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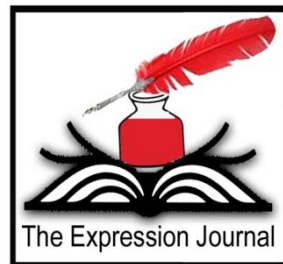
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URBAN EXPANSION AND LOSS OF AGRICULTURAL LAND: EVIDENCE AND IMPLICATIONS FOR KARNAL CITY

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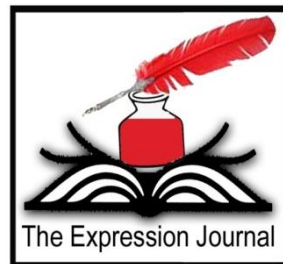
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Abstract

For geographers interested in spatial analysis, land surface is always an area of interest. This surface has changed over the course of the geological period, but this change coincided with the recent rapidly expanding urban spread. In the urban landscape, it is more typical. This change should be mapped and measured regularly so that we can get information on it in real time. This knowledge will not only allow you to understand the dynamics of changes, but is also important for land resource planning and management. Satellite images of Landsat have been used downloaded from www.glovis.usgs.gov/. Apart from satellite, Toposheet No. 53C/14 and the map of the city of Karnal has been used for purposes. The researcher also searched for the modifications which have taken place in the urban side in Haryana from 2001-2017. The aim of the study is to discover the sprawl pattern of the city of Karnal and surrounding agriculture land changes. For land use classifications a supervised classification using a Landsat Data is perform. The Built up, Water bodies, Crop land, Fallow Land and Open Land are five major categories list. In addition, improvements in these categories were calculated and mapped from 2001, 2011 and 2017. ARC GIS 10 and MS OFFICE are use for software. Two main areas are the sprawl of the city. The first is between the main railway route Delhi-Ambala and the national highway number 44; the second is on National Highway No. 44 in the east of the city. The study found that major changes have occurred in land use in urban areas and cultivation land. Construction has mainly been expanding on cultivated land and in part on vacant land.

Keywords

Land-use Change, Loss of Agricultural Land, Urban Sprawl, Urban Agriculture.



