

Land Degradation and its Possible Consequences on the Environment: A Case Study of Amta (Gram Panchayat), Haora, West Bengal

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ABSTRACT

In present day lot of problem has been rise up along bad consequences over our environment and socio-economics, among them land degradation is major one for its powerful impact. Land Use & Land Cover (LU/LC) change has been occupied the main theme in the concept of land degradation. This paper examines the LU/LC changes that have been taken place in Amta Gram Panchayat, in Amta-I block, West Bengal.

Therefore this paper have been formulated several objectives, which include, to find out the major causes of land degradation in Amta Gram Panchayat followed by to find out the environmental & socio-economic impact of land degradation on human being as well as to suggest some remedial measures for adverse effect of land degradation and finally to explore whether any Governmental initiatives have taken place for against the problem & adverse effect of land degradation.

However in this research paper an, attempt has been made to point out the change detection of land degradation problem and its possible adverse impact on surrounding environment in Amta Gram Panchayat block followed by suggestive measures which could be made out the possible solution of land degradation in near future.

Keywords: land degradation, human induced process, LULC change.

1.0 Introduction:

Now in present day almost the entire world has been face lot of environmental related problem along with them very bad socio-economic issues. Land degradation is one of the major problems which create very worst consequence in our daily life and this problem has been rapidly emerged all over the world. It is a peculiar problem in few parts of West Bengal as well as Amta Gram Panchyat. At the same time it might be responsible for some environmental and socio-economic problem like, climate change along with a macro level to micro level range, cheap air quality, poverty etc.

Land degradation, indicated by state of soil degradation, vegetation degradation and degradation of its water resources, is often linked to sustainability in terms of retaining its productivity. Human intervention which are causing land degradation are- deforestation, over grazing by livestock, mismanagement of agricultural land, over-exploitation of the vegetative cover for domestic use, and industrial activities. (Gabriels. D, Cornelis.W.M., Human Induced Land Degradation, LAND USE LAND COVER AND SOIL SCIENCES-Vol. III)

Land degradation normally depicting such process, in which combination of various human intervening process already been taken place over land in terms of some land use and land cover changing issues and ultimately this process degraded a major part of the entire land. (Definition after Author)

In Howrah 1('000) ha land is occupied as waterlogged area while 146('000) ha land is occupied by normal agricultural land, water bodies, rivers, lakes and habitats etc. (Das, K. and Sarkar, D. (2016), "Soil Degradation: Status and Management Options in West Bengal", SATSA Mukhapatra- annual Technical Issue 20)

1.1 Literature Review:

Literature review is very relevant to fulfill the present research work because it gives a crystal clear idea about, what I have going to be done and what step I should take to succeed over it and it also help to build up a mental map or planning, in which way it has been conduct the research work. Here the literature review has been attempted in three phases, which includes:

- (A). International level
- (B). National level
- (C). State level

(A). International level:

- i. F. Nachtirgaele, R. Biancalani, and M. Petri in the paper entitled on "Land degradation (SOLAW Background Thematic Report 3)" marked out that globally where land degradation have taken place, the effect it has on the population and what kind of problem should come up in future. Global assessment of soil and land degradation began more than 35 years ago. It has been identified locally the institutional, socio-economic and biophysical causes of land degradation through many case studies. There to check the rate of land degradation in globally some remote sensing approaches have been incorporated. There it has also been incorporated the status and trends in global land degradation. The major findings are the impact of this degradation is most felt in areas with a high incidence of poverty. The agricultural lands used mainly for cropping purposes and it create a more susceptible impact to degradation than non-agricultural land.
- ii. Donald. Gabriels and Wim. M. Cornelis in the paper "Human- Induced Land Degradation" mark out that, land degradation, indicates by its state of soil degradation, vegetation degradation and degradation of its water resources. Land degradation is a human- induced or natural process which negatively affects the land to function effectively within an ecosystem. Human is very much responsible for land degradation for them intervening nature on natural resources viz. deforestation, overgrazing by livestock, mismanagement of agricultural land etc. Water erosion is the most important type of soil degradation occupying 56% of the world wide area affected by human-induced soil degradation and mainly occurring in Asia.
- iii. Adam Kertesz (2009) in his paper "The global problem of land degradation and desertification find out that, the degradation of the Earth's surface (i.e. land degradation) is one of the most severe problem of our times and it is an ensemble of negative processes extending over immense areas. Land degradation in a very complex process to identify. Several environmental factors contributed to land degradation as well as human induced socio-economic factor also. Desertification as land degradation processes within arid, semi-arid and sub-humid are discussed here to pull attention to the certain dangerous situation in these areas. There in some areas of Hungary this is corresponding to the definition of desertification. May for that reason Hungary signed the convention of desertification, as increasing aridity is a real national danger, especially on the Danube-Tisza interfluve.
- iv. G. Gisladottir and M. Stocking (2004) in theirs paper that is entitled on "LAND DEGRADATION CONTROL AND ITS GLOBAL ENVIRONMENTAL BENEFITS" revealed that land degradation is widely recognized as a global problem associated with dry lands. There are three principal ways that land degradation can be perceived to be global. First, it affects a large number of people over a significant proportion of the earth's surface. Second, land degradation has prompted a stream of national and international policy responses. Third, land degradation negatively affects a number of important problems of global concern like, desertification, loss of biodiversity, carbon reduction in soil. Today, about 1.9 billion hectares of land worldwide are affected by land degradation.

(B). National Level:

- i. Hiraxmi Deb Barma (2018) in her paper entitled on "Susceptibility to Land Degradation in Haora Drainage Basin (HDB), Tripura, India" has worked out that assess the degree of susceptibility to land degradation in Haora Drainage Basin of Tripura, 2016. In order to predict the susceptibility to land degradation in HDB she has been prepared a susceptibility map of land degradation by taken some factors of land degradation viz., land use land cover (LULC), vegetation cover (from NDVI), slope aspect (in degree) of Haora drainage basin. The degree of susceptibility to land degradation in the year of 2016, she divided the result into 5 classes. The result shows that more than half of the HDB (55.81%) has moderate degree of susceptibility of land degradation. Lots of farmers and agricultural laborers are directly dependent on HDB by rural land use and they might be faced some problem which is associated with susceptibility to land degradation. Consequently any kind of human development activities get affected in HDB region.
- ii. Mythili Gurumurthy and Jann Geodecke (August 2015) in theirs paper which is entitled on "Economics of land degradation: A study of India" discussed that two third of the Indian population depends on agriculture for their livelihoods. Yet, about 44% of India's land area is degraded due to cultivation of marginal lands, improper crop rotations or deforestation as a consequence of shifting cultivation. Here it has also been noticed that land degradation has been spreading in India since 1980s. More recent data, using the Normalized Differenced Vegetation Index (NDVI) have shown a decline in vegetation cover on 47 million hectares (16%) of the Indian Territory between 1982-

2006. As a diver of land degradation there in this paper Green Revolution of India got more importance. This occurred often at the express of forest land and the consequent land cultivation led to soil erosion and degradation. It is identified that decreasing land- man ratio, subsidies for fertilizers are the major factors which contributes to land degradation. Lastly it has been conclude that understating the impact of specific drivers could be a crucial step to mark out effective policies that help abate land degradation.

