Losses of Agricultural Land due to Infrastructural Development: A Study on Rajshahi District.

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Abstract: Geographically speaking, Bangladesh is a small country but bears a huge population resulting in a very high density of population and very high intensity of land and resource use. Per capita land is estimated to be about 13 decimals only. Two significantly prominent phenomena drives country's overall scenario of economic development and environment imbalance are the high growth rate of population engulfing precious land for settlement and scarcity of land for ever increasing demand of food. Every year country is losing 1 percent arable land. Due to the population growth its infrastructure use is increasing and agricultural land is decreasing gradually. Rajshahi District was selected as study area because of its relatively higher growth in infrastructure development under various regional development programs. For analyses of land use pattern and its change remotely sensed data (Landsat MSS-1977, TM-1990 and TM- 2010) and GIS techniques was used.The methodology of the current research included secondary data collected from SPARRSO, published and unpublished data regarding crop, population and other ambient information from mostly government sources. The data (spatial and attributes) were analyzed by GIS and statistical tools and through tables of various natures.It was found that the land use pattern of Rajshahi District is changing. Among various causes of agricultural land losses the infrastructural development is the most important cause. The agricultural land of the study area is losing 0.46% per year and area under infrastructure use is increasing 5.86% per year. If this rate is steadily progressing, within next 217 years the agricultural land will be totally empty.
Key Words: Agricultural Land, Losses, Infrastructure, Development, Rajshahi District.

1 INTRODUCTION

Bangladesh is one of the largest populated countries in the world but the smallest one according to population. Its hasty growth rate and high density of population is liable for rapid expansion of infrastructures. Fast growing rate of infrastructures is cause of losses of agricultural land. Infrastructural development and agricultural land losses are interrelated in a land hungry country like Bangladesh.The total arable land of Bangladesh is not more than 1.93 cores acres and per capita land is only 13 decimals. Moreover every year 1 percent of its arable land or 82900 hectres of crop land in a year and in a day at a rate of 221 hectres of arable land is losing in Bangladesh. The arable land decreasing day by day but population is increasing rapidly. Despite the remarkable achievement in controlling the high birth rate, the population continues to grow by 2 Billion people each year because of the large existing population base (Mahabub, IRRI). The country's population will over around 190 million by 2030 when an extra 25 percent grains will have to be produced. But the additional harvests will have to be reaped from a much smaller area of cropland than is now available (Bhuiyan, 2003).According to one projection, the country would have to grow an additional five to six millions tones of grains by 2020 in a land area two million hectres less than today. In this study on attempt has been made to detect losses of agricultural land through satellite image and geographical information system technique in Rajshahi District.

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2 DATA AND METHODOLOGY

The key data for this study were collected by remote sensing techniques. The FCC color hard copies of Landsat MSS- 1977, Landsat TM-1990, Landsat TM-2010 (in table-1.5 (a)) has been used. A large number of published and unpublished text materials also have been used. Among this Agriculture Census Report, Statistical Yearbook of Bangladesh, Banglapedia etc. are especially mentionable. For identifying the land use pattern and change detection, there were a lot of attempt has been taken. From the landsat data the object have been identified with tonal variation and GPS survey. The land use patterns classify and prepare land use map of study area of three different time period with Arc. GIS 9.2 software. Then measure the area of different classes of landuse map and detects their changes with map and statistical application. In table 1 and figure 1 shown the data & methodology.

Table1: Remote sensing data used in the present Research

| Platform	Product	Band	Resolution	Time/Session	Format
Landsat-TM	FCC Copy	R(4)G(3)B(2)	30 Meters	21 January, 2010	Hard Copy
Landsat-TM	FCC Copy	R(4)G(3)B(2)	30 Meters	30 January, 1990	Hard Copy
Landsat-MSS	FCC Copy	R(7)G(5)B(4)	30 Meters	10, February, 1977	Hard Copy