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Introduction

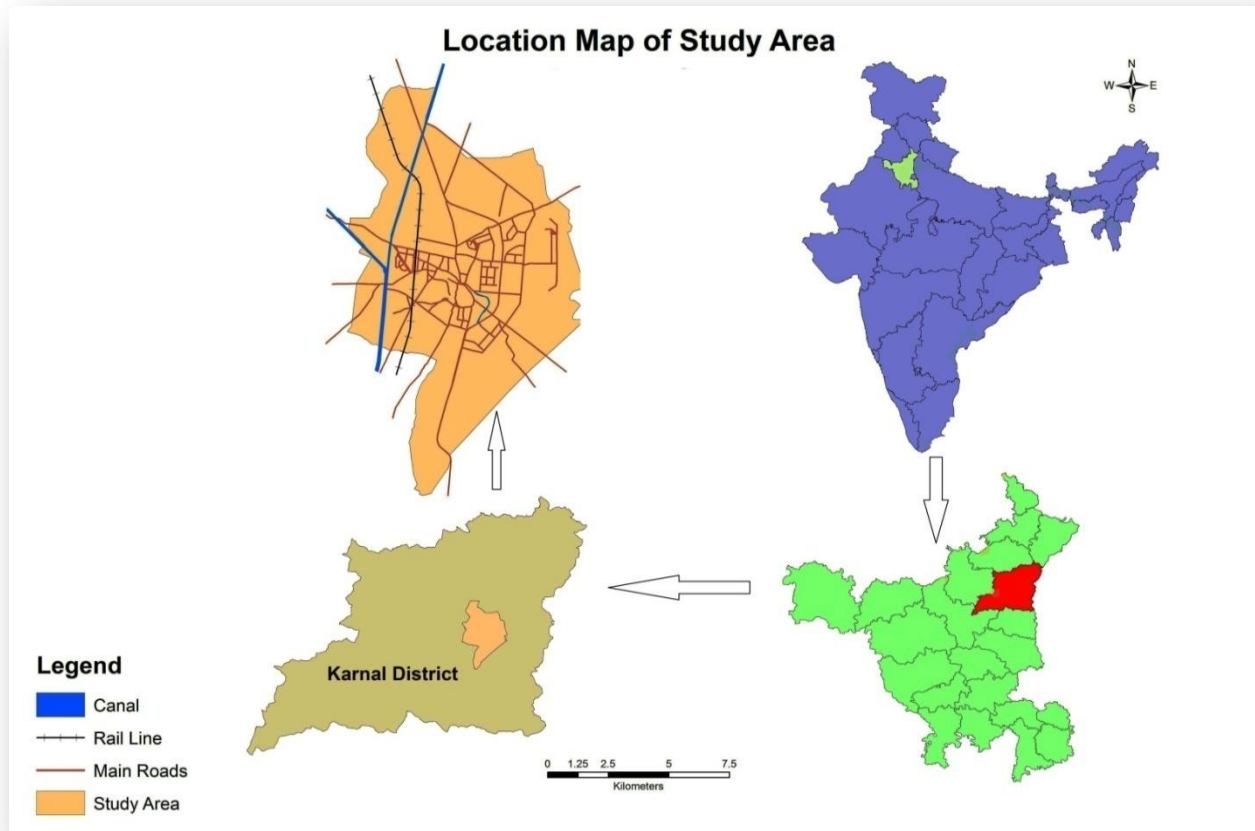
The ground surface has always been an attractive center for geologists to study spatial phenomena. This growth is driven by the amenities of cities. As migration increases the city's population, it is affecting the natural resources on the outskirts of the city. Construction on land is getting out of land development control, which is increasing blindly especially in the outer area of these cities. Urban and rural fringe is the elements that have changed most rapidly in relation to the urban landscape map. Hence the importance of land use of rural urban fridges increases for urban schemes. Information on land change at the national and regional level is very important on sustainable land use planning.

Land use identification mapping and delimitation is important for resource management and planning. Identification of land use provides the basis for the activities taking place thereon. There are several approaches to collecting and analyzing data. Land cover is currently used by the researcher using remote sensing images as a source of space satellite data. Traditional field surveys and aerial photo interpretation have been used to assess urban development and to find land use changes such as reduced agricultural land. Satellite images are often authorized and can be viewed in time intervals for changes in the land use of the same area.

Study Area

The city of Karnal is located at 29°37'50"- 29°44'40"N and 76°56'20"-77°02'50"E in Haryana in the province of India. Karnal is one of the twenty two state districts. The city of Karnal is also the headquarters of the district of Karnal. Karnal's population is 3,57,284 in 2011 after formation of Municipal Corporation. Karnal is believed to be a mythological hero and a key figure in the epic story, founded by the Kauravas during the Mahabharata era for king Karnal. It is located on the national highway No.44 (popularly called GT road) between Delhi and Chandigarh, 123 km north of Delhi and midway between Delhi and Chandigarh. Karnal is renowned for its luxurious grasslands, Liberty shoes, quality Basmati rice production and its many institutes for agricultural and dairy research.

Figure No. 1: Location Map of Study Area



Source: M.C. Office, Karnal City

Methodology

Data sources: Following data sources have been used for present work. Topsheet No 53C/14 on scale 1:50000(Survey of India, Dehradun). Guide Map of Karnal City. M.C. boundary Map of Karnal city (2011). Landsat-7 satellite image dated 31.08.2001 and Landsat-7 satellite image dated 20.09.2011 and Landsat-8 satellite image dated 24.02.2017 having with 0% cloud covers are downloaded from www.glovis.usgs.gov/. All these data are open source satellite images and Census data published by Census of India 2011. Primary data will be collected through field survey. Study focus on urban expansion and its impact on land use/land cover pattern.