- iii. V. R. Reddy in his paper “Land Degradation in India (Extent, Costs and Determinants)” trace out that, land degradation mainly occurs in the form of water- induced soil erosion. Even agrochemical and wind erosion have also contributes as a severe impact on land. The main objectives for this paper is that to examine the trends of land use pattern across agro-climatic regions, to identify the factor influencing land degradation, to study the linkage between degradation and policy. This paper also focuses on land degradation and sustainable development. This paper also seeks to measure the rate of damage which is happening due to degradation. Beside this it has also been estimating the extent and costs of degradation. This paper also revealed that how the socio-economic, demographic, technological, institutional and climatic factors playing a role as determinants of land degradation.

(C). State Level:

- i. K. Das and D. Sarkar (2016) in the paper which is entitled on “Soil Degradation: Status and Management Options in West Bengal” has marked out that Soil degradation in West Bengal is estimated to be occurring in 21,40,000 hectares of land, covering about 25% of the total geographic area of the state. They are trace out some major causes which is increased the problem of soil erosion. Among them soil acidity, soil salinity, water erosion is very predominant. Along with poor agricultural practice with chemical fertilizers, sometime might be the reason for soil degradation. It has been find out some management strategies to check degraded soil like, liming practice for acidity management, crop management to hold natural productivity, integrated watershed management to controlling soil erosion, balanced use of NPK fertilizer for soil fertility management.
- ii. Pravat Kumar Shit, Gouri Snakar Bhunia and Ramkrishna Maiti (2015) in theirs paper “FARMERS’ PERCEPTION OF SOIL EROSION AND MANAGEMENT STRATEGIES IN SOUTH BENGAL IN INDIA” expressed that farmers perception study about soil erosion problem and their conservation knowledge and practices in knagsabati watershed. The Kangsabati watershed is a part of Chottonagpur plateau and the lower Ganga basin. The survey was conducted by the using of stratified random sampling method from Paschim Medinipur, Bankura and Puruliya district respectively. The study revealed that the farmers of the Kangsabati watershed constrain crop production problems from several decades and behind this problem the main reason is erosion of top-soil due to high rainfall during monsoon and step slope is the another chief factor of soil erosion and according to farmers due to soil erosion, loss of fertile soil, shortage of farm and grazing land, loss of seeds are being introduced. This paper also expressed that, average 40% households of the study area constructed either stone or soil bunds in at least one of their plots to counter water erosion. Government takes some initiative recently to make check-dams to prevent water erosion and soil erosion.

1.2 Reason behind selection of the Study Area:

Land degradation might be happened on a local scale or over the vast areas. Amta Gram Panchayat has been choose as a study area because this area are facing from rapid urbanization over two decades in a non-planning way (household built randomly along with random road) creates an encroachment of settlement which has already been done and lot of deforestation taken place in this region followed by soil erosion, degradation of bio-diversity etc. Therefore study area which has been selected under Amta Gram Panchayat, land degradation is very predominant in this area. So, identification of land degradation followed by land susceptibility measurement could be take place, this study area has been selected.

1.3 Objectives:

Several objectives have been formulated in this research paper to shape the paper more Scientific:

- (1) To detect the temporal changing pattern of Land Use and Land Cover features in the study area.
- (2) To find out the major causes and accountable factors for the problems of land degradation in Amta Gram Panchayat.
- (3) To find out the environmental as well as socio-economic impact of land degradation.

(4) To mark out whether the adverse effect of land degradation is going to more powerful in Amta Gram Panchayat.

(5) To suggest some remedial measures for adverse effect of land degradation.

1.4 Data base:

Both primary and secondary data have been inculcated to prepare this paper:

(A). Primary data has been collected on the basis of perception study based on questionnaire survey and observation method has introduced to identify the intensity of land degradation.

(B). Secondary data have been incorporated from various sources like, from land use and land cover change analysis four base map have been collected from the official website of USGS platform, To complete the location mapping associated work base map have been culled from various sources viz. B.D.O (Block Development Office), official website of map of India (www.mapsofindia.com). Some secondary data have been collected from District Census Handbook, Haora, 2011.

1.5 Methodology:

For preparing any kind of research report, methodology is a most important step. This survey report is almost based on primary data collection.

1.5.1 Pre Field: In this step at first a pilot survey has been conducting by the authors and it has been prepared a structured questionnaire schedule on the basis of the perception of land degradation and some survey report have been studied by the authors and some important map have been gathered from different sources to get the basic pre-defined knowledge from the various sources.

1.5.2 Field: In this stage, it has been started the survey based on prepared questionnaire schedule and this survey has been followed the method of stratified sampling and some snaps have been taken by the authors which have been actually need to fulfill the requirement of the survey. Interview method also been followed in this regard to collect the data base.

1.5.3 Post Field: On the basis of study it has been processed the collected data in a systematic way and master table has prepared by the surveyors. On the basis of those table some cartographic techniques is articulated which represent as an indicator of different view point of the local people perception. On the basis of downloaded satellite images from USGS Platform a supervised classification has been done and also a post classification report has been formulated by the author depends on classified image which provided a clear idea about land use and land cover change about the entire study area. The process of supervised classification is as follows in below with the help of a flow chart:

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graph TD
    A[Downloading the LANDSAT 4-5 and LANDSAT 8 images from USGS platform] --> B[clipping those images with the help of QGIS 2.14.2]
    B --> C[load the image bands with the SCP plugin]
    C --> D[set band wavelengths and create a virtual raster]
    D --> E[change color composite]
    E --> F[create a training input file]
    F --> G[create training areas]
    G --> H[create ROI polygons]
    H --> I[set the corresponding Macro class and Class]
    I --> J[use the ROI pointer to create a growing ROI]
    J --> K[set the Macro class and Class]
    K --> L[add training areas for all land cover and land use classes]
    L --> M[preview classification produced by algorithm classes]
    M --> N[preview classification produced by algorithm]
    N --> O[run the classification report with preferred algorithm]
    O --> P[save classification output]
    P --> Q[layout the processed image]
  
