), and feedbacks between these factors, including past human activity on the land (land degradation, irrigation and roads). Investigation of these drivers of LULCC requires a full range of methods from the natural and social sciences, including climatology, soil science, ecology, environmental science, hydrology, geography, information systems, computer science, and anthropology, sociology, and policy science.

- **Spatially-explicit modeling**

Spatially-explicit models of the social and environmental causes and consequences of LULCC is made possible by GIS and other computer-based techniques which can define and test relationships between environmental and social variables using a combination of existing data (census data, soil maps, LULC maps), observations on the ground (ecological measurements, household surveys and interviews with land managers) and data from remote sensing. *These spatial models of LULCC drivers and their impacts can be used to establish cause and effect in LULCC observed in the past and is also extremely useful tools for land mangers and policymakers, offering forecasts of future land use changes and their effects*. Models of LULCC dependence on political, economic, environmental and other changes can then be used to explore the impacts of policy decisions and other factors using scenario analysis and other computer modeling techniques, guiding policymakers and land managers toward sustainable land management decisions.

Sustainable development

Sustainable land management is a central challenge in the sustainable management of earth systems and resources. On the one hand, land management must ensure a growing supply of food and other resources to human populations, which are expected to grow for decades to come. *On the other hand, management of land to procure these resources is linked with potentially negative consequences in the form of climate change, biodiversity loss and pollution.* Moreover, local alteration of land use and land cover can have global consequences, requiring local and regional solutions to global problems and the cooperation of the world's policymakers, land managers, and other stakeholders in land management at local, regional and global scales.

Sustainable management of land

Management of land in support of biodiversity covers a wide range of policies and practices. The most basic of these is to set-aside existing biodiverse habitats as conservation reserves from which humans are excluded. Another is the establishment of preserves and parks in which local human populations and tourists participate in the less harmful economic use and preservation of biodiverse lands. More recently, efforts are being made to restore biodiverse habitats on lands stripped of their original habitat, and to manage existing agricultural and urban landscapes to enhance their suitability as habitat by practices including the planting of native plants and the restoration of habitat patches within intensively managed landscapes.

Discussion

Land cover refers to the physical and biological cover over the surface of land, including water, vegetation, bare soil, and/or artificial structures. From the above classification forward by Agriculture Department of India, we found only in the district Forest area, Area under non –agriculture use, Current fallow, Net sown area. Rest of the classification such as Barren and uncultivable land, Permanent pasture and other grazing land, Land under miscellaneous trees and groves not included in net sown area, Culturable waste land, Fellow land other than current fellow are excluded due to minimum proportion.

Forest area

In India Forest area has increased considerably from 40.45 million hectares in 1950-51 to 69.00 million hectares in 1999-2000 recording a 70 percent increase in a span of half a century. However 22.23 percent of forest land to the total reporting area is not sufficient for a tropical country like India where about 33 percent of the total land should be under forest. This will require massive tree plantations and vigorous restriction on the reckless felling of trees. According to the expert committee recommendation, much of the area reclaimed from the forest for agriculture should be retired from cultivation and brought back under forest to save the land from the adverse effect of deforestation.

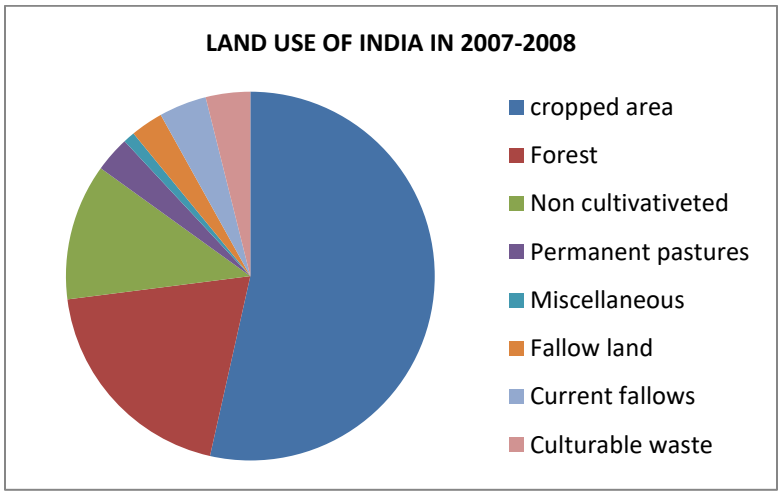
In West Bengal the area under forest is limited and concentrated regionally. Of the reporting area, 13.5 per cent is under forest (although, because of the methodology of data collection, this is likely to be and underestimate). As may be expected, forest are concentrated in the Western District of Bankura, West Midinipur and Purulia , in the estuarine area of south 24 parganas and in the Himalayan region of Darjiling and Jalpaiguri.