Figure-1 Methodology for the study
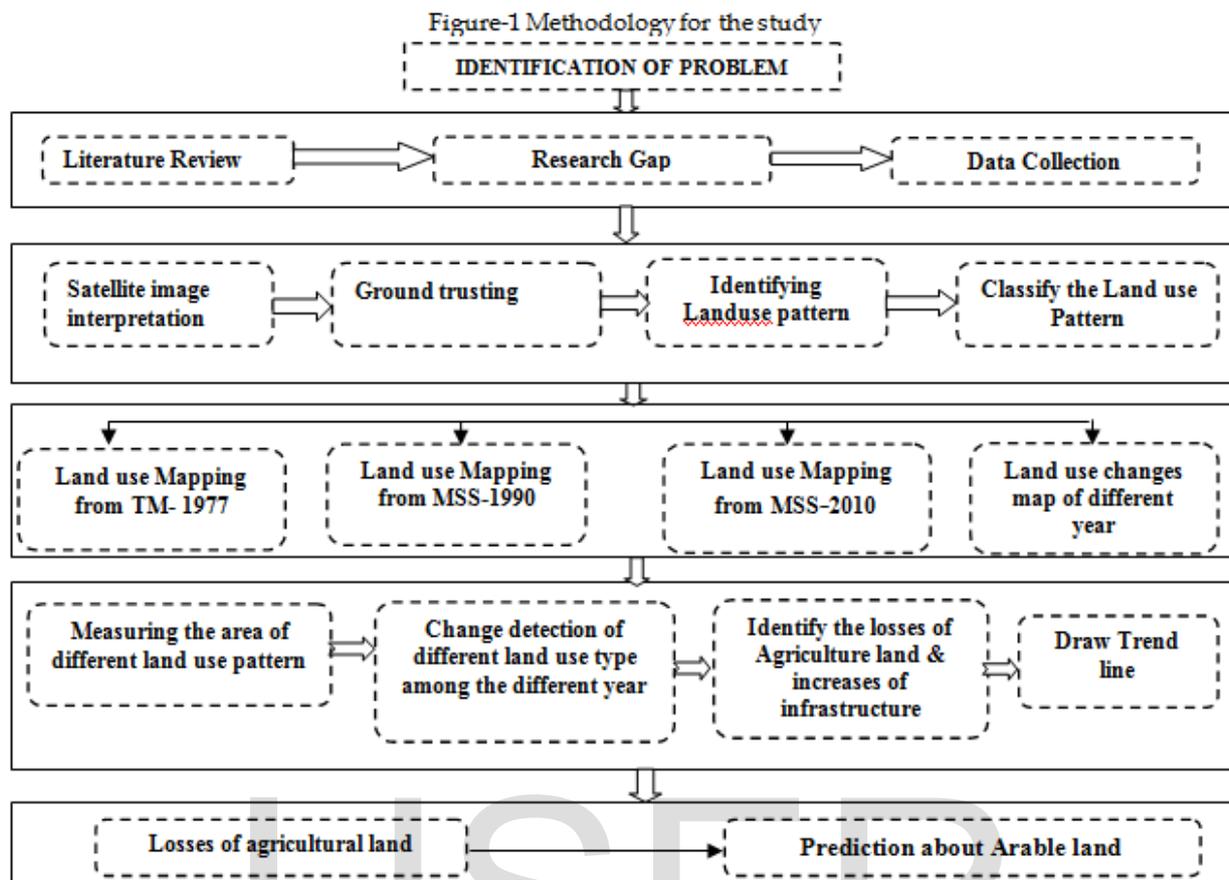
3 RESULT AND DISCUSSION
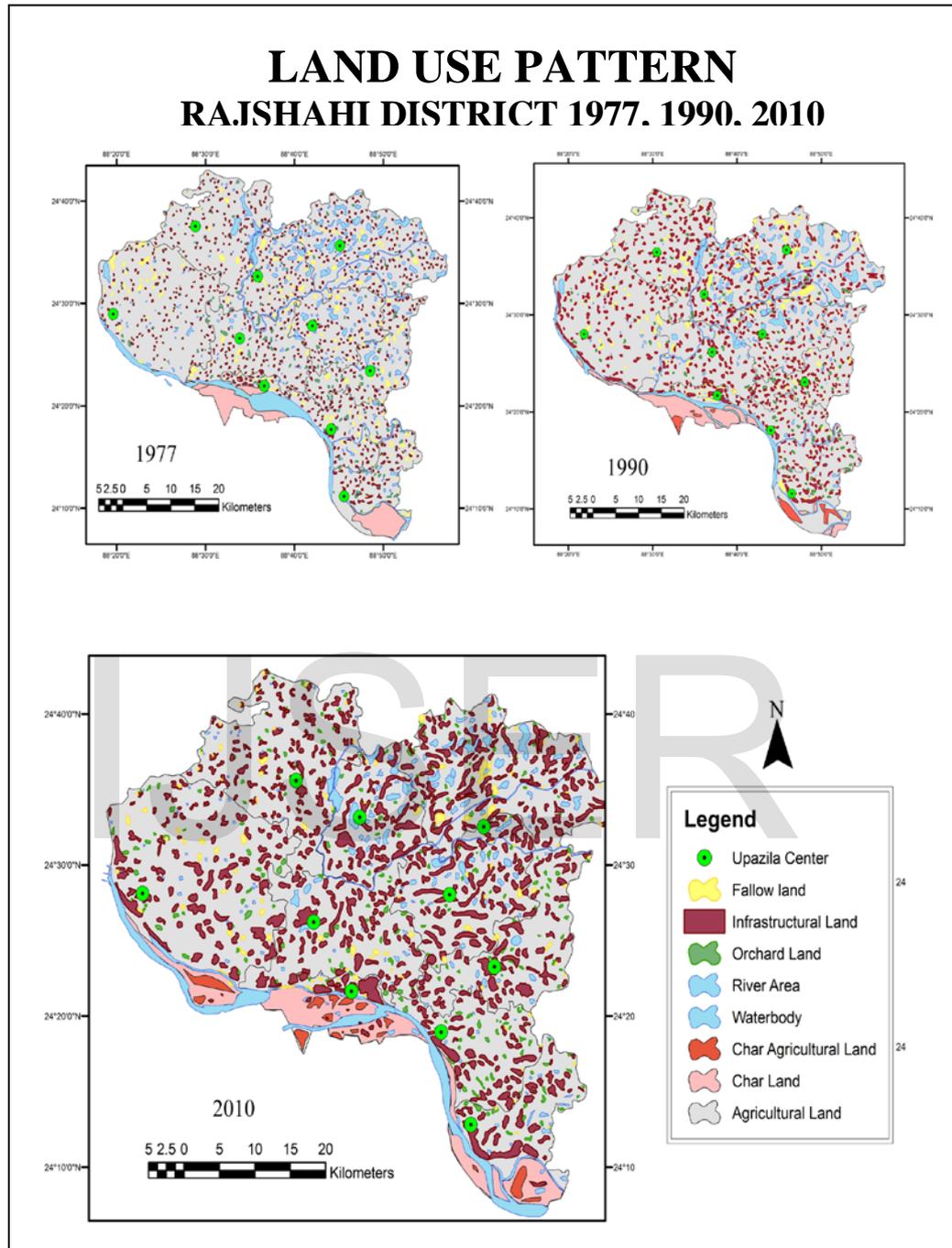
3.1 LAND USE PATTERN OF THE STUDY AREA

