Chapter 1
INTRODUCTION

1.1 Statement of the problem

The combined force of technological, economical, social and political changes, with each serving an impetus to the other has made the world entirely different from what it was a century ago. The fast rate of urban development that is a manifestation of rapid economic restructuring of society, has made many changes in the world's land resources and socio-economic status of the people. Recently revised United Nations estimates show that world's urban population, which was 36.6 percent in 1970 increased to 44.8 percent in 1994. By the year 2001, almost 50 percent of the world's total population will be living in urban areas (UN 1996). Urban population is growing three times faster than rural counterpart. According to one estimate, more than 60 percent of the total population is expected to be urban dwellers by 2025. Number of million cities has grown from 31 in 1950 to 150 in 1995 and is likely to reach 280 by the year 2000 (Rao et. al, 1995).

Effects of growing urbanisation are being felt in both developed and developing countries. However, in the developing countries urbanisation has been growing at much faster rate than the developed nations. In 1950, the percentage of total population living in urban areas was only 17 percent; in 1970 it reached to 25.4 percent and in 1990 it rose to 33.6 percent. By the year 2025, more than half of the population of the developing countries (57 percent) will be living in cities (Tobla et. al., 1992). There had been a substantial growth of urban population in Third World cities over the last decade and it is more striking in the poorest countries where urban population is increasing by 5 percent per annum (World Bank 1994). It is estimated that built up area in developing countries between 1980 and 2000 will be increased by 118 percent (UNCHS, 1987). The doubling of the urban area with fast increase in population implies an increasing demand for residential plots for all income groups, establishment of commerce and industry, public buildings and other physical infrastructure. The unprecedented urban growth will result in crowding and haphazard development in the fertile tracts of lands. McGee and Ginsburg (1992) argue that existing cities are finding and increasingly find it difficult to absorb more migrants either in economic or social terms and that this has affected the nature of urbanisation. Many have chosen to stay in rural areas, particularly those relatively close to the urban core in terms of
travel time and cost, and are increasingly becoming involved in both on farm and off farm activities. There has been insufficient research in this peri-urban area and policy implication of the process. Although enormous opportunities have been created in the peri-urban, it has also generated the tension particularly in competition for scarce resources such as land and water. White and Whitney (1992) pointed out that most of the modern cities have spread beyond their carrying capacity and draw resources from very wide areas.

Like many other developing countries, India has experienced a rapid growth of urban population after independence especially in metropolitan cities. In 1950-51, urban population of India was 17.9 percent of the total, which increased to 19.9 percent in 1971 and 26.1 percent in 1991. Metropolitan cities showed a higher rate of urban growth as compared to small and medium towns. Although overall urban population increased from 62.4 million in 1950-51 to 217 million in 1991 (four times), the corresponding increase in the metropolitan cities was from 11.7 million to 70.9 million (six times) during this period. The rapid growth of the urbanisation indicates that pressure on land for non-agricultural activities is increasing. In 1950-51, the area under non-agricultural activities was 9.36 million ha. which increased to 22.51 million ha. in 1994-95. Though the arable land increased from 146.87 million ha. to 166 million ha. between 1950-51 to 1994-95, this marginal increase was offset by the growth of population. The ratio of cultivated land to total agricultural workers was 1.1 ha./person in 1984 (Mathur 1997). It recorded a decline of 2.3 percent per annum and reached to 0.8 ha./person in 1994. Population density is rising at the rate of 2.5% per annum and the increase in arable land is very marginal (0.31% per annum). This marginal increase in arable land is attained through continuous efforts in reclaiming degraded lands. The cost of bringing such lands under productive uses is high and is also accompanied by limited returns as well as further degradation. Though food production has increased from 50 million tonnes in 1950-51 to 199 million tonnes in 1994-95, yet this increasing trend of food production will not exclusively be able to keep pace with the growing population unless we utilise our finite land resources very judiciously. However, urbanisation is a symbol of economic development and its growth is inevitable. There is a need to divert the growth of urbanisation to the unproductive and marginal lands to protect land resources for agriculture.

National Capital Territory of Delhi, the area under study, has experienced rapid growth of population and spatial expansion in its metropolitan area in the last few decades. Pressure
of migration from different states has played a vital role in this direction. With the increase in population, the land use pattern of National Capital Territory of Delhi has gone under significant changes.