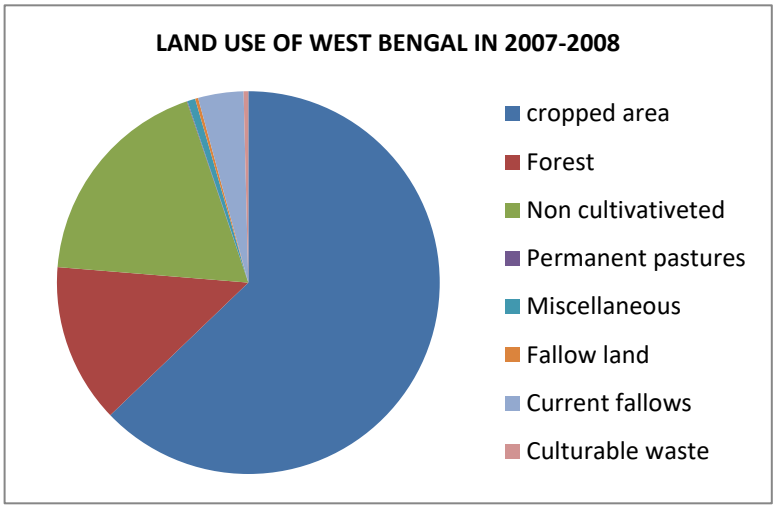
In jalpaiguri district the area under forest is large compare to the district of West Bengal. Of the reporting area (622.70 thousand hectares), 28.75 percent (179.00 thousand hectares) is under forest. The forest of the Jalpaiguri district are numerous and valuable and cover an even larger area than those of the adjoining district of Darjeeling. In addition to the reserved forest, which are situated entirely in the Western Duars between the Tista and Sankos rivers there is a large forest measuring 81 square miles, west of the Tista, which is belong to the Raikat of Baikanthapur. All the forest are plains forests,with the exception of about 45 square miles in the vicinity of Buxa which occupy hilly ground rising rapidly from 500 to 4000 feet. Administrative division of the forest of Jalpaiguri district is three, such as Jalpaiguri division ,Buxa division, Baikanthapur division.

Table 01: area under different land use categories of india, west bengal and jalpaiguri in thousand hectares

Region	Year	Total Reported area	Total cropped area	Forest	Not available for cultivation	Permanent pastures and other grazing	Land under Miscellaneous	Fallow land other than current fallow	Current fallows	Cultural waste
India	1999-2000	306054	189740	69024	42407	11040	3618	10108	14798	13828
West Bengal	2003-2004	8687.54	5463.67	1171.31	1608.97	5.05	57.87	22.13	333.38	34.50
Jalpaiguri	2007-2008	622.70	334.65	179.00	84.65	00.00	06.11	00.06	14.81	00.06

Source: 1. Statistical Abstract of India (2003)
2. Directorate of Agriculture (Evaluation) Government of West Bengal (2006)
3. District Statistical Hand Book (2008)


LAND USE OF INDIA IN 2007-2008
cropped area
Forest
Non cultivativeted
Permanent pastures
Miscellaneous
Fallow land
Current fallows
Culturable waste


