

Changing Urban Landuse and Agricultural Land Transformation: A Case Study of Narayanganj City

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Abstract

The rapid increase in world population and the irreversible flow of people from rural to urban areas have become common problems for governments and decision-makers in both the developed and the developing countries. The mismatch between the supply and the demand of land leads to the degradation of environmentally fragile land, occupation of hazard prone areas, and loss of cultural resources, open space and prime agricultural lands of the study area. The current research is an attempt to study the pattern of landuse change and agricultural land transformation in Narayanganj city.

Keywords: degradation, environment, landuse, land transformation

Introduction

The relationship between man and land is inseparable. It means, land has been the perennial source of man's food, shelter, clothes, etc. That is why, people have been using lands in many ways according to their changing needs at different times. Human intervention and natural phenomenon causes change in landuse from time to time. Landuse change has become an unipatant component in current strategies for managing natural resources and monitoring environmental change. Because of the rapid development in the field of landuse mapping, there is an increase in studies of landuse change worldwide.

The study of landuse is very important both to the user of the land as well as to understand the environment around. The landuse pattern of an area changes along with time and need. The changes are related to the overall functional demand and physical environmental change. Without knowing the changing pattern of landuse, it is impossible to predict and analyse the consequential effects of environmental degradation for an area or region (Lee, 1991). The conversion of prime agricultural land to urban use may increase costs for locating, storing and purchasing food (Bernstein, 1994).

Statement of the Problem

The studies on landuse in urban areas are not of recent origin. The planners have made a number of studies on rural and urban landuse and its intensive use in various countries. Despite the dynamics of landuse, change in urban area has significant impact on the environment in and around a city. In fact there is a dearth of research in this field. The scanty research on landuse changes and agricultural land transformation has left this question largely unanswered. It has been

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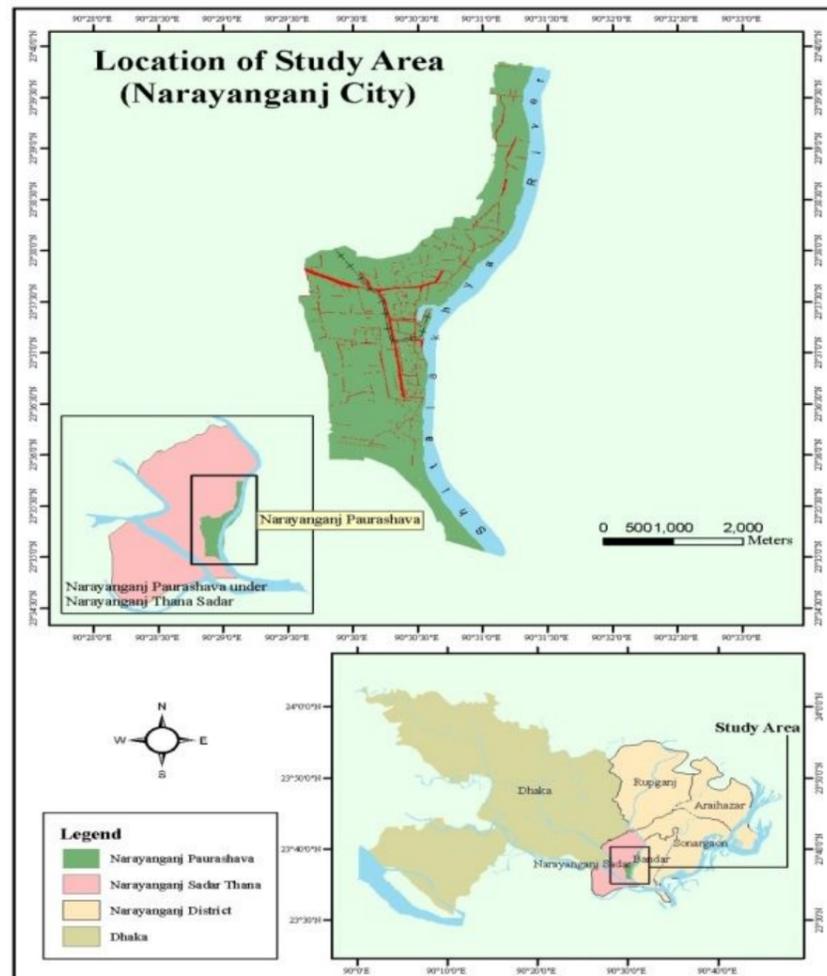
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increasingly felt that the relationship between landuse change in urban areas and its impacts on urban agriculture is of significant importance for urban and regional planning and quality of life.