In 1951, the total population of Delhi was 1.74 million, which increased to 9.4 millions in 1991. This increase was more significant in the urban areas where it increased from 1.44 million to 8.47 million during this period. Similarly industrial activities were also increased from 26,000 industrial units in 1970 to 81,000 in 1990 and 1,26,000 units in 1996. This rapid growth of urbanisation and industrialisation has been encroaching upon good agricultural land without any consideration of its suitability for specified purposes. It is seen that net sown area of 80,500 ha in 1970-71 was decreased to 58,500 ha in 1980-81; 48,000 ha in 1990-91 and further decreased to 47,000 ha in 1995-96. It is further observed that major portion of the most potential agricultural land has been put to non-agricultural uses. Land under non-agricultural uses has increased from 34,000 ha. in 1970-71 to 72,000 ha in 1995-96. Such encroachments of prime agricultural land for human settlements and industrial units are severely affecting limited land resources.

Rapid growth of population in Delhi has gone beyond the carrying capacity of the Metropolis and thus spreading in the peri-urban areas. The census figures of 1991 clearly speak about this trend where peripheral areas i.e. rural zone of Delhi have experienced more than double the growth of population in the urban agglomeration during 1981-91. Besides the limited carrying capacity of metropolis, it is also the economic condition of the migrants, which forces them to settle down in the peripheral areas as living in the metropolis is beyond their means. High growth of population in the peri-urban areas increases the demand for residential land. Speculators purchase land from the farmers in bulk and convert the same into residential plots. The process of agricultural sale in the informal market reduces the size of the land holdings and forces the farmers and others engaged in agricultural activities to change over to other occupations. Money received from the land sale improves the socio-economic level of the farming community.

The low and middle-income group who purchases plots construct poor quality houses. In this process, the peri-urban settlements swell at a rapid rate putting a tremendous pressure on limited infrastructure. Further, in the wake of exemptions for certain industries in the Lal Dora, local as well as outsiders establish small and medium scale industries and commercial establishments, which attract the labour force in the area. In the absence of strict
regulations, the expansion of peri urban areas is very haphazard and leads to many environmental problems. Thus, dynamics of land use are not only reducing the agricultural land resources but also transforming the demographic, socio-economic and environmental structure of the peri-urban areas.

Policy makers have been attempting through master plans to regulate the conversion of agriculture land; check the growth of unwanted industries to control further need of land and discourage the inmigration of labour force but the past experience had been far away from satisfaction. The problem of unregulated conversion of land to non-agricultural use and associated problems in the peri-urban area has been increasing and efforts of the policy makers are impeded by the absence of up to date reliable comprehensive study on these changes. It is evident that peri urban interface which is an area of future urban development requires systematic and detailed studies on land use dynamics for formulating sustainable development plans.

1.2 Review of literature

1.2.1 Concept of the peri-urban term

Before presenting the review of literature on the theme of research problem, it is essential to explain the term peri-urban, which has been used by many authors under different nomenclatures in their studies. Alam and Khan (1972)\(^9\) used the term peri-urban for the primary and secondary fringe of Hyderabad Metropolitan Region. Mather (1987)\(^10\) used the term peri-urban to explain the land use dynamics in the city environs. More recently, UNDP (1996)\(^11\) has used the term in synonym with the widely used term rural urban fringe and described it as an area that surrounds the city and is characterised by small and medium sized farms oriented to the metropolitan market that are more diverse than those in the rural areas. In this zone, large proportion of families has some off farm income. The agriculture industry in this zone is constantly shifting to new sites and adapting to new dimensions.

Thus, it is evident that the term "Peri-Urban" is a synonym with the "Rural Urban Fringe" used by several authors in different periods.

The term urban fringe was introduced by Smith (1937)\(^12\) to describe the built up area, just outside the corporate limits.

Salter (1940)\(^13\) defined the fringe as a mixture of land uses that are related to farming and urban interest. He classified it into number of zones around the central city based on their land use characteristics.
Andrews (1942)\textsuperscript{14} had described rural urban fringe as the area having inter-mingling of characteristically agricultural and characteristically urban land uses.