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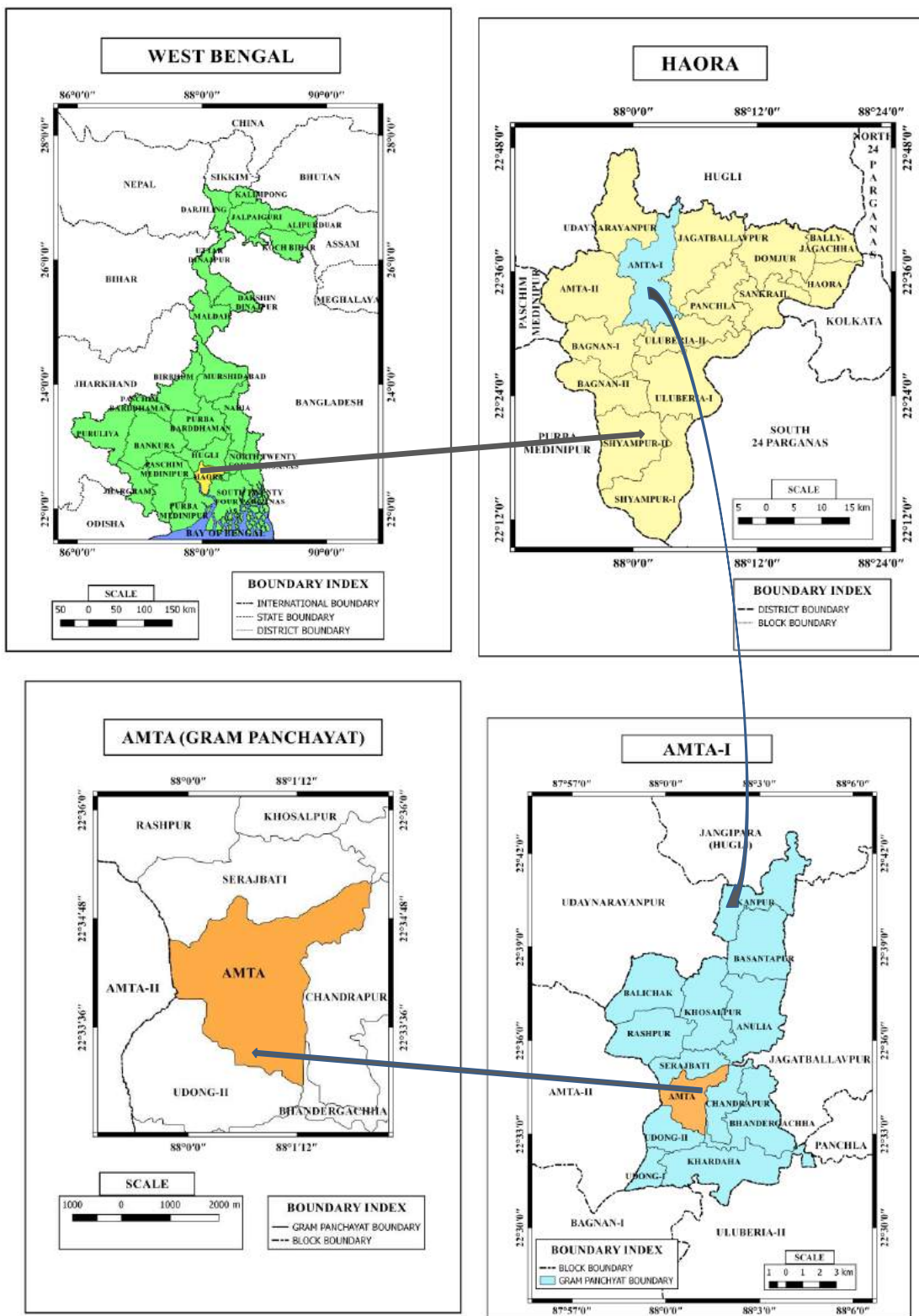
1.6 Information about the Study Area:

Amta Gram Panchayat lies between 22°30'34"N and 22°43'17"N latitudes & between 87°57'55"E and 88°4'32"E longitudes. It is bounded by Amta-II block in the West, Chandrapur gram panchayat in the East, Serajbati gram panchayat in the northern part and southern part with Udong-I and Udong-II gram panchayat. Amta Gram Panchayat has a great importance and influence in Amta-I block compare to that of other gram panchayat, because it has Amta Gramin Hospital, Amta Railway Station, Amta Bus Terminals, 3 High Schools, so many Primary Schools, flowing down of Damodar River, Ma Malai Chandi Mandir, B.D.O office so on and so forth.

According to the 2011 census, Amta-1 Block has a total population is 223218. It consist 13 gram panchayat and 7 census town. Amta census town has 16,699 populations. The study area Amta Gram Panchayat lies under Amta-I block and it consist Amta Census Town but in PCA (Primary Census Abstract,

Haora, 2011) it was absent the total population of Amta Gram Panchayat. (Source: District Census Handbook, Haora, 2011).

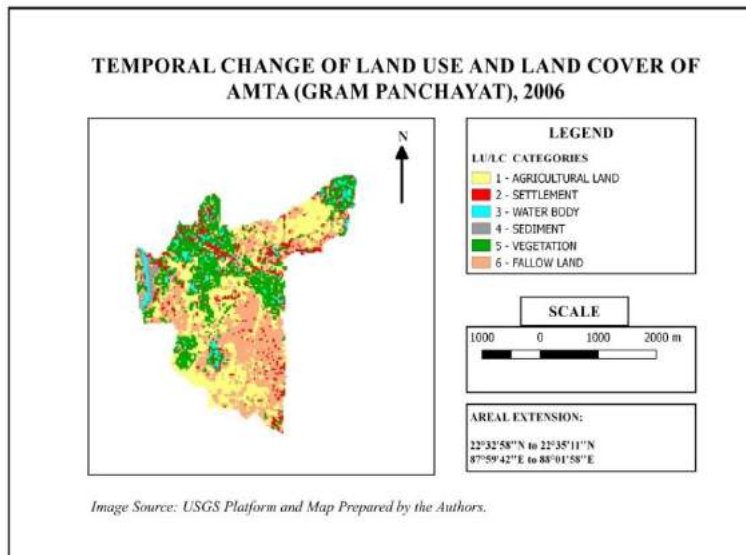
LOCATION MAP OF THE STUDY AREA



Source: Map of India, B.D.O office and Map Prepared by the Authors.
Map No.: 1.

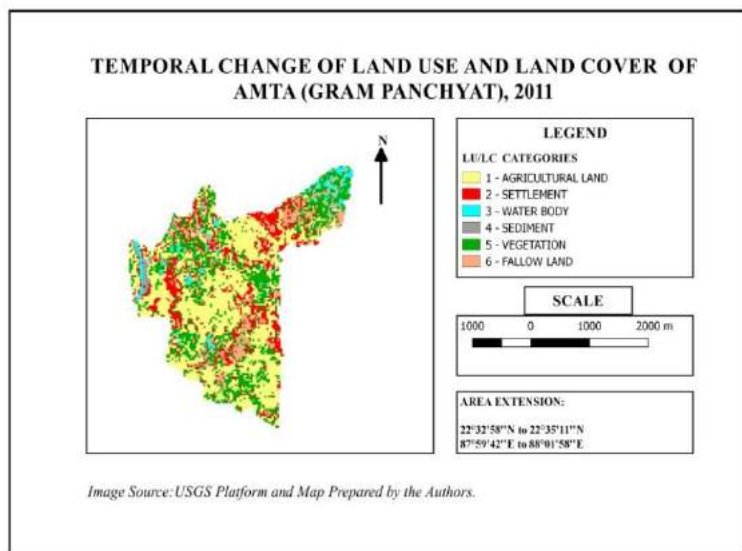
1.7 Changing Scenario of Land Use and Land Cover Change in Different Time Frame in Amta (Gram Panchayat):

Over two decades Amta region is playing a crucial role as a witness of rapid land degradation and this could be easily traced out with the help of satellite images by analyzing land use and land cover changing phenomenon. However, in order to identify this changing phenomenon, four images from different years have been taken into consideration, from which LANDSAT 4-5 images were taken for 2006 and 2011 and on the contrary LANDSAT 8 images were taken for the years 2014 and 2018.