Selection of the Study Area

Narayanganj city, a former sub-divisional town of Dhaka district, is characterised as an important trade and manufacturing center of Bangladesh. The size of the city is 10.40 sq. km. which is dotted with many industrial units for its easy transportation linkages with other parts of the country. It also plays a vital role on food security of both Dhaka and Narayanganj. Landuse pattern of the city is rapidly changing from agricultural lands to residential and commercial areas. As such, Narayanganj city (former Narayanganj Pourashava) is selected as the study area of this research (Map-1).

Map-1: Location of the Study Area.



Source: - Compiled and redrawn by researchers, 2009.

Objectives of the Study

The specific objectives of the study are:

- to analyse the existing landuse pattern of the city;
- to analyse the changing landuse pattern of the city; and
- to find out the nature of agricultural land transformation of the city under study.

Materials and Methods

The methodology adopted for the present study also includes extensive use of secondary materials to build up and support its objectives. Through reviewing available literature a broad outline of different issues of landuse within a city structure has been made. To fulfill the objectives of the study, an attempt was made to illustrate the current landuse pattern and trends of landuse change in the area. Cadastral maps of different periods and satellite images were used to bring out the trends of urbanization and the pattern of landuse change.

Data Collection

Relevant data for this research were collected from the field by using a questionnaire which contained structured and open-ended questions. Data related to the previous landuse of the city were gathered from different sources. Landuse data were gathered mainly for the years 1978, 1988 and 1998. The landuse data of 1978 were collected from an unpublished Master's thesis on "Narayanganj: Planning for Growth" by Rukun Uddin Ahammed submitted to the Department of Urban and Regional Planning of BUET. A similar type of study entitled "Planning Service Facilities in Pourashavas of Bangladesh: A Case Study of Narayanganj" from BUET by Moshtaque Ahmed Khondakar for the year 1988 was consulted. Based on an unpublished postgraduate research of M.M. Rahman of the Department of Geography and Environment of Dhaka University in 1993, a generalized landuse pattern was found for the year 1998. Current landuse map of the city was prepared by the present researchers based on the survey of Narayanganj Pourashava in 2008 in association with the adjustment of Landsat satellite data and Google Earth images.

Results and Discussion

The research is fully devoted to visualize the dynamics of landuse change of Narayanganj city, as it is attributed to rapid urbanization and its consequential impacts on its landuse and land evaluation. The existing pourashava area is unable to accommodate present expansion of urban growth. Therefore, the city has physically started spreading beyond the existing pourashava limit and infusing urban characteristics to the surrounding rural unions. To delimit the limit of any city is quite impossible as it merges with peripheral rural population. In this context the first objective of the research was to analyse the landuse of Narayanganj city.