Wehrwein (1942)\textsuperscript{15} puts the fringe problem in a conceptual perspective and considered the urban as part of rural territory pierced by finger like projection of urbanised land. He has described the fringe as an institutional desert because of uncontrolled locations, unpleasant and noxious establishments such as slaughter houses, junkyards, and wholesale oil storage and of utilities such as sewage plants and cemeteries.

Dewey(1945)\textsuperscript{16} observed that in fringe area there is mingling of people, some of whom work in and out are oriented towards agriculture, while at the same time the remainder pursue urban occupations and an urban way of life.

Blizzard and Anderson (1952)\textsuperscript{17} described as the areas of mixed urban and rural land uses between the points where full city services cease to be available and the point where rural agricultural land uses predominate.

Golledge (1960)\textsuperscript{18} used the term "geographical no man's land" for this contact zone between rural and urban land uses.

Russwurm (1960)\textsuperscript{19} refers to this area as "frontiers of discontinuity between the city and the country".

Pastalian (1967)\textsuperscript{20} has defined it as an area in transition where land uses are giving way to the urban land uses.

Pryor (1968)\textsuperscript{21}, while attempting to resolve the various issues pertaining to areal differentiation of the urban fringe came across another problem. According to his view, the rural urban fringe may quantitatively be subdivided into an "urban fringe" and a "rural fringe" on the basis of its land use composition. The urban fringe exhibits a density of occupied dwellings higher than the medium density of the total rural urban fringe and higher rate of increase in population density, land use conversion and commuting. By contrast, the rural fringe exhibits a low density and lower rate of increase.

Ramchandran (1989)\textsuperscript{22} defined rural urban fringe as an area of mixed rural and urban population and land uses, which begins at the point where agricultural land uses appear near the city and extends up to the point where villages have distinct urban land uses or where some persons, at least from the village community commute to the city daily for work or other purposes.
1.2.2 Theme of the study

Comprehensive studies in the peri urban areas and especially around metropolis have been of considerable interest to the researchers from different disciplines. Some of the studies related to the present topic and in the similar locations are reviewed as follows:

Griffin & Chatham (1958)\textsuperscript{23} in their studies of urban impact on agriculture in Santa Clara County, California found that urban growth is taking place in most fertile land of the County and suggested the need for its conservation. He argued that factors responsible for this trend were population growth, policy conflicts and agricultural economies.

Sjoberg (1960)\textsuperscript{24} revealed that pre-industrial cities had a simple land use pattern with a core and a periphery. The post-industrial cities, however, display a great complexity in land use pattern, which is manifestation of an equally complex social and economic structure.

Sinclair (1967)\textsuperscript{25} in his studies in Midwest (U.S.A.) found that urban sprawl disrupted the Von Thunen pattern of decreasing intensity of production with distance from the city. He found that there was an increase in the area of low value crops (grain, hay, & pasture) in the urban fringe as cities grew into their rural surroundings. He cited several factors especially the real estate speculation, which held land in semi idleness in anticipation of future resale, landowners were reluctant to make any investment in agriculture beyond that necessary for minimum returns.

Mattingley (1972)\textsuperscript{26} in his studies in Rockford (Illinois) area found that labour input per unit area increased for some distance outward from the urban edge. He also found that part time farmers were twice in the inner zone and that the relative role of dairying and cash grain farming changed outward from the city.

Bryant (1973)\textsuperscript{27} found that different types of agriculture were affected differently by possible urban encroachment in the rural urban fringe. Type of land use, which requires investment for long-term returns, is most likely to be adversely affected than those, which yield short-term returns.

Vagale (1974)\textsuperscript{28} studied different characteristics responsible for urbanisation in Africa and suggested different strategies for sustainable urban growth.

JUNEP (1975)\textsuperscript{29} studies reveal that environmental degradation finds expression in the rapid spread of slums and squatter settlements, and haphazard and disorderly growth taking the form of ribbon development along the peripheral roads.
Hart (1976) made the temporal study of encroachment of agricultural land in the periphery of the cities of U.S.A. and found that though urban sprawl did irreparable damage to the environment, the encroachment of agricultural land was very small in percentage to total agricultural land and had little apparent effect on agricultural production.