The major land use pattern of Rajshahi District have been classified into following classes-Agricultural land,. Infrastructural land, Orchard, Water body, Fallow land, Char land, Agricultural land and River area. Among this land use pattern Agricultural land and Infrastructural land are dominating pattern. The Land use pattern of Rajshahi District in 1977, 1990, 2010 are shown in fig.2

Fig-2: Land use pattern of Rajshahi District.
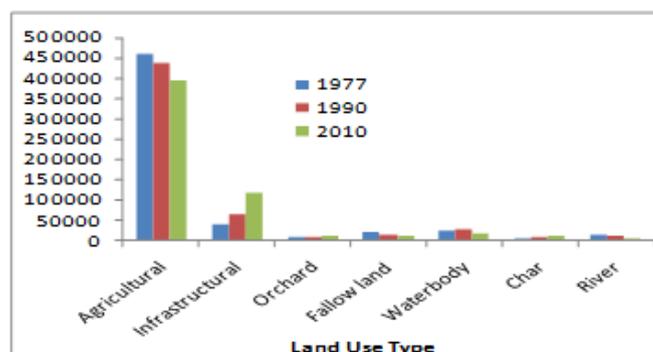
Source: Satellite image analysis.

Figure-3 Land use pattern of Rajshahi District in 1977,1990 & 2010.

| Land use Type	Area in acre	Area in Acre	Area in Acre	Change Area from 1977-19 (In Acre)	Change Percent	Change Area from 1990-20 (In Acre)	Change Percent	Change Area from 1977-20 (In Acre)	Change Percent
Agricultural	459560.	438584.6	394986.3	20975.49	4.65	44098.36	9.95	64573.85	14.05
Infrastructure	39918.4	64262.57	117615.4	24354.14	60.98	53352.85	83.0	77696.99	194.6
Orchard	9341.43	8492.91	11113.90	848.52	9.08	2620.99	30.8	1772.87	18.97
Fallow land	21405.2	16335.76	11070.78	5069.45	23.68	5264.98	32.2	10334.42	48.27
Water body	25282.8	25715.02	20817.49	332.23	1.32	4897.53	19.0	4465.31	17.66
Char land	5115.88	10851.14	13281.80	5735.26	112.10	2430.66	22.4	7165.95	140.7
River	15869.9	12229.30	7547.65	3440.63	22.9	8322.28	52.4	8322.28	52.44