Software Used: The following software's were used for this study. Arc/Map (10): This software was used for the preprocessing, import image, geo-referencing of satellite data. Arc Map is the premier application for desktop Geographic Information System (GIS) and mapping. Ms Office: Microsoft Word was used basically for the presentation of the research work i.e. for preparing the manuscript and power point presentations. Excel was used in computation of various statistics, preparation of the graphs and excels sheets.

Methodology: The methodology is the central part of any research work which is helpful in explaining reality and scientific descriptiveness. The methodology is quick and physical by a group of tools, technicians and method. A tool is a tool that is required to perform certain tasks. A method does not describe the main methods, yet it specifies a number of procedures that

must be followed. The main process forms a common framework. That process can be broken and combined into sub-processes or the order can be changed. These procedures must be completed for any work practice. The steps adopted in the methodology are as follows: Acquisition of data, Geocoding Toposheet No. 53C/14 on scale 1:50000 of Karnal city, Georeferencing & Rectification, Subset of study area, Supervised Classification, Accuracy assessment, Map Construction, Results and Discussions, Conclusions.

Process of Urbanization

An important element of urbanization is the development of cities and metros. The city is a ray of hope for the rural people. Because the city has a high standard of living and it is not available mainly in rural areas. Cities provide economic opportunities to the people of rural areas. This leads to large scale migration from rural to city. With this, India's urban population is expected to reach around 575 million by 2030, which will be more than 40% of the world. Due to this, the quality of physical environment is gradually decreasing in almost all cities. Therefore, we should look positively at the response to urban development. It should also be noted that urbanization should be more balanced and accountable to national development goals in general.

Urbanization in Karnal: The urban population in 1951 was 68422 persons which have reached 82929 persons in 1961 with increased of 14787 persons. In the next decade (1961-1971) the urban population has increased by 22900 persons from 82929 in 1961 to 105829 in 1971. In 1981, 183755 persons were living in urban area of the district. During the period of twenty years (1981-2001) the urban population rose enormously from 183755 persons to 337842 persons.

Table 1: Urban Population and its Growth Rate in Karnal district and Karnal City, 1951-2011

Census Years	Karnal district			Karnal City		
	Total Urban Population	Variation in Population	Decadal Growth (Percent)	Total Urban Population	Variation in Population	Decadal Growth (Percent)
1951	68442	-----		59790	-----	
1961	82929	14487	21.16	72109	12319	20.60
1971	105829	22900	27.61	92784	20675	28.67
1981	183755	77926	73.63	132107	39323	42.3
1991	246121	62366	33.94	173751	41644	31.52
2001	337842	91721	37.26	207640	33889	19.50
2011	456030	118188	34.98	286827	79187	38.13

Sources: Census of India, District Gazetteer Karnal 1990, Chandigarh, Haryana, Census of India, Primary Census Abstract 1991, 2001, 2011 Chandigarh, Haryana.