Bryant (1976) studied land transaction around Ontario and found that overall density or frequency of land transactions decreased outwards and that farmer to farmer transaction increased rapidly in that direction, in contrast to the pattern of farmer to non-farmer deals.

Ziemetz et. al. (1976) while interpreting the land use of 53 counties of U.S.A. found that 33% of land developed for urban uses had been idle immediately previously.

Joshi (1977) in his studies of Indore City found that there was no significant effect on the size of farm & ownership of land. Urban impacts increased the fragmentation of land that resulted in a phenomenal rise in the input and capital formation in agriculture.

Gowda & Mahadev (1977) in his studies of changing nature of agriculture in the rural urban fringe of Bangalore found that the intensity of agriculture is high near the cities. The land is positively related to intensity of market gardening, which in turn is negatively related to distance from the city.

Ottensmann (1977) in his studies in SMSA (U.S.A.) found that land values were directly affected by levels of expectation, population change and the income levels.

Krueger (1978) studied urbanisation of Niagara fruit belt in South Eastern Ontario. He found that urban expansion took place primarily at the expense of peach and cherry orchards due to competition for the light textured, well-drained soils, most suitable for both building sites and stone fruit orchards. The area in vineyard and orchards of other fruits that are able to grow well on heavier soils was almost unchanged. In response to urban growth, however, all types of fruit farming witnessed a shift of new plantations to areas well away from the urban fringe and neglect of existing orchards and vineyard near the fringe. He attributed this shift to uncertainty over farmer's ability to recover the cost of new investment in continued farm maintenance near the urban fringe.

Jafri and Sahu (1978) in their studies on urban fringe of Shillong City found that economy of the rural settlements along the Shillong Gauhati road is growing faster than the settlements on other roads.
Nangia (1978)\textsuperscript{38} in her study on Delhi metropolitan region revealed that physical expansion of the metropolis has not kept pace with its population and economic growth. As a result, its spillover effects are being borne by the settlements in the neighbourhood, which continue to function for the city and bear some of its population and economic loads at a cheaper economic cost, though at a higher social cost than the city.

Berry (1978,79\textsuperscript{39&40}) noted that urbanisation closely correlated with a decline in dairying in the northeastern seaboard of the U, S. A. and near Chicago. He attributed this decline to the reluctance of dairy farmers in the urban periphery to make necessary investment in land and equipment due to uncertainty over their ability to recover the value of those investments if they sold their land to developers.

Sinha (1979\textsuperscript{41}) while studying the impact of urbanisation on land use of rural urban fringe of Patna City presented a new technique for demarcation and determination of various zones and identified the factors affecting land use and cropping pattern. Various suggestions for planning land use in different zones were also given.

Mrohs (1979\textsuperscript{42}) while studying the peri-urban areas of Ruhr cities found a decline of live stock farming with the exception of horses which had increased to cater to the urban recreation demands. One of the reasons for the decline in cattle and pigs, as described by Mrohs, is the need to feed and tend the animals regularly, which does not fit in well with part time farming. Another reason is complaints from nearby urban population about bad smells.

Kumar (1980\textsuperscript{43}) worked on the rural urban fringe of Bhopal City and found that commercialisation and city market oriented agriculture production were the two significant factors for changes in agricultural activity.

Heaten (1980\textsuperscript{44}) reported that gradient of land values of farm products per unit area slope outward from the metropolitan centres in the United States.

Moran (1980\textsuperscript{45}) analysed spatial patterns of change in agriculture on the periphery of Auckland, New Zealand. He found little or no decline in dairying, vineyard, or market gardening on the urban fringe. In many cases both labour and capital inputs increased, including such fixed capital investment as construction of greenhouse for intensified market gardening. Many factors affected the survival of farming in metropolitan Auckland, from
soil quality & ethnicity of farmers, to differential tax rates and the allocation of dairy production quotas.

Thomson (1981)\textsuperscript{46} in his study around London and six metropolitan counties of England found that farm in the fringe areas had low input, low productivity farming which had been unable to expand or develop as far as farming else where. Apart from the obvious disincentive to invest in better farming where the farms may be taken up for urban development for more profitable use like golf course. The author also found that the main threat to the farms were fragmentation by roads, houses and factories; shortage of land for expansion; sale of land for development; and trespass and vandalism.