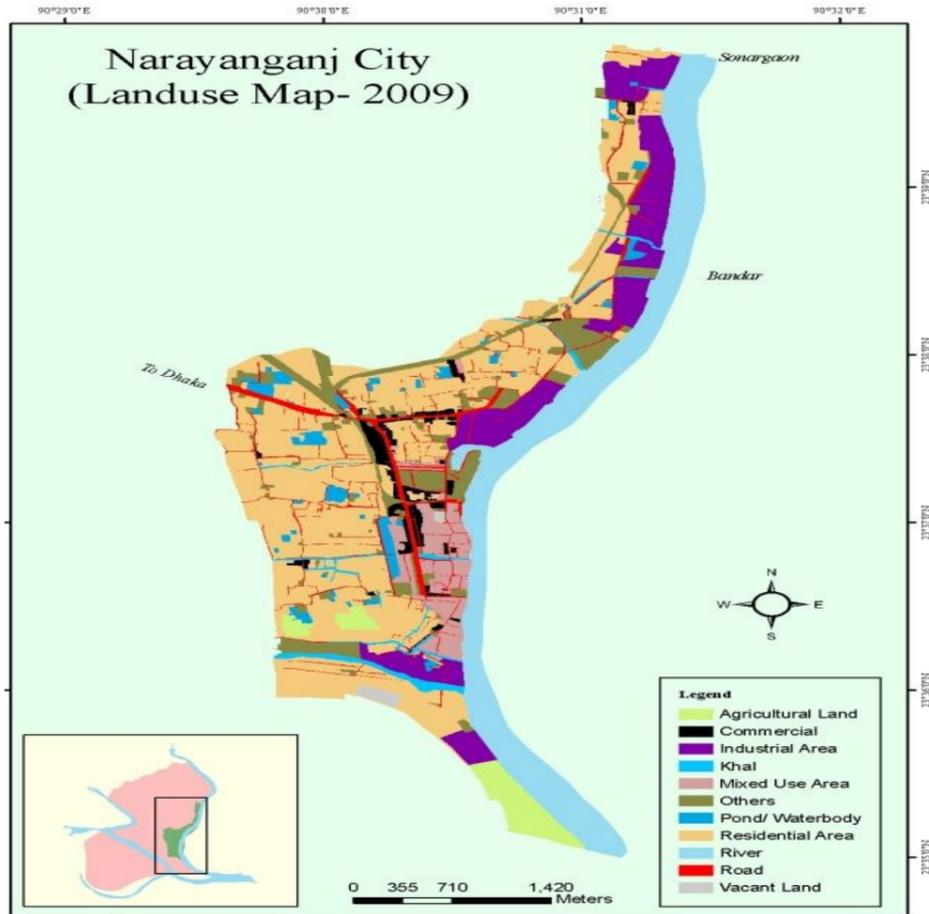
Present Landuse in the City, 2009

The present landuse pattern of Narayanganj city can be demonstrated as a mixture of commercial and residential types. Narayanganj has been treated as the city of hosiery products. The highest landuse is found to be residential (38.17%). Excepting the Shitalakhya, a river that falls in the

pourashava area, then industrial land use ranks second highest occupying 10.29% of the total land use (Map- 2).

About 5.88% of the total land area is used for commercial purposes. The main commercial block is found in ward 4, 5, 6 and 7. The increasing rate of commercial activities in and around the city has resulted in the growing proportion of residential areas within the city limits by transforming the remaining portion of agricultural and vacant lands. It is also occupying the existing water bodies in the city. About 38.17% of the total land area is residential. About 10.29% of total land area is used for industrial purposes. There are no heavy industries except some cotton industries at Bholail, Baburile etc. Chittaranjan Cotton Mill and Laxmi Narayan Cotton Mill are the two famous cotton mills existing today in the city. Now the road network covers 8 % of the city's land area. The percentage of vacant land in the city is now reduced to only 1%. Only 4 percent of the total study area is used for recreational purposes.

Map -2: Existing Landuse of Narayanganj City, 2009.



Source: Landuse Survey, 2009.

Changing Landuse Pattern in the City through Time

According to the nature and extent of the study area and diversity of its land uses, 10 generalized types of landuses have been selected for four selected years (Table-1).

Table- 1: Landuse Pattern in Different Years of Narayanganj City.

Landuse Category	1978		1988		1998		2009	
	Area in acre	(%)						
1. Commercial	38.93	1.32	39.81	1.51	49.34	1.92	56.80	2.21
2. Residential	242.61	9.44	447.44	17.41	629.91	24.51	980.97	38.17
3. Industrial	365.71	14.23	360.31	14.02	311.50	12.12	264.50	10.29
4. Mixed Area	----	----	----	----	5.41	0.21	43.69	1.7
5. Water Bodies								
I. River	695.96	27.08	695.96	27.08	695.96	27.08	695.96	27.08
II. Canal	15.94	0.62	11.31	0.44	9.51	0.37	7.71	0.30
III. Pond	2.6.11	8.02	126.20	4.91	108.20	4.21	12.85	0.5
6. Agricultural Land	724.99	28.21	524.54	20.41	393.72	15.32	77.1	3.0
7. Vacant land	175.53	6.83	131.60	5.12	52.70	2.05	25.7	1.0
8. Open Space	5.40	0.21	26.50	1.03	71.96	2.80	102.8	4.0
9. Roads	77.90	3.03	113.90	4.43	159.60	6.21	205.6	8.0
10. Others	25.96	1.01	93.55	3.64	82.24	3.20	96.40	3.75
Total	2570	100	2570	100	2570	100	2570	100

Source: R.U. Ahmmed, 1978; M.A. Khondakar, 1988; M.M. Rahman, 1993 and Landuse Survey, 2009 (for the landuse of 1978, 1988, 1998 and 2009 respectively).