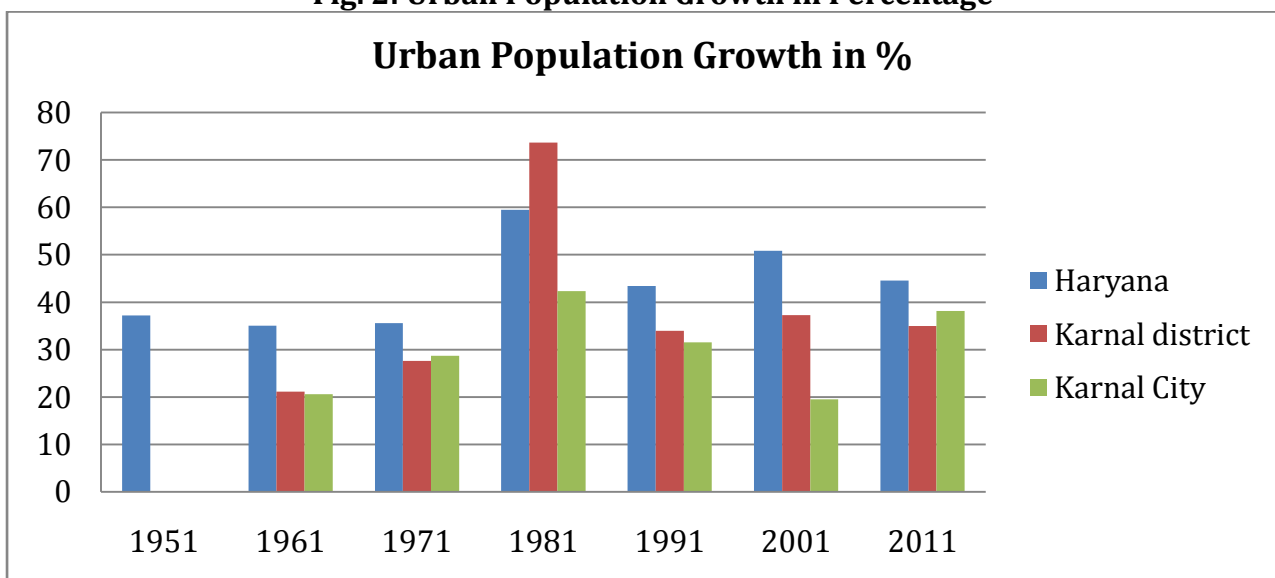
According to census 2011, there are 456030 urban populations which is the addition of 337842 persons as compared to census 2001. As we see the statistics of Karnal City, there is not significant increase in urban population up to 1931 and it remains varied 23559 in 1901 to

26610 in 1931. After that there is continuously increase in urbanization and urban population increased 59790 people in 1951 to 132107 persons in 1981 and 286827 persons in 2011. In regard to the decadal growth rate of urban population it has been observed a highly irregular trend of the growth in city as well as district also. The general factors which influence the trends of population growth are: severe attack of malaria and plague during 1901-1911, mass migration of people in the wake of partition during 1941-1951; and health measures adopted by the Government. Karnal city, because of its proximity to Delhi, had a good scope for gainful employment, hence attracted a large number of refugees. Besides, there is general trend of population rise in the country. An increase in the population of both the towns during two decades (1921-1941) was nominal.

During the post-independence period (1951-1981), there was a steep rise in the population and urban population got a boom, in the district as well as in the city (Table 1). This may be attributed to the health measures adopted by the Government. Many people do not find such facilities in the villages. It has been observed that a large number of persons shift from surrounding villages to the towns for education and livelihood.

Karnal city my study area is having a populace of 357284 as indicated by statistics 2011 after formation of Municipal Corporation. Males are 189239 and Females are 168045. Literate individuals are 267963 among aggregate. It overall region is 90.57 sq. km and population density is 3945 person per sq. km. 20th ward in Population at Karnal city. The Average Sex Ratio of Karnal City is 888 and child Sex Ratio of Karnal city is 809. 14th most elevated district in the State by education rate. 236th most elevated district in the Country by proficiency rate. Karnal city total proficiency Rate is 84.60, male 88.99 and female 79.88. The number of inhabitants in Children of age 0-6 years in Karnal city is 32468 which are 11.31% of the complete populace. There are 17945 male youngsters and 14523 female kids between the ages 0-6 years. In this way according to the Census 2011 the Child Sex Ratio of Karnal is 809.

Fig. 2: Urban Population Growth in Percentage



Urban Agriculture

Urban agriculture can be defined as the development propagation and preparation of vegetables and animal husbandry with flowers. This is an important valuable activity for markets and urban environments, which is mainly on the outskirts of the city. Urban

agriculture has been tested worldwide for many years and it is a mixed urban structure in many places. Urban agriculture is part of the integrated ecological plan in many circumstances. The importance of which is important for the greenery of the region, expansion of tourism and its environment. The increase or decrease of organic perception is of a natural concrete area, if the plan is very well organized and harmonized in the urban boundary area, then this agricultural area can improve the physical environment of the city. Flowering plants and elaborate food growers can control air disintegration and its aroma. Urban agriculture will also enthusiastically increase biodiversity with the use of humans and similar structures.