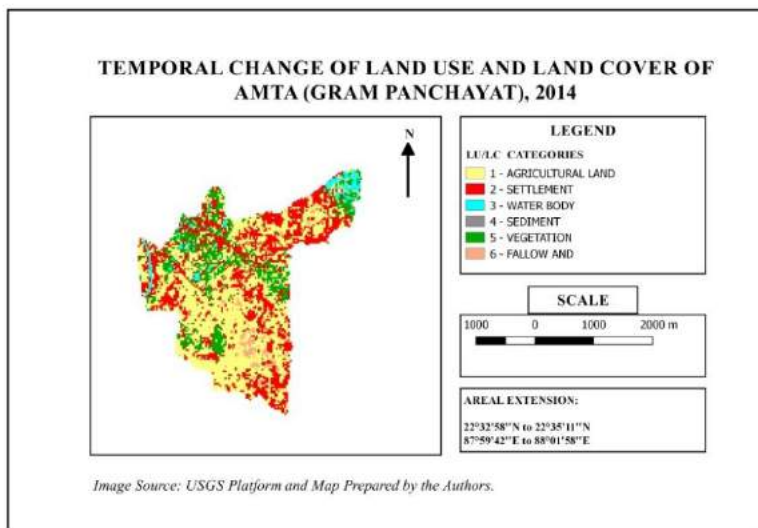
Map No.: 2

After implementing supervised image classification, the result of the post-classification report shows that in 2006 Amta Gram Panchayat has 29.26% agricultural land, followed by 32.55% fallow land, 24.04% vegetative cover, 8.34% settlement, 4.25% water body, and the remaining 1.56% is sediment.



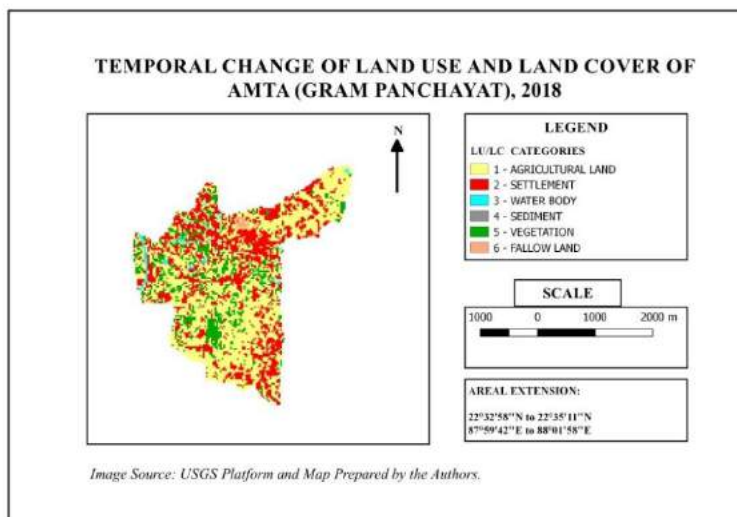
Map No.: 3

For the year 2011, the LU/LC criteria are highly changed. In 2011, the percentage of agricultural land is highly hiked to 41.93%, and the percentage of settlement and vegetation is also increased at the rates of 14.79% and 25.57% compared to that of 2006, while the other land cover features are declined than 2006 and the land pattern includes fallow land, water body, and sediment.



Map No.: 4

In 2014 the amount of agricultural land is 49.78%, settlement is 30.18% followed by vegetation 14.18%, fallow land 2.34%, water body 3.24% and sediment 0.07%.



Map No.: 5

On the other hand, in 2018 Amta Gram Panchayat has 51.73% agriculture land. 32.18% settlement, 12.89% vegetative cover, 2.28% water body, 0.18% sediment and 0.74% allow land.

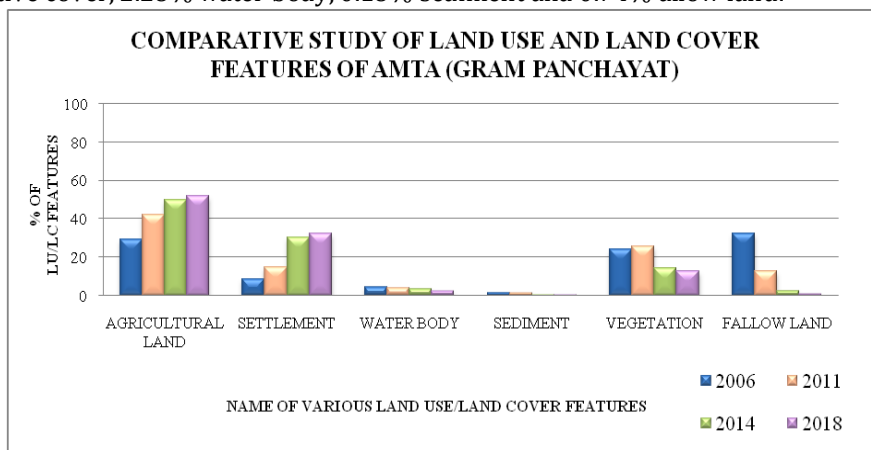


Fig No.: 1.

So, on the basis of this post classification report it can be summarized that there is a process of urbanization is presently marked out, for that reason the encroachment of agricultural land and settlement has been occur and on the other hand shrinking process of vegetative cover, fallow land, water body, sediment is being happened in a continuously manner. So it can be said that, the land use features is encroaching the total area of the land day by day while, the land cover features is shrinking on a daily basis which is responsible for land degradation. The encroachment of settlement in a non-planning way has given a new dimension of this land degradation problem.

1.8 Problems Associated with Land Degradation in Amta (Gram Panchayat):

Though land degradation itself a major problem, yet some other supporting problem have already been presented in Amta Gram Panchayat, i.e the problem of deforestation, loss of soil fertility, degradation of bio-diversity etc. and these all problem are interrelated with each other, which may give a severe face of land degradation problem in this region. Therefore this crucial problems have been taken into account to reexamine the situation.