It is very important to mention here that in 1952, the area of Narayanganj municipality was extended up to 7.5 sq miles by covering two narrow strips of land of both the western and the eastern sides of the Shitalakhya. In 1996 Narayanganj Pourashava was separated and present day Narayanganj Pourashava was formed comprising the western side of the Shitalakhya. The eastern side formed the Kadam Rasul Pourashava. Only the western strip of the city (present day Narayanganj Pourashava area) was considered for analysing the changing landuse pattern of the city in the present study. It needs to recall here that a portion of the Shitalakhya falls under the jurisdiction of Narayanganj Pourashava. As such the Shitalakhya (27.08 %) falls under the pourashava's area.

Analysis of Changing Landuse Pattern in the City

Narayanganj city is located within the sphere of influence of the capital city Dhaka. Such favourable location of the city plays a vital role in the landuse changes of the city. Landuse change is happening due to excessive pressure on and access to city land with rapid development and establishment of a) health and educational infrastructure b) commercial establishments and c)

formal and informal settlements. More expanded administrative set up and other activities promoted its growth from a small administrative town to a commercial city and finally as a multi-functional urban center. This kind of development of the city has a profound effect on landuse change. It has a better transport network with different districts of Bangladesh. Especially it has a direct connection with the capital city Dhaka. The connectivity between the central place of the city and its fringe area has been developed because of the availability of intraurban transport system. As a result, a change has occurred in the landuse pattern of the city. The rise of land value in Narayanganj city also affects the landuse pattern. Highly valued land in CBD area is used by high income group. Considering land value some residences are converted into commercial uses.

Different categorise of landuses including residential have been greatly developed in the fringe area of the city because of high value of land in the central area. The administrative importance of Narayanganj city has increased more than that in the previous years. Head offices of many government and non-government institutions have been transferred to this city. As a result, many employment facilities are created. A large number of populations from different areas of Bangladesh have migrated here for several pull factors including employment facilities of the city. These migrated people build permanent settlements in the city. Thus a change in landuse pattern has been observed. Globalization is an international factor which creates tremendous influence on landuse pattern and their changes in Narayanganj city as it works as a pull factor to reside in the city environment.

Table - 2: Changing Landuse Pattern of Narayanganj City, 1978-2009.

Landuse Category	Landuse-1978 (in acre)	Landuse-1988 (in acre)	Landuse-1998 (in acre)	Landuse-2009 (in acre)	% Change 1978-1988	% Change 1988-1998	% Change 1998-2009	% Change 1978-2009
1. Commercial	38.93	39.81	49.34	56.80	+0.19	+0.41	+0.29	+0.89
2. Residential	242.61	447.44	629.91	980.97	+7.97	+7.10	+13.66	+28.73
3. Industrial	365.71	360.31	311.50	264.50	-0.21	-1.90	-1.83	-3.94
4. Mixed Area	----	----	5.41	43.69	0.00	+0.21	+1.49	+1.49
5. River	695.96	695.96	695.96	695.96	0.00	0.00	0.00	0.00
6. Canal	15.94	11.31	9.51	7.71	-0.18	-0.07	-0.07	-0.32
7. Pond	2.6.11	126.20	108.20	12.85	-3.11	-0.70	-3.71	-7.52
8. Agricultural	724.99	524.54	393.72	77.1	-7.80	-5.09	-12.32	-25.21
9. Vacant land	175.53	131.60	52.70	25.7	-1.71	-3.07	-1.05	-5.83
10. Open Space	5.40	26.50	71.96	102.8	+0.82	+1.77	+1.20	+3.79
11. Roads	77.90	113.90	159.60	205.6	+1.4	+1.78	+1.79	+4.97
12. Others	25.96	93.55	82.24	96.40	+2.63	-0.44	+0.55	+2.74
Total	2570	2570	2570	2570	----	----	----	----