\textit{Wadhwa (1982)}\textsuperscript{47} made a case study in Ahmedabad City and found that increasing land value due to urban growth was the major factor for conversion of fringe land from rural to urban uses.

Khan (1982)\textsuperscript{48} worked on the rural urban migration and urbanisation in Bangladesh and concluded that economic and administrative decentralisation with increased emphasis on comprehensive rural development is imperative to tackle the problems of rapid urbanisation.

According to UNEP (1982)\textsuperscript{49}, environment in an urban area has three dimensions, the natural setting, physical infrastructure of houses, transport, waste disposal and energy resources and social infrastructure of political, educational, and cultural services.

Gupta (1983)\textsuperscript{50} in the studies of urban influence in the vicinity of Agra found that most dominant influence of Agra City was over the villages upto 10 kilometres distance. Gradient of influence is confirmed by the demographic and economic characteristics

\textit{Josephine (1983)}\textsuperscript{51} while studying the urbanisation and problems of urban peripheries of Nigeria found that about 50 percent of the urban population increased with the rural urban migration which was attributed to the availability of employment opportunities and modern facilities in the cities. He also found that since cities are not able to cope up with the increasing demand for housing, the settlements emerge on the peripheries of the cities to accommodate the population.

\textit{Krishan (1983)}\textsuperscript{52} highlighted the change in territorial jurisdiction of Punjab towns and felt need for the well-planned policy in their expansion to regulate the land conversion process of fertile land.
Lamb (1983) in his studies in the cities of U. S. A. explained the components of rural sprawl and its associated problems like high cost of development, energy consumption, fragmentation of holdings, traffic and other social problems. He used the concentration index to measure the urban sprawl.

Munton (1983) revealed that the area where urban growth had been halted by effective planning in Britain, particularly those with green belts, the farms that remain still face considerable problem from other sources.

Kirby (1985) studied the Chinese urban system and the ways the agricultural practices changed to non-agricultural practices in rural fringe.

Nag and Kumra (1986) made a study of environmental problems in Varanasi City and found that large-scale industries have developed in the outskirts of the city. He added that most of the slums have developed around the periphery of the main city, which have unregulated growth.

Hill (1986) in his studies on land use in urban fringe found that although payment is low in unskilled jobs in the informal sectors, for many villagers it is at least higher than the farm profits or wages.

Solanki (1987) in his study on environmental hazards in Delhi found that rural villages of Delhi are confronted with the twin problems of urbanisation and industrialisation that is leading to economic and environmental imbalances.

Lal (1987) in his work on city and urban fringe of Bareilly found that primary fringe is characterised by changes in land use particularly extension of settlements at the cost of other uses, most likely urban agriculture for urban extension. The secondary or the outer fringe is characterised by extensive land uses. In this zone, land under single crop earlier is now converted into double and multiple cropping zone.

Desai and Gupta (1987) studied Ahmedabad city and found that loss of agricultural land, land acquisition, lack of infrastructure and dual character of the fringe in terms of socio economic conditions of the people are some of the problems which have come up due to the change in land use.

Sethi and Pandey (1987) identified population growth as the single most powerful factor besides industrial expansion contributing to land use changes in Union Territory of Delhi.

Bodo (1989) in his studies on Peri-urban agriculture in Rhine Main Area found that there
are relatively higher losses of agricultural land in this zone for wide range of purposes. Besides, there are growing number of environmental conditions which act as obstacle to the agricultural production. He also found that the combination of agricultural with non-agricultural work diminishes with increasing urbanisation of the settlements although the local opportunities improve.

Berg and Ijkelanstam (1989) in their studies on land use dynamics in the rural fringe found that agricultural intensification is more pronounced in the outer fringe than in either the surrounding rural areas or on the land immediately surrounding the built up areas. Various forms of social fallow are found more frequently in the inner fringe, along the short term and part time agricultural uses of the land.

Pugh (1990) accuses ineffective land management of directly causing environmental problems. Because the supply of urban land is insufficient, he argues, the pattern of urban land use is chaotic.