Agriculture and the urban expansion in Karnal: Due to the increasing development of urban slum areas in the city of Karnal, the population is increasing. This includes adequate unemployment, lack of food and lack of facilities, lack of food in high urban social and welfare environments calls for altered processes to guarantee adequate access to food for everyone. This change in where they are is driven by factors such as particular users and preferences, because now land is needed for urban applications rather than agriculture. It has promoted maturity and land acquisition to consider capacity. For this, the land of rural urban limits is considered the most suitable.

With the expansion of urbanization in the city of Karnal, the city has developed to a large extent in the form of roads, multinational companies etc. There has been a shortage of 9.23 sq. km. of agricultural land from 2001 to 2011 and from 2011 to 2017 there has been a shortage of 4.30 sq. km. of agricultural land, which has become a built up area of slums mostly due to population pressure. This will be explained with the help of maps and tables in the further topic of results and discussion.

Results and Discussion

Looking at the map and the table shows that there have been significant changes in the city of Karnal in the years 2001 to 2011 and 2017. From the statistical images it was seen that the built up area was very low in the year 2001, the built up area in increased 2011 which is shown in red colour in the map and then in the year 2017 the built up land increased more which you see in the map. Due to which the agricultural land has decreased 13 sq. km in 2001 to 2017, 40.25 sq. km. in 2001, 30.02 sq. km. in 2011 and 26.72 sq. km. in 2017, which has reduced the agricultural land due to which production of agricultural products has decreased significantly. In the table it is analyzed that the agricultural land in terms of area has declined due to the effect of urbanization. In the year 2001 it was 40.25 sq. km. in 2011 it was 31.02 sq. km. and in the year it decreased more i.e. 26.72 sq. km. The built up area shown in the table increased in from 2001 to 2017. In 2001 it was 33.02, in 2011 it was 46.65 and in 2017 the area increased more and it was 56.02. The vacant land that could have been used for agriculture also kept declining in all these years shown above. In 2001 it was 10.32, in 2011 it was 8.36 and in 2017 it was 4.25. The water body area like lakes, ponds and wells also decreased. As seen above in 2001 the water body area was 2.03, in 2011 it was 1.56 and in 2017 it was 0.86. The fallow land that can be used for grazing of animals and more cultivation also declined. From the table it can be seen that in 2001 it was 3.09, in 2011 it was 1.12 and in 2017 the fallow land that was remained was 1.86. So all this was due to effect of urbanization.

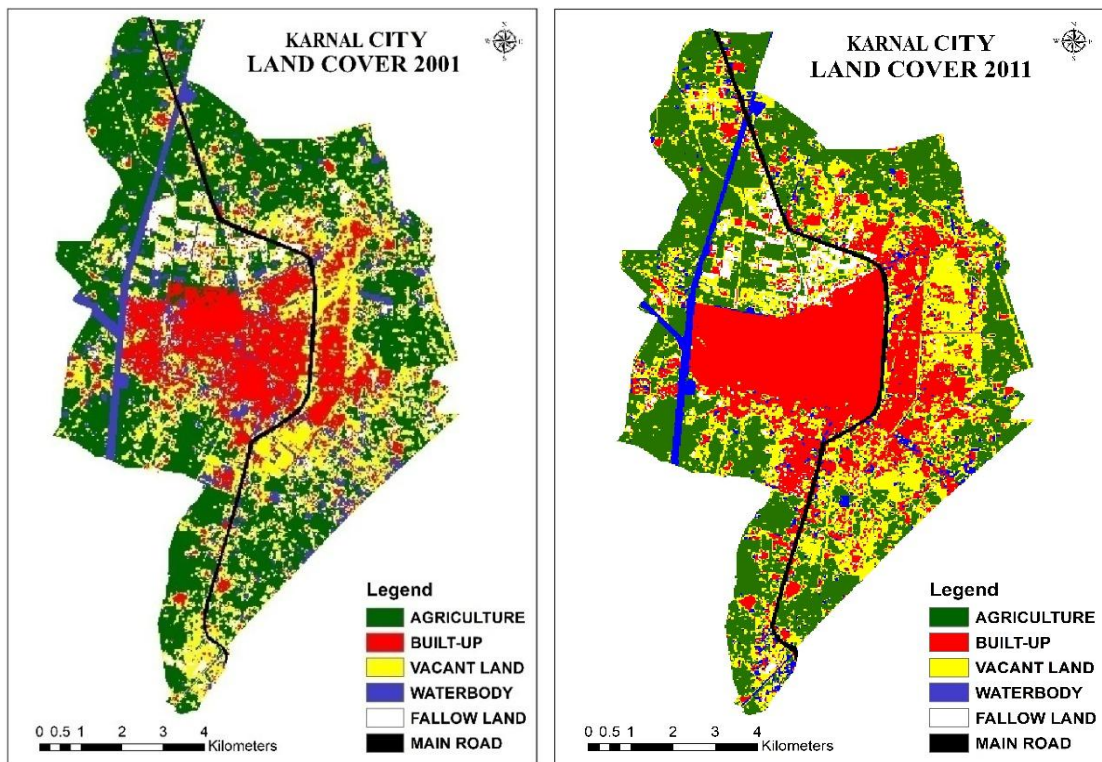
It is observed in the above statistical table that there has been a lot of change in the built up, vacant land, fallow land and water bodies of agricultural land. In the years 2001 to 2011 there has been a change of 4.32 sq. km. from the agricultural land to the built-up area and 9.17 sq. km. from the agricultural land to the vacant land.