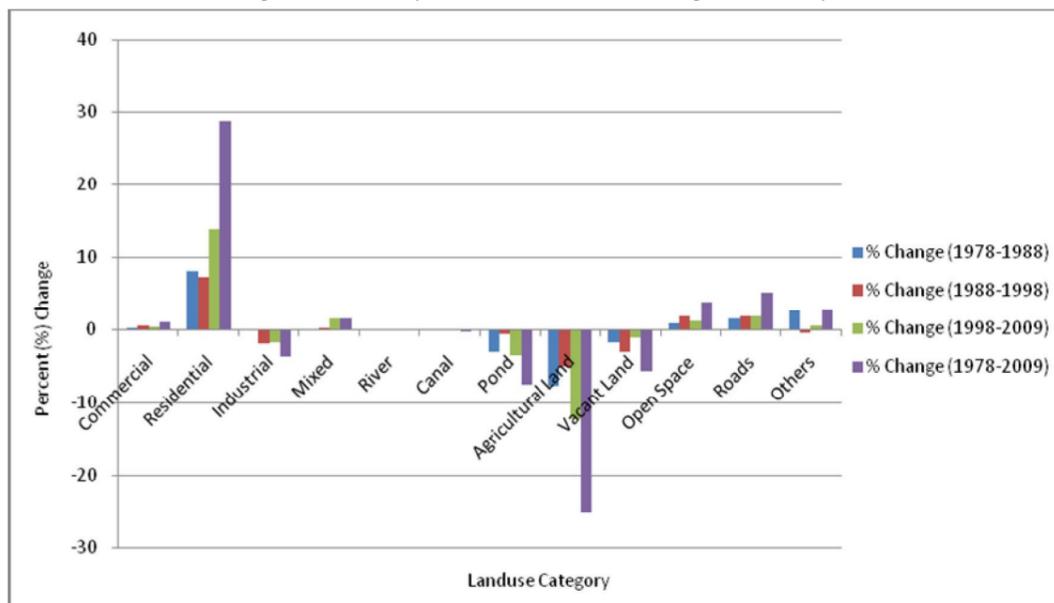
*(+) indicates the increase of percentages, where (-) indicates the decrease of percentages.

Source: Compiled from Different Sources.

A rapid and remarkable change has been observed in residential landuses (Table-2). Around 29% positive change has occurred in this type of landuse. That means 28.73 % of the new residential area has added, till 2009, to the residential area of 1978 (Figure-1). New residential area has

developed using agricultural land, fallow land and open spaces for providing housing facilities to the increasing population. The low income group residential area has declined than that in the previous two decades. But high and middle income group residential area has increased recently. In the central part of the city, the density of residence has increased. New residential areas have been establishing in fringe area of the city replacing agricultural and fallow land. Commercial function is one of the most important functions of a city. So commercial landuse and its changes have been observed with the growth of the city. The commercial land of Narayanganj city grew by 0.19 percent, 0.41 percent and 0.29 percent during the time period of 1978-1988, 1988-1998 and 1998-2009 respectively. Overall 0.89 percent increase of landuse of this type has occurred during 1978-2009. Mixed type of landuse has been observed in CBD areas of Narayanganj. Number of shops, banks, hotels, restaurants, office of the different institutions, cinema hall etc. have been established gradually since 1970 in the commercial area of the city. Thus, the presence of this type of landuse has been enhanced in the city.

Figure- 1: The Dynamics of Landuse Change in the City.

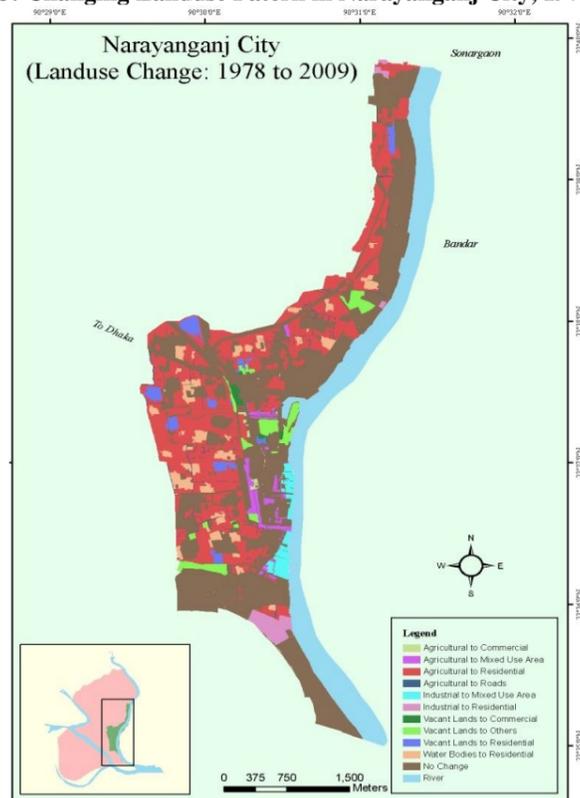


Source: Compiled from Different Sources.