Marudachalam (1990) in his studies on Madras City found that environmental deterioration is largely attributed to the rapidly growing industrialisation and urbanisation.

Chakraborty (1991) found in his studies that inhabitants of the fringe villages find employment in lower paid unskilled jobs in rural industries and in the informal sector, which gains in importance especially in the role as ancillaries and sub-contractors for national and international industries.

Rao (1991) found that in fringe areas employment is found in a great variety of occupations in trade and commerce, such as brokers, shopkeepers and contract gardening.

Marlow & Ralph (1991) studied land use and demographic change in two fast growing counties of U. S. A. and found that in earlier stages of development, land consumption per household was marginally higher than the development in the later stages. In less populated counties, the average land consumption was higher as compared to the more populous counties.

Leaf (1992) studied the price of land in Jakarta and found that infrastructure and land tenure are the important factors for the land price differentials.

A report of World Health Organisation (1993) reveals that squatters and slum dwellers are particularly at risk, because they often have no alternative but to live in close proximity to dirty industries, contaminated water sources or swamps.
Prins (1994) reveals that space for housing is an important issue, especially where land values are rising and land is becoming scarce. Other important interests concern acquiring space for industrial and commercial activities.

Surjadi and Gorden (1994) in their studies on environmental problems at the household level in Jakarta found that children and women are more likely to be affected by household environmental problems.

Khan (1994) while working in Bilaspur city of Madhya Pradesh explained that rural-urban fringe is an area of potential extension of the city itself and based on the pattern of association which people have built up to satisfy their day to day economic and social needs. He further identified various urbanisation activities and other important factors for haphazard, inharmonious and incompatible land use in transition zone, which need to be checked.

Rodriguez (1995) remarks that conversion of agricultural land to suburban uses is of major importance, not so much in terms of the total area but in terms of its social and economic effects.


Arya and Abbasi (1995) describe at length the difficulties of slum dwellers in Delhi; many of these slums are located at city fringes.

Broomhall (1995) in his studies in urban fringe of Seattle Primary metropolitan Statistical area found that land prices are speculative to factors such as inflation, interest rates, population pressures and local economic conditions.

Mohanraj (1996) observes that industrialisation inevitably vitiates our environment and is not just a health hazard but a threat to our very survival. It does more harms than good to the people.

Anjum (1997) made the study of environment degradation of Abdullahpur, Merrut and found that environmental degradation has led to several diseases that are damaging the health of the people.

Schenk (1997) express that fringes becomes the easy outlet for industrial activities which are environmentally hazardous, as pollution control is even less effective than in central urban areas.
Visaria (1997)\textsuperscript{81} reported that 9.7 percent households in Delhi still have no drainage arrangements and 15.1 percent are exposed to risk of water logging partly due the insufficient drainage.

Razin (1998)\textsuperscript{82} in his studies on policies to control urban sprawl in Israel highlighted the problem of the urban sprawl and suggested the tax sharing strategies by the local govt. from non-residential property to control over development of industrial areas in the metropolitan fringe.

Pamuk & David (1998)\textsuperscript{83} in his studies on price of land for housing in Trinidad found that institutional and regularity environment have a profound impact on land market and prices.

Mori (1998)\textsuperscript{84} in his comparative studies of land conversion at urban fringe in Japan, Britain and Netherlands found that land values for agricultural and urban uses was very high in Japan and Britain as compared to Netherlands. Author suggests that this socially excusable large gap result mainly from speculative motives of landowners rather than from alleged excessive public regulations. He also suggested landowners or purchaser should bear the social cost of land conversion for its development.

Bentinck (2000)\textsuperscript{85} in his studies on Delhi fringe found that unauthorised parts of the village outside Lal Dora or colonies usually don’t have paved roads and cemented sewage system, unless the residents and the colonisers have put in these features themselves.