Source: Satellite Image analysis

3.3 LOSSES OF AGRICULTURAL LAND DUE TO INFRASTRUCTURAL DEVELOPMENT

From the above analysis it's clear that massive change have occurred between agricultural land and infrastructural land. From 1977 to 2010 agricultural lands have been loosed and infrastructural area increased, without these two others types of land use did not change massively. In 1977 total arable land of Rajshahi District was **459560.17** hectres and in 2010 its turn into **394986.32** hectres that mean loosed about 14.05% in previous 30 years. Infrastructural land was **39918.43** hectres in 1977 **and in 2010 it's befall 117615.42** hectres that its increased **194.43**% during this time period. On the other side the others type of land was **77015.26** hectres in 1977 and **63829.56** hectres in 2010 that mean during this period it has been changed about **20.65 %/.** So it's clear that agricultural land have been decreased due to infrastructural development. In figure 4, 5 and table 3 shows the losses of agricultural land due to infrastructural development.

Fig- 4 Losses of Agricultural land due to Infrastructural development.
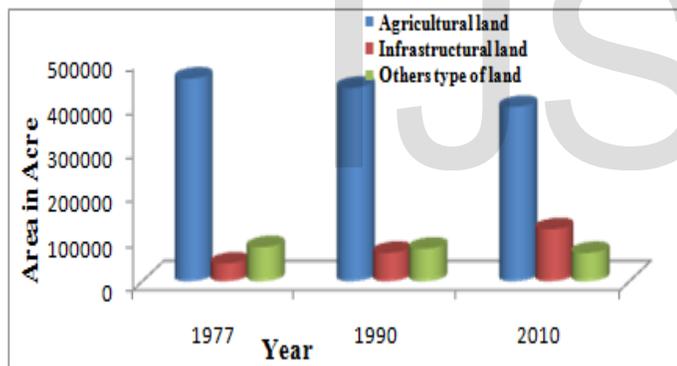
Source: Satellites image analysis.

Table-3: Losses of Agricultural Land of Rajshahi District from 1977-2010

Year	Area of Arable land (Acre)	Difference from	Decreasing (%)	Per year change(%)
1977	459560.17	-	-	-
1990	438584.60	1977-1990	4.57	-0.36
2010	394986.32	1990-2010	11.03	-0.55
		1977-2010	14.05	-0.43