Table 2: Land use/cover in Karnal city (2001, 2011 & 2017)

Class	2001 (Area in sq km)	2011 (Area in sq km)	2017 (Area in sq km)
Agriculture	40.25	31.02	26.72
Built-up	33.02	46.65	56.02
Vacant	10.32	8.36	4.25
Water Body	2.03	1.56	0.86
Fallow Land	3.09	1.12	0.86
Road	1.86	1.86	1.86
Total	90.57	90.57	90.57

Source: Karnal City Map in M.C. Office, & Landsate Data (2001, 2011 & 2017)

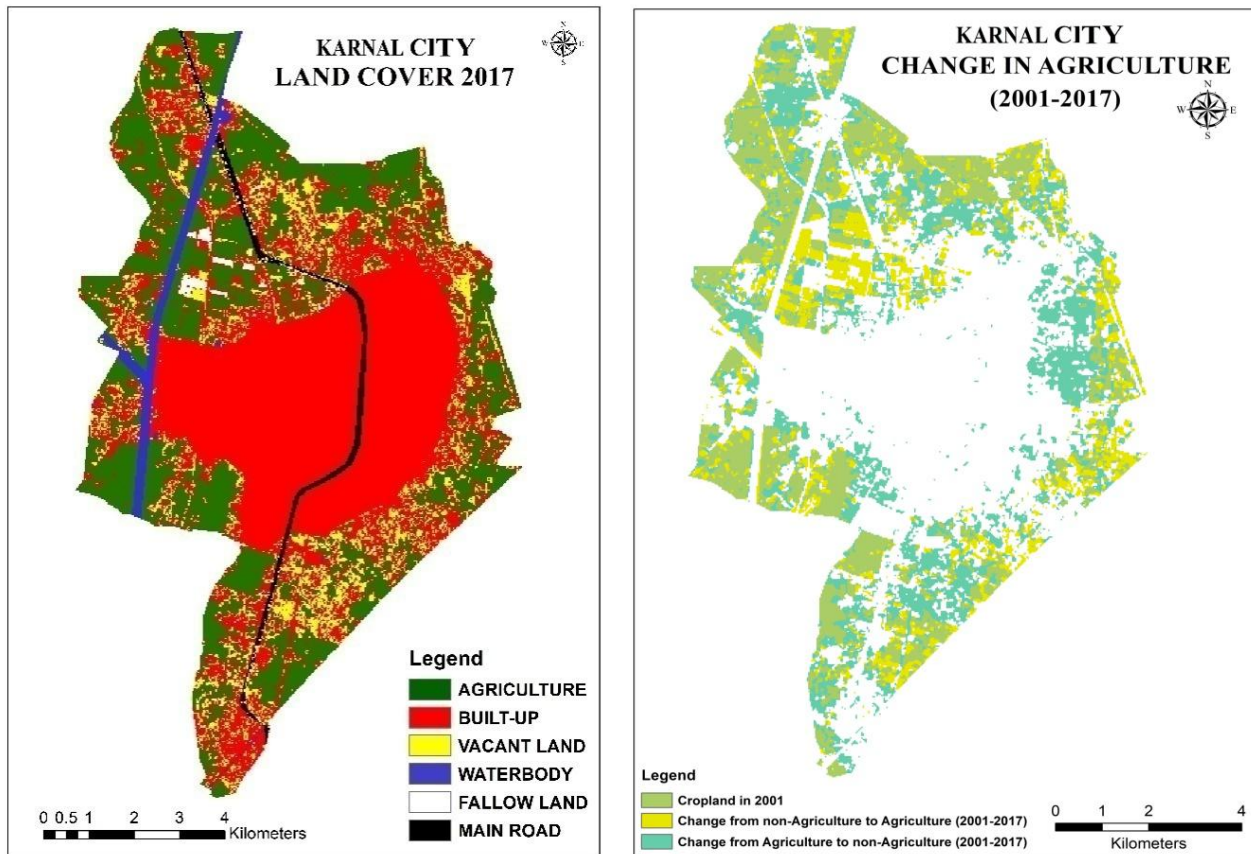
Fig. 3 & 4 the land use and land cover map (2001, 2011).