LAND USE OF WEST BENGAL IN 2007-2008
cropped area
Forest
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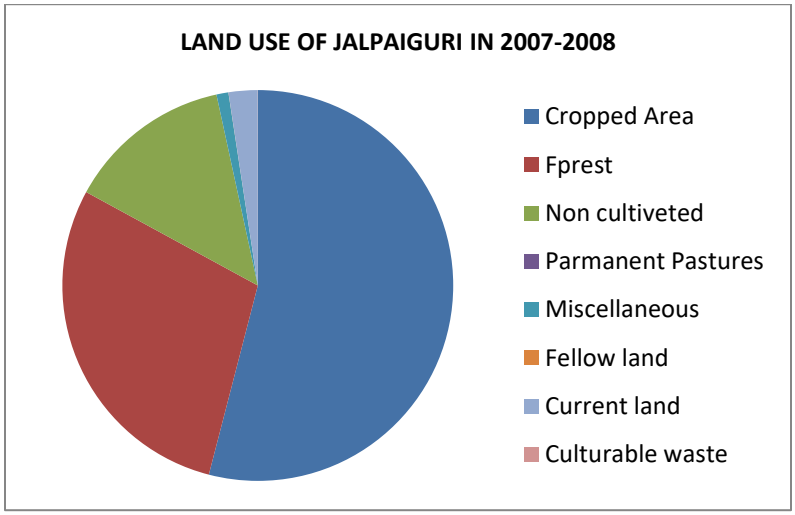
Permanent pastures
Miscellaneous
Fallow land
Current fallows
Culturable waste


LAND USE OF JALPAIGURI IN 2007-2008
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Culturable waste

Area under non-agriculture use

In India land put to non agricultural uses includes land occupied by villages, towns, roads, railway or under water i.e. rivers, lakes, canals, tanks, ponds etc. These areas cannot be brought under plough except at high input cost with possible low returns. Land not available for cultivation accounted for 7 .70 (47517 thousand hectares) of the total reported area in 2000-01.

In West Bengal the extent of land currently under non agriculture uses is higher in West Bengal in 2003-2004 was 18.50 per cent (1608.97 thousand hectares of total reported area) while the corresponding share for India was 7.70 per cent.

In the district the area under non agriculture uses is 13.57 per cent (84.65 thousand hectares) of total reported area of the district. This is very higher compare to India but close to West Bengal. This is high due to the high proportion of rivers and ponds. Census 2001 it has recorded 4 municipality and 595 villages.

Current fallow

Fallow land means the land which was used for cultivation but is temporarily out of cultivation. Fallow land is of two type's viz. current fallow and fallow other than current fallow. Fallow of one year is current fallow while that of 2-5 years is classified as fallow other than current fallow.

In India there have been varying trend in the extend of current fallow but it has recorded an increase from 10.68 million hectares in 1950-1951 to 14.79 million hectares in 1999-2000. It is 4.83 per cent of total recorded area.

In West Bengal current fallow land is 3.84 per cent (333.38 thousand hectares) of total area recorded in the year of 2003-2004. Current fallow land in the state are concentrated in specific region of the state. The district level analysis shows that much of the current fallow is concentrated in eight districts- Darjeeling (3.43%), Jalpaiguri (3.45%), Malda (13.38%), Birbhum (5.77%), Bankura (5.98%), Purulia (17.70%), Paschim Madnipur (3.23%), Howrah (3.55%).

In Jalpaiguri district in the year 2003-2004 the proportion area under current fallow is 21.46 thousand hectares which is 3.45 per cent of total recorded area. The area under current fallow is mainly concentrated in northern part of the district, such as Malbazar ,Nagrakata, Kalchini, Kumagram Duar, Matiali, Madarihat blocks.

There is need to reduce the extent and frequency of fallow land in order to increase agriculture production. This can be done by proper dose of fertilizer,

providing irrigation facility, crop rotation and combination and several other similar farm techniques.

Table 02
Land use in india and west bengal, jalpaiguri as percentage of reported area

Region	Year	Total Reported area	Total cropped area	Forest	Not available for	Permanent pastures and	Land under Miscellaneous	Fallow land	Current	Cultivable
India	1999-2000	306054	46.07	22.66	07.70	03.56	01.10	03.33	04.83	4.46
West Bengal	2003-2004	8687.54	62.89	13.48	18.52	00.06	00.67	00.25	03.84	00.40
Jalpaiguri	2007-2008	622.70	54.09	28.75	13.57	00.00	00.98	00.00	3.45	00.00

Source: Calculated by Author

Net sown area

Cropped area in the year under consideration is called net sown area. This area has a special significance in an agricultural country like India because agriculture production largely depends upon this type of land. There is an urgent need to increase the net sown for meeting the food and other requirement of rapidly increasing population in India; although there is not much scope for increasing area under this category due to natural limitations such as topography, soil, climate, etc. However, it is heartening to note that net area sown has increase from 118.7 million hectares in 1950-1951 to 142.2 million hectares in 1999-2000. Net sown area accounts for about 46 per cent of the total reporting area of India against the world average of about 32 per cent. This is a serious trend and can be checked only by population control.