A significant change has been observed in landuse pattern of the city in respect of industries. Industrial landuse of Narayanganj City decreased by 0.21 percent, 1.90 percent and 1.83 percent during the time period of 1978-1988, 1988-1998 and 1998-2009 respectively. Before the emergence of Bangladesh as an independent country, Narayanganj was the birthplace of many small, medium and heavy industries. With times the development of new industrial estates outside the city limit especially at Enayetnagar, Fatulla, Adamjee, Kachpur and Panchabati areas, has made the city an ideal place of trade and commerce for hosiery products (Map-3). A significant

number of large industries are shut down in the city. Today's few cotton mills and some light industries are the remnants of the past. The existing cotton mills, especially at Khanpur, Godnail, Shahid Nagar and Nayamati, are the serious concern of environmental thinkers.

Map- 3: Changing Landuse Patern in Narayanganj City, 1978- 2009.



Source: Researcher, 2009.

Rapid growth of population, rise of land value in CBD area, lack of sufficient vacant land in the city, agricultural land, fallow land and water bodies have used for settlements in terms of residential, commercial, road network etc. in Narayanganj city since the independence of Bangladesh in 1971. Agricultural land declined by 7.80 percent, 5.09 percent and 12.32 percent during the period of 1978-1988, 1988-1998 and 1998-2009 respectively.

With the passage of time the growing population and the faster economic activities has reduced and it is also reducing the amount of agricultural land of the city. The remarkable change in agricultural land is observed in the south-western and north-western side of the city. Most of the agricultural lands are converted into settlements and into mixed type of landuse. Fallow lands of the city are gradually transformed into settlements in terms of residential, commercial and

institutional etc. A huge number of tanks, *dighis* and ponds were available in Narayanganj city. But with the necessity of settlements for increasing population, these water bodies are filled up over the years. A remarkable negative change is observed in the percentage of change of water bodies of the city since 1970. The proportion of administrative landuse in the pourashava area is not increasing remarkably. A shift of major administrative offices is seen recently from old southern part to the northern part of the city. Important administrative establishments such as civil court, DC office, central jail, police super office etc. have already shifted from the pourashava boundary to Chanmari and Isdair areas. This creates a new extension of the city to the north. The pourashava office and AC (Land) office are remaining under the pourashava.

The changing pattern of landuse of the city can be summed up by saying that increase of residential and commercial area is responsible for decreasing agricultural and industrial landuse. The encroachment of the river Shitalakhya was negligible in the pourashava area but illegal occupation of major ponds, khals and other forms of water bodies happened during the period of 1978-2009. An increasing amount of land has been found to be occupied by a number of formal and informal activities of the city in the year 2009.

Nature and Pattern of Agricultural Land Transformation

Urban agriculture is one of the ways to the supply of food grains and vegetables to the residents of the cities in the country. The nature, type and magnitude of transformation of agricultural lands to non agricultural activities may have a profound effect on food security of Narayanganj city. Narayanganj city lies on fertile land between three peripheral rivers, the Shitalakhya, the Dhaleswari and the Buriganga. But its development was due to its commercial role. It had a well-developed trade center. In the last few years, as new commercial activities have developed, the city and its surroundings have undergone radical changes, including the expansion of its built-up area and a transformation in its population's occupational structure.

Historically Narayanganj has been recognized as a center of trade and commerce. Due to its easy means of communication and transportation, an agglomeration of commercial activities developed at the bank of the Shitalakhya. The present boundary of the city limits to the western bank of the Shitalakhya which is as it was earlier in this western bank of the river. Except the presence of industries alongside the river Shitalakhya, other portions of the city area mainly were in agricultural landuse with some portions of scattered residential areas and vacant lands. After the emergence of Bangladesh in 1971, the population of the city increased at a fast pace. This is because of the presence of employment in the industries and the abundant scope of doing commercial activities in the city. This extra pressure of population is the key to the rapid reduction of agricultural land within the city limits and this is what table 3 shows. Table 3 shows that the area under agricultural use has declined. There was a tremendous increase in the urban area between 1978 and 2009 while a total of 647.89 acres of fertile agricultural land were lost due to the city's expansion.