1.8.1 Problem of Deforestation: The problem of deforestation is identified here and in this regard it has known the fact of deforestation with the help of change detectation analysis of satellite images. The perception study represent that, 97.778% respondents response, there are some problem of deforestation is present in the study area where as 2.222% respondents do not support the fact that the deforestation is occurred in this study area and they might be not sentient about the deforestation problem.

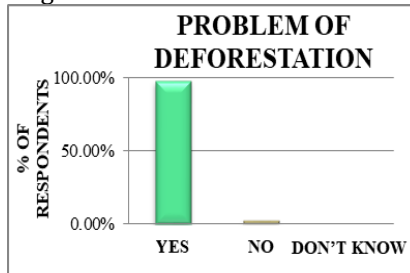


Fig No.: 2. Data Source: Field Survey,2018.

1.8.2 Loss of Soil Fertility Problem: If it has been taken into account over the change detection of temporal images then it has been seen the encroachment of agricultural land is comprising in mainly eastern, southern and south-eastern part of the study area and along the embankment of Damodar river which is located in the west has proliferated the present condition predominantly. Therefore, the most of the farmer use chemical fertilizers to cultivate in the agriculture land which enhances the problem of loss of natural fertility of soil. The present study has reflected the idea that 44.444% people known about the problem of loss of fertility of soil is markdly observed in this study area because they are directly or indirectly involved within agriculture whereas 6.660% respondents said there is no problem associated with loss of soil fertility and 48.890% respondents said, they have no idea about this problem.

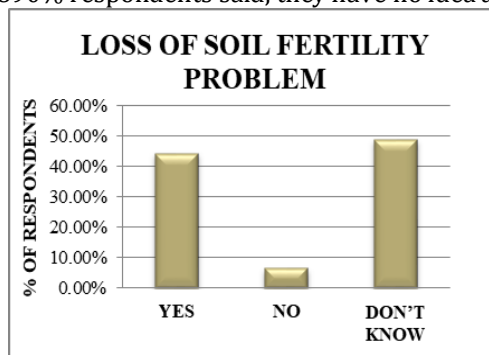


Fig No.: 3. Data Source: Field Survey,2018

1.8.3 Problem of River Bank Erosion: River bank erosion is associated with the problem of deforestation and continious agricultural practices along river embankment. In last 10 years the rate of deforestation, settlement establishment along the river side, agricultural practice may trigger these problem which increased at the rate of high speed, which continiously damaging the strength and flow velocity of river bank and ulitimately eroded the river bank. In order to identify the problem of river bank erosion, in the study area 42.222% people are suffering from river bank erosion whereas 6.667% people may not suffering

directly and 51.111% people do not, realise or they do not know whether the impact of river bank erosion is reasing in the study area or not.

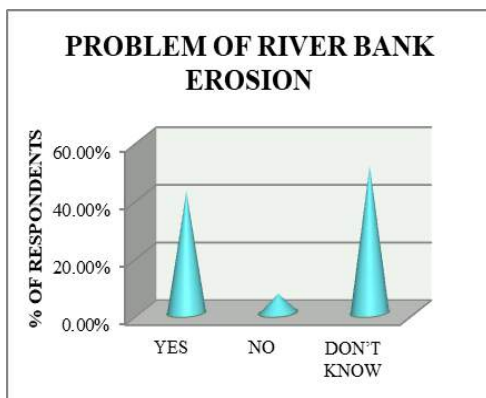


Fig No.: 4. Data Source: Field Survey,2018.

1.8.4 Problem of Degradation of Biodiversity: Along the problem of deforestation there are some problems regarding loss of biodiversity have been arisen. In the study, it has been collected the data on the basis of perception study, and it reflects the idea that, 93.333% people feel that problem of loss of biodiversity, whereas 6.667% respondents do not know the fact, and basically they are not aware about the degradation of biodiversity which might be a serious causes of environmental degradation.

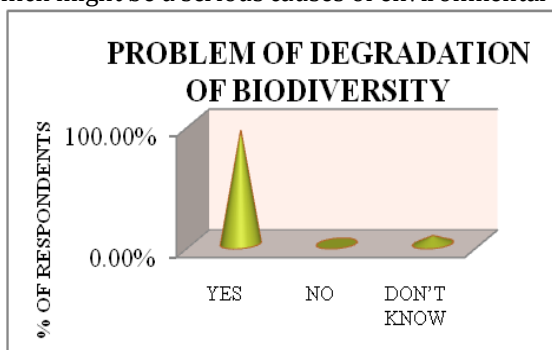


Fig No.: 5. Data Source: Field Survey,2018.

1.9 Causes behind Degradation of Land in Amta (Gram Panchayat):

There the several accountable reasons are present behind the problem of land degradation in Amta Gram Panchayat and these are already been discussed in the previous phase but there some of the perceptual evidence through which it can to know about environmental degradation.

1.9.1 Reason for Deforestation: During survey it has been know that there are some responsible reasons are present for deforestation and for these reason 34.375% people respondend that enhancing of settlement is the main causes behind the causes of deforestation. Therefore 29.688% people comment on the increasing trend of agricultural land is the main reason for it and 35.938% people agreed the fact that other infrastructural condition are also responsible for deforestation like encroachment of road, set up of rent house, hospitals etc.

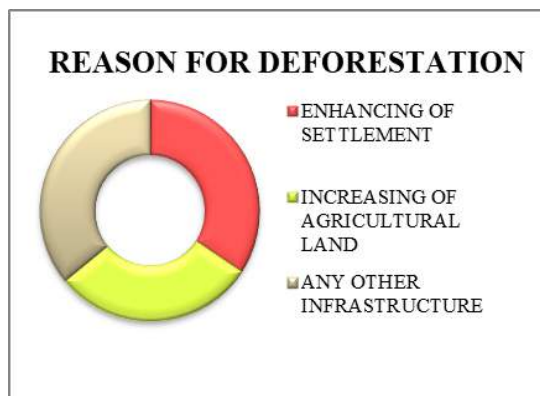


Fig No.: 6. Data Source: Field Survey,2018.

1.9.2 Reason behind Degradation of Biodiversity: The perception study has revealed the fact that 22.481% people opined that clear cutting and over exploitation of forest resource is mainly responsible factor for degradation of biodiversity, as well as on the other hand almost equal percentage people said that livestock including overgrazing is liable for it because due to overgrazing some eco-friendly bacteria like rizobium are get distrubed. 32.560% people commented on that, urban sprwal and commercial development is accountable for that and at the same time 22.481% people supported that increasing rate of pollution is more porne to the degradation of biodiversity because the magnitude of air pollution spread by toxic particle in air like, CO₂, CO, SO₂ etc. and due to toxicity lots of animal as well as plant species are directly and indirectly affected by this, on the other hand water pollution by various fertilizer are some time causes of eutrofication and it might be the reason for BOD (biological oxygen demand) which could hamper or distorted the water eco-system in a local or large scale.