Agriculture prosperity does not depends as much as on total net sown area as it does on the percentage of net sown area to the total reporting area. There are large variations in proportion of net sown area to total reporting area from

one state to another. In West Bengal have high proportion of cultivated area. This is largely due to gentle slope of the land, fertile alluvial and black soil and favourable climate, excellent irrigation facilities and high density of population. The share of net sown area is 5463.67 thousand hectares, that is 62.89 per cent of total reported area. Net sown area is not evenly distributed all part of states. Seven districts have high proportion of net sown area, such as Coochbehar (77.55%), Uttar Dinajpur (87.23%), Dakshin Dinajpur (87.07%), Murshidabad (75.83%), Nadia (78.64%), Hoogly (72.12%), Purba Midnapur (74.96%). It is lowest in the South 24 Parganas 40.22 per cent of total reported area.

In Jalpaiguri district the area under sown is 337.46 thousand hectares, that is 54.09 per cent of total reported area in the year of 2003-2004. Jalpaiguri is famous for three T, such as 1.Tea 2.Timber 3.Tourism. Tea is the most valuable crop grown in the district. It covers 118707 hectares of total geographical area. The land is generally fertile and grows good crops of rice and jute. The Western Duars comprises an area of 1968 square miles, of which 509 square miles or more than a quarter of the whole area, are occupied by reserved forest. In the north, at foot of the hills, lie numerous tea gardens. Below the tea-gardens, as far south as the Cooch Behar border, lie rice fertile plains growing splendid crops of rice, jute, tobacco and mustard. Towards the east, there is still much waste land, but, at the present rate of progress, it will not be long before this is brought under cultivation.

Conclusion

Changes in land use and land cover date to prehistory and are the direct and indirect consequence of human actions to secure essential resources. This may first have occurred with the burning of areas to enhance the availability of wild game and accelerated dramatically with the birth of agriculture, resulting in the extensive clearing (deforestation) and management of Earth's terrestrial surface that continues today. More recently, industrialization has encouraged the concentration of human populations within urban areas (urbanization) and the depopulation of rural areas, accompanied by the intensification of agriculture in the most productive lands and the abandonment of marginal lands. All of these causes and their consequences are observable simultaneously around the world today.

The main features of the data and information can be summarized as follows:

1. Forest area of Jalpaiguri district is higher (28.75%) compare to the state and nation. Forest area of West Bengal is much lower (13.48%)

compare to the district but In case of India area under forest cover is near(22.66%) to district but all of these are not to the sustain one(33.33%).

2. Area under non agricultural use is higher in the state (18.52%) compare to the district (12.28%) and nation (7.70%). This indicated that the pressure on land is very high in West Bengal.
3. Area under current fallow is almost same in case of district (3.45%), state (3.84%) and nation (4.83%). This indicated that much area is still now not in use, this can be done by proper dose of fertilizer, providing irrigation facility, crop rotation and combination and several other similar farm techniques.
4. In case of sown area the state is higher (62.89%) compare to the district jalpaiguri (54.19%) and nation (46.07%). Form the percentage it is clear to us that pressure on land is almost same all over the country and in case of West Bengal it is alarming rate.

The main sources of new demand for land at present are industry, housing,urban spaces and infrastructure. The provision of land for each of these purposes will require the conversion of land from other uses. The factors to be consideredwhen land is converted to any of these uses from other current use include thefollowing: 1. The current use to which land is being put and the social costs of landconversion. Where land is agricultural, the factors to be considered arethe number of crops grown on the land, irrigation facilities current levelsof employment and incomegeneration and the productive potential oflands. 2. The impact of land conversion on the present users of the land,Particularly when they belong to the working poor. Full and just
Compensation must be provided for any land that is converted toalternative purposes. This is a matter of the people's entitlement.3. The benefits from the alternative uses to which the land will be put,particularly with regard to employment and income generation.4. Environmental considerations, particularly with respect to fragile orendangered ecological zones.5. Identify vacant land first. As stated, the Govt. has initiated action tocreate an inventory of land that is not currently in use.

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