Synthesis of the review of literature reveals that before nineteen eighties, the research in the peri-urban was mainly focused on the conversion of fertile land and the associated problems for the agriculture. In eighties, the research themes in the field of demography, economy and environment were also attempted in the peripheries of the cities. In the nineties, the main focus of study in the peri-urban has been on infrastructure and the environment. However, these single theme studies donot project a comprehensive picture of the peri-urban to help the planners to formulate a plan for these areas for sustainable development. Land use changes in the peri-urban directly have an impact on urbanisation process, socio-economic status of the local population as well as the migrants. It also reflects upon the housing and household amenities. Rapid growth of population in the peripheral areas exerts pressure on the limited infra-structure, which deteriorates the environment. With these contents and observations from literature, a comprehensive study has been attempted.
1.3 Objectives

The main objectives are to study:

1) the land use pattern in the peri-urban area of NCT Delhi,
2) the process of land use conversion from agricultural to residential, commercial, industrial and other non-agricultural uses,
3) the diversity of occupational structure and alternative sources of income with change in land use,
4) the environmental implications of urbanisation and migration into peri-urban areas; and
5) to suggest strategies for land use development and environmental planning in peri-urban areas.

1.4 Hypothesis

The study is contemplated with the following hypothesis in view:

1) Land use in peri-urban areas is diversified and shows inverse relation with distance from the city and highways.
2) Intensity and diversity of crops are positively related with distance from the city.
3) Speculators dominate in the land conversion process and large tracts of land remain uncultivated for years together in peri-urban areas near the city.
4) The local population have more diversified sources of generating income than the migrants as the former are engaged in several economic activities simultaneously.
5) There is a general physical environmental deterioration as a result of urbanisation and migration in peri-urban areas. But, the socio-economic environment of such areas has improved with urbanisation and migration.

1.5 Database and methodology

To conduct a detailed study on land use dynamics in the peri-urban, wide range of data from different sources were collected. Main source was the primary information conducted through field survey of the sample areas. However, secondary data are also used for base information and the general land use trends over time and space.
1.5.1 Secondary Source

The following secondary sources of data have been consulted:

i. Delhi statistical handbook—Data on land utilisation, livestock, expansion of industries and other commercial activities in National Capital Territory of Delhi.

ii. Village revenue records—Data on land holdings, land ownership, cropping patterns, and general land use in the sample study areas.

iii. Census of India—Village level data on general land use, distribution of population and households; General occupation structure, literacy and migration in the NCT Delhi.

iv. MCD, DDA, NCR Board—Information on rural urban expansion, master plans and the policy planning in rural Delhi.

v. Survey of India map (1: 50,000): To measure the distance of Peri-urban settlements from Delhi urban agglomeration boundary and from the highways and to analyse the drainage relief and landforms of NCT Delhi.

vi. Delhi Govt. records and reports—Gazetteer of rural Delhi, revenue records in the reorganisation of administrative divisions of NCT Delhi.

vi. Apart from these, different published / unpublished records and project reports of govt./ non-govt. organisations were also used.

1.5.2 Primary Source

The basic source of data is the pilot survey and the extensive fieldwork conducted in the area. Primary data was collected through four tier comprehensive questionnaire:

i. Village level: It included the data on infrastructure, amenities and public utility services available in the village. It also included the data on the perception of the 43 community level local respondents concerning the impact of land use changes, their reaction about the commercial and industrial development, physical and socio-cultural environment. Data source at the village level were village pardhan, and other persons from different professions.

ii. Household level: At household level, 339 household were surveyed. It included 133 farming class, 123 non-farming class (original) and 83 migrant (41 house owners and 42 tenants) households. Data at the household level included demographic pattern, occupation structure, level of expenditure, the daily usable
assets, housing, household amenities and environment. In addition, data of farming class families included land holdings, the type of farmers, the cropping pattern, the livestock and the problems for agriculture. It also included their perception for the present land market system and their future course of action in the sale of land. Data on migrant households also included temporal migration, reasons of migration and temporal land-purchase in the area.

iii. **Estate agents and speculators level:** 18 estate agents and speculators were interviewed. Data included the process of land conversion, land sale in the informal sector and its price over time and space.

iv. **Commercial and industrial establishments level:** 62 commercial and industrial establishments were surveyed. It included the data on the origin of the establishments, classification of owners, type of establishments, reasons for the choice of the area for establishments, classification of workers employed, market for raw material and finished goods.

Besides, personal observations, photographs included the primary information.