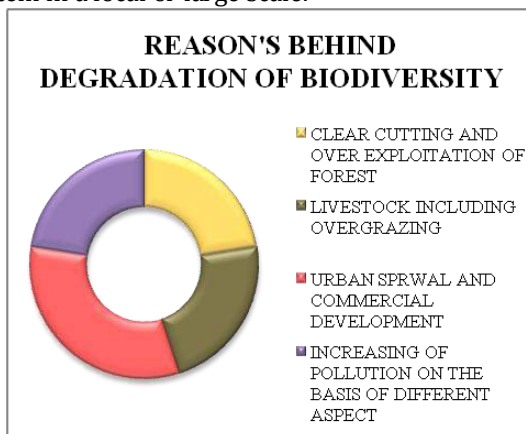


Fig No.: 7. Data Source: Field Survey,2018.

1.9.3 Reasons behind Low Fertility of Soil: During perception study 34.483% people is very active with their perception of uses of chemicals in agricultural purposes to check the low fertility of soil however 34.483% people opined that lacking of processes of crop rotation in agricultural purpose is the main reason behind it because crop rotation is a natural way to preserved the fertility of the land and 31.034% people is agreed with the statement that they have the lack of interest for making the soil more fertile for more production because there is lot of factories are presently evolved in the neighborhood, which has resulted in alternative employment opportunities. So, mainly for this reason many people do not want to be engaged in farming.

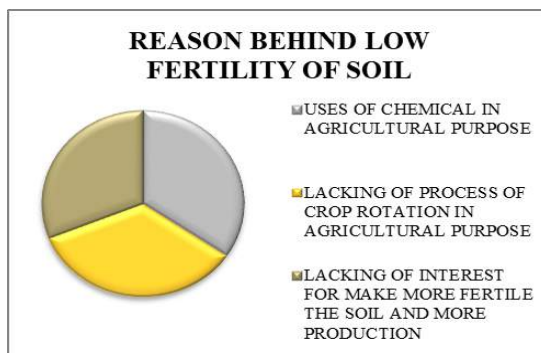


Fig No.: 8. Data Source: Field Survey,2018

1.9.4 Reason for River Bank Erosion: From the perception study, it is been accounted that 9.524% respondents opined that, for enhancing number of settlement is the reason for the river bank erosion where as 19.048% respondents informed that high rate of cultivation on river bank is a responsible reason for river bank erosion however, 71.428% people commented on that less density of forestry on river bank is major accountable reason for the degradation of forest cover.

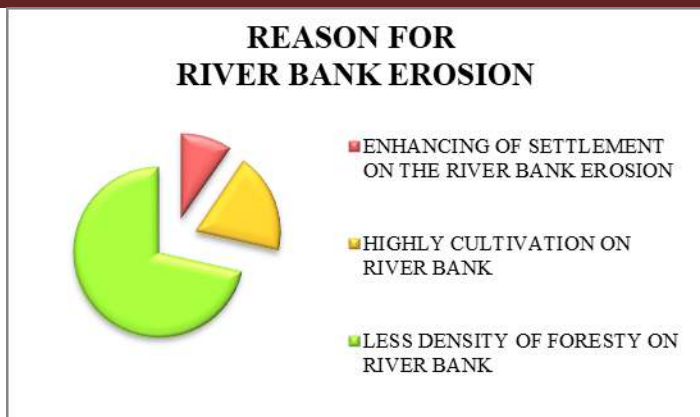


Fig No.: 9. Data Source: Field Survey,2018.

1.10 Predictable Effect of Land Degradation:

On the basis of present, situation of the rate of on-going process of urbanization and deforestation, river bank erosion, respondents have traced out some predictable effect of land degradation and also they identify some predictable causes of land degradation which might be responsible for further enhancement of this problem in study area. All most all respondents are scared to imagine the vulnerable impact on them environmental and socio-economic life.

1.10.1 Predictable Effect of Deforestation: The data have collected from the field, it revealed that 100 percent people in the study area have supported the predictable effect of deforestation they observed that during two decades the number of settlement and agricultural land in being increased with a very first rate. They are very much aware about the notourious effect of deforestation.

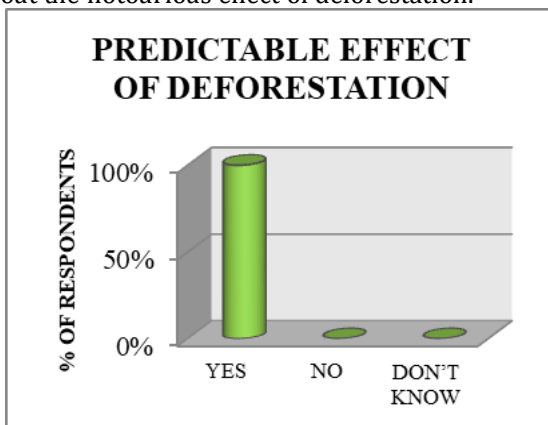


Fig No.: 10. Data Source: Field Survey,2018.

1.10.2 Predictable Impact of River Bank Erosion: The work represent that 88.889% people is well known about the predictable affect of river bank erosion, because some of them are the occupant of river bank and some of them are native of Amta Gram Panchayat and nearly 11.111% people don't know about the fact of river bank erosion because they are not the living in the study area.

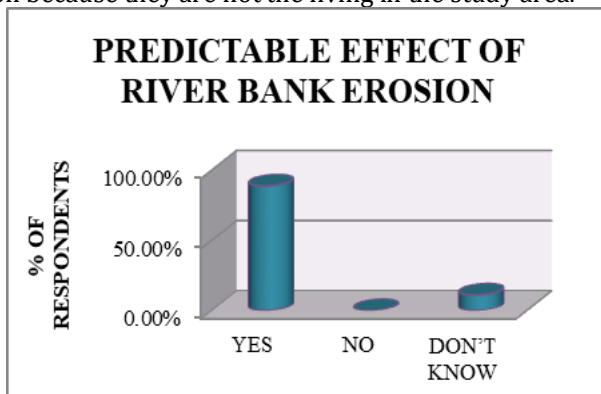


Fig No.: 11. Data Source: Field Survey,2018.

1.10.3 Predictable Effect of Population Explosion: According to the present study, 100% people have opined for predictable effect of population explosion and this population explosion is thrusting in various way for land degradation like, encroachment of settlements, roads, agricultural fields is happening, and it is one of the reason of forest sacrifice. Mainly Amta Gram Panchayat hold the economic and political importance of through out the whole Amta-I block. There the B.D.O office, One Irrigation Office (Bungalow), One Post Office, One Civil and Criminal Court, Roads office, some major Bank (State Bank of India, UCO Bank, Bandhan Bank, Allhabad Bank, Axis Bank, Co-Operative Bank), One Public Library, School Inspector office of Mata-I Block, One College, Three High School, Six Primary level School, One Amta Bus Terninals, One Rail Station, One Police Station, Ma Malai Chandi Mandir, One Rural Hospital, Six private Nursing Home, Two Vegetable Market, some Super Market is present, which create a gravitational pull effect for attracting the people. That's why the population explosion is being on a daily basis.