Source: Karnal City Map in M.C. Office, & Landsate Data (2001& 2011)

But 5.17 sq. km. from the agricultural land to the built-up area between 2011 and 2017, 1.18 sq. km. from the vacant land the key has changed. After seeing all this it is known that between 2001 and 2017 a large part of agricultural land has turned into built up land, vacant land fallow land and water bodies. Apart from this, one thing has also come to notice that between 2001 and 2011 the agricultural land has gone into a lot of vacant land which later changed to the land built up area between 2011 and 2017. This analysis shows that urbanization has been greatly affected agricultural land.

Fig. 5 The land use and land cover map (2017). Fig. 6 Change in Agriculture Map 2001 & 2017



Source: Karnal City Map in M.C. Office, & Landsate Data (2001, 2011 & 2017)

Table 3: Transformation of Agricultural Land

		Agriculture 2001 to 2011	Agriculture 2011 to 2017	Agriculture 2001 to 2017
Categories Total (Area in sq km)		40.25	31.02	40.25
Change Categories	Agriculture	25.01	24.36	24.36
	Built-up	4.32	5.17	13.75
	Vacant	9.17	1.18	1.67
	Water Body	0.80	0.05	0.12
	Fallow Land	0.87	0.19	0.23
	Road	0.08	0.07	0.12
	Total %	100	100	100

Source: Karnal City Map in M.C. Office, & Landsate Data (2001, 2011 & 2017)

Loss in the Production of Food Grains: An estimated 193 million tones, which was barely achieved due to favorable monsoons, were in demand in the country in 1998. The demand will amount to some 350 million tons by 2015. Production needs to be increased by 3 percent a

year in order to fulfill these food requirements; but in the past five years, food grain production has grown by just 1.6 percent. The attainment of these goals is more demanding and also an issue for agricultural scientists, as the reduction in agricultural land directly resulted in a decrease in the production of food grains, and this loss is very difficult to achieve.

Table 4: Loss of Food Grains Production 2001 to 2017

Years	Loss of Agricultural Area (sq. km.)	Average Loss of Food Grain Production per Year (in quintals)
2001 - 2011	9.23	80283
2011 - 2017	4.3	62336
2001 - 2017	13.53	103659

Source: Based on estimation by Researcher and Karnal City Map in M.C. Office, & Landsate Data (2001, 2011 & 2017)

The estimated total annual average loss of food grain production from 2001-2011 due to urban expansion in the area studied is about 80283 quintals per year in the area under study. The average annual food grain production in the study area between 2011 and 2017 is estimated to lose 374016 quintals of food crop production at 62336 per year. In this regard, new technologies should be pursued to improve productivity in agriculture as agriculture has lost land worldwide because of urbanization.