1.5.3 Sample plan and design

The expansion of Delhi Metropolis was studied from Survey of India map- Delhi and its Environs (1:50,000), 1996, and it was found that expansion in eastern and south eastern direction has not only reached its territorial boundaries but has also spilled over to the adjoining states of Uttar Pradesh (Ghaziabad, Noida), Haryana (Faridabad) and hence peri-urban area of Delhi in that direction lies almost in these states. As this study is limited to the peri-urban of NCT Delhi, sample areas were selected mainly in the North, the West and the Southwest direction of the territory. After the pilot survey, it was found there were three distinct zones of peri-urban running in different stages of urbanisation process. Hence, the distance of each peri-urban settlement was measured and all settlements falling in peri-urban were classified into three zones (map 1.1).

9 sample sites were selected from the three zones. 4 sites were selected from inner peri-urban, 3 from middle and 2 from outer peri-urban (map 1.2). The selection was broadly based on proportion of settlements in each zone to the total settlements. For the study at the household level, households were classified in original and migrants. Original households were further classified into farming class and the non-farming class and the
NCT DELHI
PERI-URBAN ZONES

MAP UNIT

PERI-URBAN ZONES
INNER PERI-URBAN 0 to 3
MIDDLE PERI-URBAN 3.1 to 9
OUTER PERI-URBAN More than 9

DISTANCE (in Kms.)
Map 1.2

NCT DELHI: PERI URBAN
LOCATION OF SAMPLE AREAS

Legend
- Inner peri-urban
- Middle peri-urban
- Outer peri-urban

References
- State
- Tehsil
- Urban Agglomeration
- Municipal area
- Census Town
- Village
- Statutory Towns 1 to III
- Rural Area: R.A.

Kms. 0 2 4 6
migrants into owners and the tenants class. 10 percent samples at household level, commercial and industrial level from each sample site were selected. The criterion used in sample selection for the farming class households was based on the size of land holdings before the sale of land. All the farming class households were grouped into three classes i.e. farmers having <5 acres of land, 5-10 acres and more than 10 acres. Proportionate sample from each class was selected. For other population groups such criteria was not applicable, therefore random samples in proportion to their total households were selected.

The selection of samples for the industrial and commercial establishment was based on random sampling. For the estate agents and speculators level 2 respondents were selected randomly from each village. For the perception at the community level 6-7 persons from different professions in the age above 20 years were randomly interviewed from 7 sample sites. Sample sites of outer peri-urban were not considered for the perception studies as community level changes in this zone are not significant and as such people have little reaction to these changes.

Data thus collected were transformed into variables and indicators suitable to the theme of the study. For the objective assessment of the study, suitable statistical techniques like simple percentage distribution, cross tabulation, correlation, rank coefficient, composite index, diversification index were worked out showing intra as well inter settlement variations among the sampled villages. Maps have been generated using GIS digitisation technique while graphs have been prepared using excel software package in the computer.

1.6 Research design

Present study is divided into nine chapters: -

**Chapter one** introduces the background of the study, review of literature, objectives and hypothesis, database and methodology, sample plan and design and the structure of the chapters.

**Chapter two** gives an account of the general profile of the National Capital Territory of Delhi covering physical, economic and demographic profile.

**Chapter three** deals with the general land use pattern and changes in time and space. It also highlights the pattern and changes in land use with respect to the distance from the highway and urban agglomeration.

**Chapter four** covers the changing face of agriculture in the peri-urban and includes
classification of land holdings, farmers, cropping pattern, crop intensity and diversification, livestock and problems of peri-urban agriculture.

Chapter five deals with constituents of urbanisation process in peri-urban. This chapter reviews the urbanisation process in the urban and peri-urban of Delhi and highlights the migration, industrialisation and commercialisation; and land market and land sale process as the main constituents of urbanisation process in the peri-urban.

Chapter six gives an account of the socio-economic changes in the peri-urban and highlights the occupation structure, economic status of the population, quality of life and social change.

Chapter seven covers the housing, household amenities and environment in the peri-urban.

Chapter eight gives an account of the perception of local population about to the socio-economic and socio-cultural changes at the village level and their perception to the urbanisation process in their region.

Chapter nine summarises the results of the study, conclusion and gives recommendations for the alternative form of development in the peri-urban to reduce the negative impact of urban expansion.

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