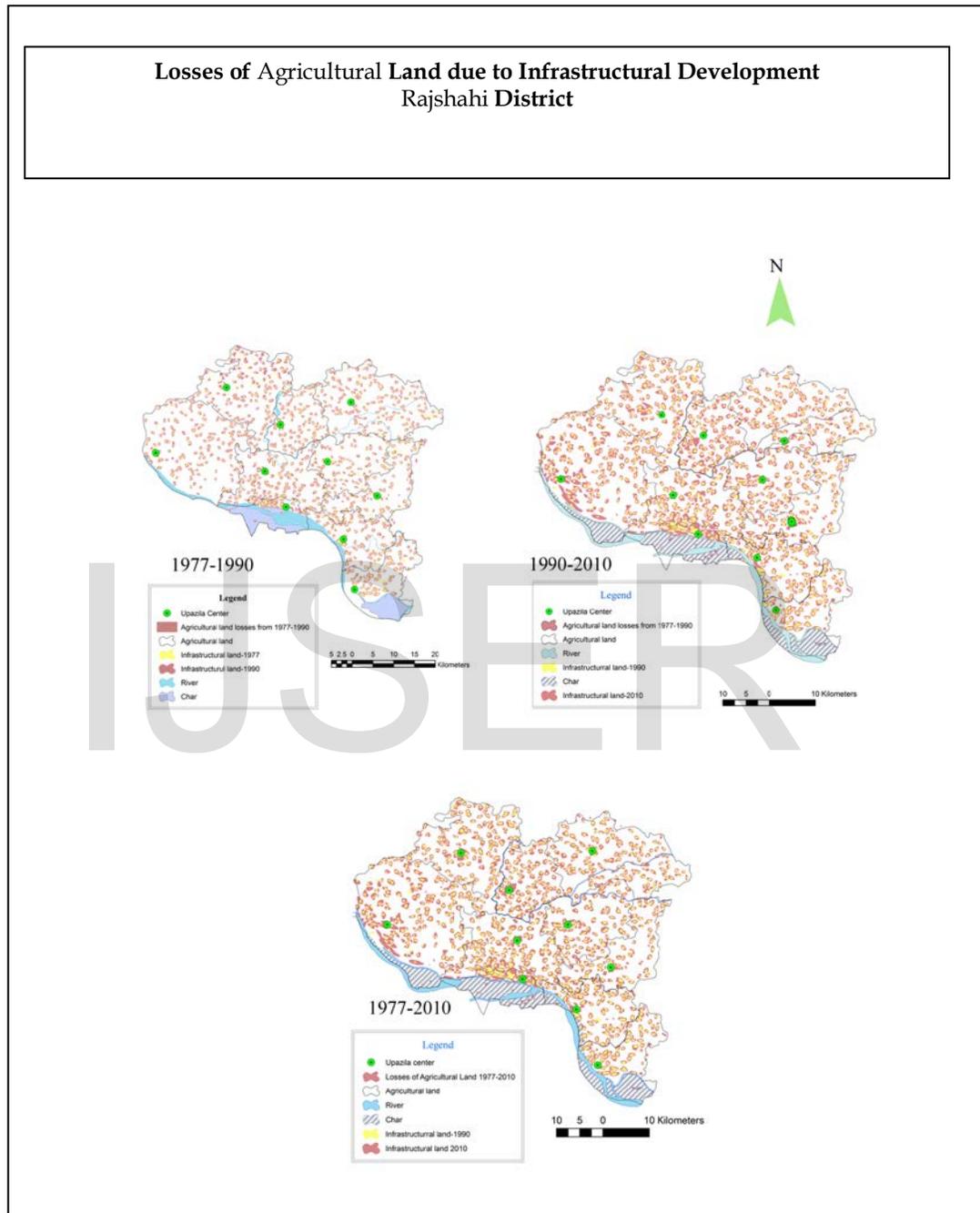Source: Satellite Images of 1977-MSS, 1990-TM, 2010-TM analysis

Figure-5 Losses of agricultural land due **to infrastructural development.**
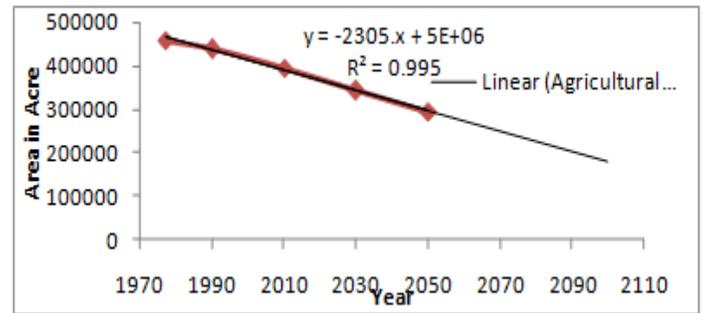Source: Satellite Images of 1977-MSS, 1990-TM, 2010-TM analysis

3.4 PREDICTION **ABOUT** AGRICULTURAL LAND

The agricultural lands of the study area have been decreasing and infrastructural area increasing. To keep harmony to these changes it's very easy to forecasting about the agricultural land of the study area. For

forecasting the following hypotheses have been considered. The hypothesis are- Agricultural land losing rate is constant, Continuous Infrastructural development rate, No action would be taken to protect the arable land. Consider the above hypothesis agricultural land would be loses quietly within next 217 years. That means within 2228 A. D. the agricultural land of Rajshahi District would be quietly dropout. In figure-6 shows the Forecasting about the agricultural land.

Figure-6: Forecasting about Agricultural land losses.

Source: Satellite Images of 1977-MSS, 1990-TM, 2010-TM analysis.

4 CONCLUSIONS

With unchecked population growth and economic development in the study area, infrastructural land has increasingly expanded and encroached upon agricultural land in the last few years. In this paper analyzes the spatio-temporal changes of land use and losses of agricultural land due to infrastructural growth. By using remote sensing and GIS integrated, it was found that agricultural land of the study area loosed by 0.46% per year. If this rate is continuous than within next 217 years the agriculture land would be finished. Moreover for the loss of agricultural land it's having been creates pressure on environment and it's polluted by different ways. The food production decreasing, food price rising and land fertility decreasing and this all are the result of agricultural land losing. Infrastructural development is the main causes of agricultural land losses. Though the agricultural land of the study area have been decreasing these can be taken a land use plan. If the land is used by planning guide, the agricultural activity will be continued otherwise the agricultural land will dropout.

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