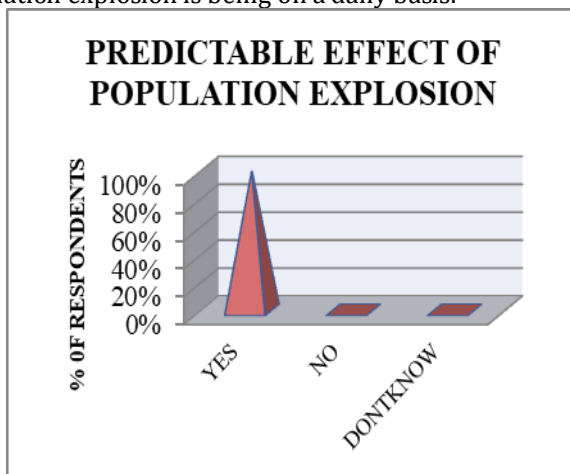


Fig No.: 12. Data Source: Field Survey,2018.

1.10.4 Predictable Effect of Salinization Process: From the study it is accounted that salinazation is created a vital effect over land degradation and it may not be suitable for agricultural practice. During the survey 57.778% people in the study area have commented about the predictable impact of salinization process as a land degradation through global warming. Due to global warming evaporation and evapo-transpiration process achived its high intensity, during evaporation only water evaporates from soil but the salt remains on the ground and as a result salinization process takes place on the ground and therefore 42.222% respondents have not known the fact of impact of salinization behind land degradation.

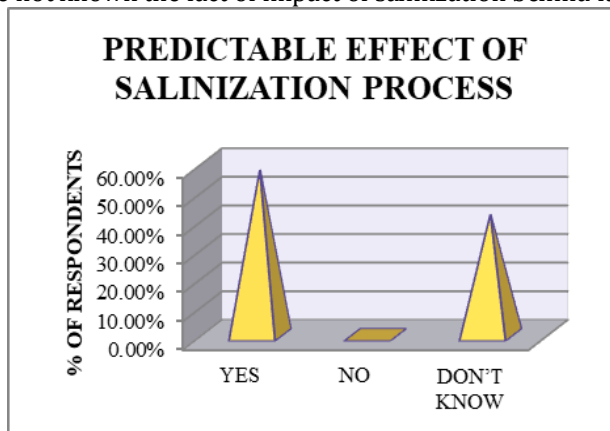


Fig No.: 13. Data Source: Field Survey,2018

1.10.5 Predictable Effect of Encroachment of Land: In survey, most of the respondent are the local respondents and they all knew the fact that, shrinking of open land and vegetative covered land is mainly due to enhancement of settlement, for that reason, 86.667% people have expressed their opinion in study area for predictable effect of encroachment of land, however 4.444% people put forwarded the negative answer and 8.889% people said don't know for it because they are not living in the study area, that's why they have not any idea about encroachment of land, in study area.

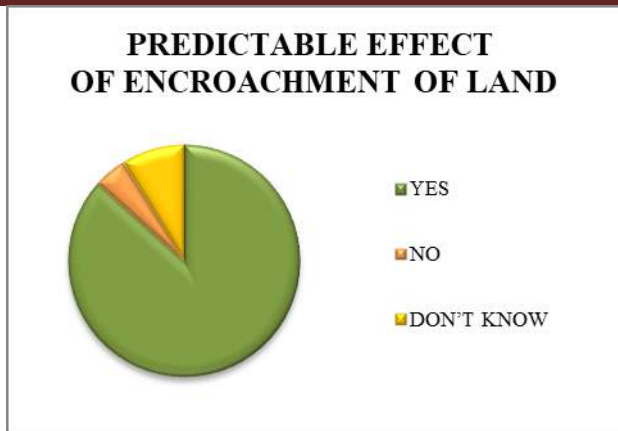


Fig No.: 14. Data Source: Field Survey,2018.

1.10.6 Predictable Effect of Chemical Fertilizer: The field study represent that 64.444% people have opined regarding predictable effect of chemical fertilizers using in agricultural field which might be the causes of land degradation, however 15.556% people commented the negative answer and 20.000% people don't know the fact because they have no idea about agricultural practices and about the worst effect of chemical fertilizer, which may rationable in terms of land degradation procedure.

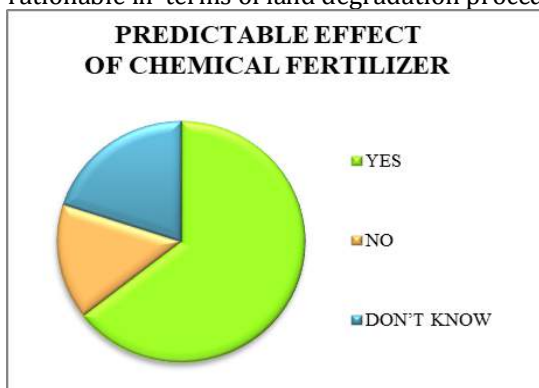


Fig No.: 15. Data Source: Field Survey,2018.

1.11 Proposed Remedies to Eradicate Land Degradation Problems:

Land degradation is expressed as a major problem of the study area in present day context and Government should take some steps to provided by local people a satisfactory rid from this problem. To know the satisfactory level Governmental role and their intiatives to check this land degradation problem, some perception study have been drawn which has expressed followed by some proposed remedies of respondents.

1.11.1 Role of Government: From the present study, it has expressed that, 23.333% people support the fact that Government has taken intervention about to protect land degradation in the study area. However, 23.333% people said negative response and 53.334% people said that they don't know about any kind of governmental intervention.

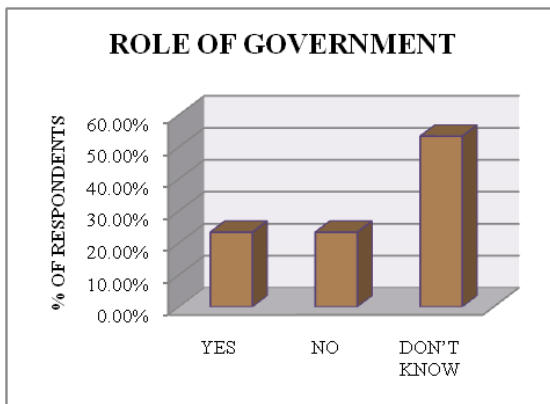


Fig No.: 16. Data Source: Field Survey,2018.

1.11.2 Proposed Remedies: According to the perception study 30.000% people expressed their opinion that, in the study area afforestation should be the main remedies for land degradation because there are deforestation is presently occur in a high manner. However 23.333% people said about to implimenting nature of sustainable development because they belived, development in all aspect is needed and the equal percentage of people voted for appropriate irrigation practice and almost 23.333% people proposed that control of grazing should be as a remedies for land degradation because many types of grass and weeds hold the soil firmly with their roots, but due to pasture those grasses and weeds can not retain their soil with the help of their roots so that leads to soil erosion as a part of land degradation.