Table- 3: Loss of Agricultural Land in Narayanganj City, 1978-2009.

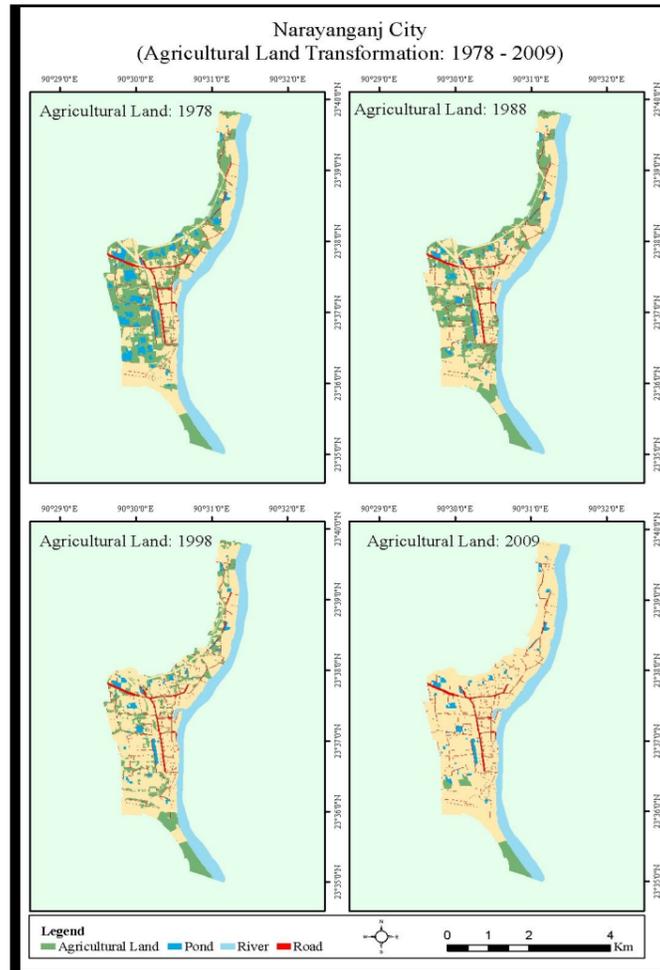
Year	Area Under Agriculture (Acres)	Loss of Agricultural Area	
		Acres	%

1978	724.99	-----	-----
1988	524.54	200.45	7.8
1998	393.72	130.82	5.09
2009	77.1	316.62	12.32

Source: Compiled from landuse data.

Table 3 and map 4 show the land transformation among the four main land use classes, namely, agriculture, industrial, water bodies and vacant land. This indicates the rapid loss of fertile agricultural land, much of which is non-recoverable because some permanent construction has been undertaken. Significantly, the land where no permanent construction has taken place, i.e. that which is lying vacant, can be recovered but it will not be an easy task to restore this land back to agricultural use.

Map-4: Transformation of Agricultural Lands, 1978-2009.



Source: Researchers, 2009.

In Narayanganj city there has been rapid conversion of agricultural areas to non-agricultural uses. The built-up area has increased in all directions but this is more pronounced to the north of the city than to the South, where the morphometry of land has blocked development. The study area has recorded a significant increase in residential area to accommodate the city's rapidly growing population but this increase has been more pronounced in unplanned residential areas than in planned residential areas.

The amount of vacant land in and around Narayanganj city has reduced substantially, largely as a result of the increasing demand of land for non-agricultural uses and landowners' anticipation of increased land values as urban development expands. The urban expansion of the city (both built-up and non-built-up) has destroyed fertile agricultural land. The canals which used to flow through agricultural fields are now encroached upon and are used for the disposal of garbage and wastes.

Conclusion

A variety of factors affect the supply and demand of land and its uses in a city. The multifarious changes in landuse of Narayanganj city result in the transformation of prime agricultural lands of the city. The improper use and changes of urban land poses serious problems in Narayanganj city simply because the supply of surplus land is limited and subject to many competing claims. Dissatisfaction with the emerging landuse changes is almost universal. The present way of transforming agricultural land into extensive non-agricultural activities with relatively low density is continuing in the absence of land use control and legislation mechanism. Therefore, proper planning of landuse is most essential for an orderly and efficient growth of the city.

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