Conclusion

Urbanization is also viewed as having a detrimental effect on agriculture, ranging from land losses to construction and urban growth, and industrial predisposition to government support for infrastructure, utilities, and subsidies. Yet the scale of urban deprivation for many people reveals no urban prejudice and, naturally, rural income is of significant importance to the urban market for agricultural products. Farmers and rural consumers are also dependent on urban companies to supply a variety of goods and services including market access. The main issue is, therefore, how the growing and evolving demand for food (and other agricultural products) generated by an increasingly urban population and the economy will help sustain agricultural and rural resources in a global downturn in the amount of agricultural land per person and in water constraints. In addition, it is now important to respond to the impacts of climate change that could affect agriculture and urban demand, as well as to city companies supplying rural community farmers and customers with services. This is because farming can be seen as the foundation of the Indian economy's industrial structure. It offers livelihoods in the country of more than 70 percent. It is the largest sector of economic activity and plays a key role in the economic development of the country by providing food and raw materials, jobs for very high populations, captive for its own development and surpluses for natural economic development.

References

- Bhardwaj, P.K. and Kumar, S. (2012). "Urban Expansion and Land Use Change Analysis of Karnal City in Haryana: A Study Based on Open Source Satellite Data." *International Journal of Emerging Technology and Advanced Engineering*, vol. 2, no. 12, pp. 182-186.
- Bhardwaj, P. K. and Kumar, R. (2009). "Technological mapping of land use /land cover transformation along Haridwar-Roorkeetransport corridor." proceedings *CETAS-2009*, pp. 315-319.

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- Bhardwaj, P. K. and Kumar, V. (2012). "Geoinformatics based Mapping and Analysis of land use/land Cover Pattern: A case study of Rohtak City in Haryana." *Maharshi Dayanand University Research Journal (ARTS)*, vol. 11, no. 1, pp.135-141.
- Census of India (1991a). "General Population Tables and Primary Census Abstract Series-6 (Part II- A and B)." Director of Census Operations, Haryana.
- Coppin, P. Jonckheere, I. Nackaerts, K. Muys, B. and Lambin, E. (2004). "Digital change detection methods in ecosystem monitoring: a review." *International Journal of Remote Sensing*, vol. 25, no. 9, pp. 1565–1596.
- Gautam, N.C. and Narayanan, L.R.A. (1983). "Landsat MSS Data for Land-use/ Land cover Inventory and Mapping: A case study of Andhra Pradesh." *Indian Society of Remote Sensing*, vol. 11, no. 3, pp. 15-28.
- Kumar, S. (2014). "Land transformation and urban planning case of Sonipat city, Haryana, India." *Indian Journal of Spatial Science*, vol. 5, no. 2, pp.1-11.
- Lakshmana, CM. (2014). "Dynamics of urban growth, resource degradation and environmental pollution in million plus cities of India." *Environment and Urbanization Asia*, vol. 5, no. 1, pp. 49–61.
- Mukherjee, S. (1987). "Land-use Maps for Conservation of ecosystem." *Geographical Review of India*, vol. 49, no. 3, pp. 23-28.
- Sharma, K.R. Jain, S.C. and Garg, R.K. (1984), "Monitoring Land-use and Land cover Changes Using Landsat Imagery." *Indian Soc. Remote Sensing*, vol. 12, no. 2, pp. 115-121.
- Singh, N. and Kumar, J. (2012). "Urban Growth and its Impact on Cityscape: A Geospatial Analysis of Rohtak City, India." *Journal of Geographic Information System*, vol. 4, no. 1, pp. 12-19.
- Sulochana, S. (2005). "Monitoring urban sprawl of Pune by using Remote Sensing and GIS techniques." Ph. D thesis submitted to University of Pune.