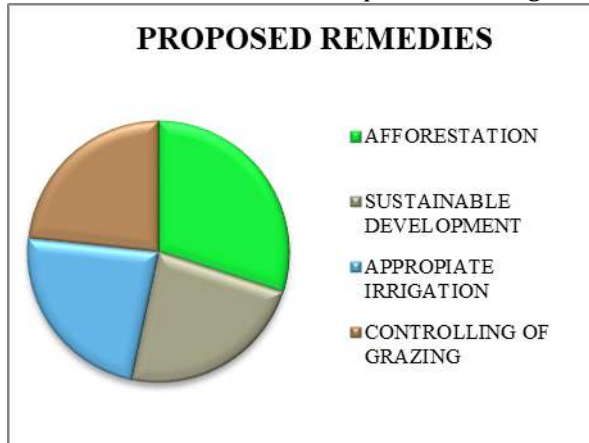


Fig No.: 17. Data Source: Field Survey,2018.

1.11.3 Remedies for Controlling of River Bank Erosion: River bank erosion is a very predominant problem because it is not only contribute for land degradation rather it is also a reason for to load the river bed very soon and for its consequences the river is experienced high inundation nature of flood almost every year, which might be the causes of again river bank erosion. During the survey it is notified that 32.558% respondents said, control of cultivation should be the remedies for controlling of river bank erosion in the study area because along the river bank forest is cut down due to agricultural work and as consequences agriculture is not able to retain that amount of soil that forest could be hold. Almost 32.558% people said afforestation along the river bank will be the solution for it and 34.109% people opined that Governmental intervention might be the remedial measures for river bank erosion because Govt. has some power to enact some law to protect river bank erosion. Unfortunately 0.775% people suggest their opinion by the selecting option don't know.



Fig No.: 18. Data Source: Field Survey,2018.

1.12 Major Findings:

Several findings have been pointed out while study has been conducted.

1.12.1 Land Use and Land Cover Pattern: On the basis of satellite images it can be conclude that is study area temporal changes of land use and land cover pattern has been occurring. In this paper it shown that land use and land covers changing scenario on Amta Gram Panchayat for 12 years which identifies that there, increasing of land use features are happening on the other hand simultaneously the percent of land cover features is being decreasing very rapidly.

1.12.2 Present Causes and Problems Associated with Land Degradation: From the entire study it has been specified that, in the study area different people said that different reason are responsible for deforestation such as enhancing of settlement, increasing of agricultural land etc. Lot of people represents the idea about land degradation from different prospective. They have concluded their idea through some causes behind degradation of land like as deforestation, low fertility of soil, degradation of biodiversity, river bank erosion etc. And also they have been said some problem which are associated with land degradation such as deforestation, fertility of soil, river bank erosion and degradation of biodiversity.

1.12.3 For Possible Effect: On the basis of people's perception study it has been concluded that, in the study area some predictable effect of human induced phenomenon like, exploitation of forest, population explosion, more uses of chemical fertilizer on agricultural field and some quasi-natural phenomenon like, river bank erosion, soil salinization process could be taken place in near future and which could be played a very significant role to change the present scenario

1.12.4 About Proposed Remedies: From the entire study it has been concluded that, to protect the study area from the present and potential problem of land degradation some proposed remedies are given by respondents like, afforestation on river bank and on any kind of fallow land, sustainable development, controlled grazing, appropriate irrigation, any kind of Governmental intervention. According to them, the resolution of proposed remedies could be a solution to check the problem of land degradation.

1.13 Problems of the Study Area:

Several problems have been identified which might be the reasons of backwardness in this region.....

- ❑ Deforestation may reason for soil degradation because tree root specially help to hold soil cohesion and tree canopy help to hold soil moisture and tree has playing a crucial role to nitrogen fixing and the process of de-nitrification. So, if in any region the process of deforestation in going on there is soil degradation as a part of land degradation might be happening and the study area not the exceptional one.
- ❑ Utilization more amount of chemical fertilizers may loses soils natural fertilities because over uses of chemical fertilizer over a vast period might be causes of death of some bacteria like, Rhizobium which playing a great role in nitrogen cycle by the help of nitrogen fixing process. Chemical fertilizer also may hamper the natural composition of soil and it creating a worst effect on soils natural productivities.
- ❑ Improper management of dumping waste in study area has been occurring. Behind that the main reason is since it is not a corporate area that's why Government not took any kind of step to towards waste management and there has no proper dumping ground in and around this area. Most of the local people also not aware about the negative impact of waste on land degradation.
- ❑ Encroachment of localized water bodies is a major problem in the study area and temporal change detection analysis of land use and land cover in Amta (Gram Panchayat) with the help of satellite imagery proved that.
- ❑ Lacking of respondents awareness is a major factor to the problem of land degradation because lot of people don't know the actual concept of land degradation how it is negatively affected the socio-economic stability of them and how it is also responsible for environmental degradation.

1.14 Suggestion:

Several suggestion have been formulated to overcome the problems in this study area-

- ❑ More number of trees should be planted by Government and local people in a large scale. Afforestation and reforestation along with river bank, road side, and fallow land should be a good initiative to retain the soil properties and to check land degradation.
- ❑ Social as well as human awareness programmed could be very good alternatives. For instance, Government and local people will be together, organize various procession regarding to the negative impact of land degradation and how it is affected our socio-economic life. For farmer and agricultural labors it might be healthy initiatives that, if Government will organize a training camp on how rightly and beneficially modern and eco-friendly farming method practices.
- ❑ In the study area there is no proper landfill site to thrown any kind of waste like, solid, liquid. As consequences people dumped their garbage here and there and ultimately its create soil degradation. So people should use a proper land filling site for dumping. And Government should help local people to fulfill this work by providing a proper rubbish ground.

- ❑ Using of bio-organic fertilizer like, cow dung and using of eco-friendly soil productivity developmental method like, crop rotation, rhizobium culture, wormy culture, could enhance the soil fertility and reduced the problem of soil degradation as an important part of land degradation.
- ❑ Proper Governmental intervention should be suggested along the implementation of law to check the increasing rate of land degradation. Government should take some step by organizing cultural program for enhancing the awareness within the local people which may protect the increasing rate of land degradation in and around study area.

1.15 Conclusion:

At the end of the discussion, it has been concluded that, the study area under Amta Gram Panchayat, is very much predominant of land degradation and the local people have been suffering from various problems like, loss of soil fertility, deforestation, river bank erosion, loss of biodiversity etc. and these problem continuously hampering the socio-economic life of local people and decline the environment quality by the enhancement of various pollution level like, soil pollution, water pollution. So a proper sustainable programme should be inculcated which would improve the quality of land in near future.

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