

Study of Rural-Urban Fringe Patterns of Sargodha City, Pakistan

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Abstract: Urban fringe is a transitional zone of various land uses between urban and rural lands with a low population density that is lower than urban centre but higher than the countryside. The current study focuses on the spatial and structural pattern of the rural-urban fringes of Sargodha. Sargodha city is one of the rapidly growing cities in Pakistan. To analyze the spatial pattern of rural-urban fringe five study sites were identified such as Gulberg Town, 49 Tail, 85 Jhaal, Jhaal Chakian and Johar Colony different techniques were utilized. Primary and secondary collected data was used for field surveying besides the interview based on a designed and partially structured questionnaire. Maps were prepared with the help of the Geographic Information System (GIS) and remote sensing. Results revealed that many commercial centres were situated on the edges of the city. The structure and pattern of these localities were recognized and it is found that urban impacts have not only transformed the socio-economic and demographical shape of the rural-urban fringes but also the pattern of land use of the study area. It shows that GIS and remote sensing are essential techniques to map out the spatial changes at the urban fringe.

Keywords: Spatial pattern, rural-urban fringe, GIS, Sargodha city, Pakistan

Introduction

The rural-urban fringe is a transformation boundary between the core city and the adjacent area described by accelerated changes in land use often demonstrates unique characteristics (Schneider et al., 2012). It is a transitional area, slow and dynamic in various viewpoints, for example, population, economy, land use, and environment. It can be situated between an urban well-developed and an under-developed rural area (Yang et al., 2017; Li et al., 2018). So, an urban fringe plays a significant character in urban development. The research studies on the development of the urban fringes are very important in consolidating the systematic regulation of land properties and recognizing the coherent change of the urban advancements and rural expansion (Newton et al., 2017). It is witnessed that urbanization is expanding at a distressing rate in contemporary decades internationally and it may cross 70% at the end of 2050 (Aziz et al., 2015). Therefore, thousands of people shift towards the cities on daily basis for achieving better living standards and this process of migration from rural to city areas is very common (Aboukorin et al., 2015; Cobbinah et al., 2015). Consequently, remarkable socio-economic and ecological influences are arising (Akin et al., 2014).

The increasing urban growth usually exceeds the capability of the local administrations in the delivery of services and infrastructures, which raises urban poverty and shantytowns, particularly in developing countries. An administrative border can also be used as a geometric component, which is never conducive with the urban fringes certainty (Duque et al., 2015; Huang

et al., 2016). The main aim of urban fringe location research is to perform the geographical acknowledgement and limit the demarcation of the metropolitan periphery zone (Huang et al., 2016). It is found that the agricultural land located on the urban fringe is at a high risk to convert into urban uses. The reasons for this conversion may prolong from rapid increase in population to commercial and industrial expansion (Mohsin, 2014).

Urban fringes are marked with a variety of land-use changes. However, the greatest element of the urban fringe is the variety of land use types (Bian and Wang, 2015). In this regard, many researchers have conducted research studies on the urban fringes recognition technique by utilizing data related to remote sensing (Wadduwage et al., 2017). So, remote sensing is a beneficial tool to detect earth resources for observing and evaluating urban sustainable growth (Trinder et al., 2017). Remote sensing gives high-recurrence earth perception information on a wide spatial and temporal scale (Newton et al., 2017).

Pakistan is a non-industrial nation and Sargodha is one of the quickest developing cities of Punjab. The land of this region has been widely shielded with the country metropolitan periphery. Notwithstanding the metropolitan zones lying near the focal city, other developed zones are shaping the continuation of the city and appears to have spilt inside as far as possible into the bordering zones. This study uses Sargodha, with the quick advancement of urbanization, metropolitan populace and the land closely stretched out to the metropolitan periphery of the urban fringe. The objectives of the current research were to find out

the geographical and structural tendencies of urban fringes in Sargodha and the influence on the economy of the study area.

Materials and Methods

Study Area

Sargodha City is one of the fast-expanding cities of Punjab, Pakistan. It is situated geographically on the 32°5'1"N latitudinal and 72°40'16"E longitudinal extent (Figure 1). The Sargodha city is an agrarian district comprising the land of 5,854 square kilometres, having a population of 3,703,588 in which 872,557 (23.55%) population belongs to urban area as per the census of 2017 (GOP, 2017). Sargodha city is an administrative headquarter of District Sargodha of Punjab, Pakistan. It is the 12th biggest city of Pakistan while the 7th biggest city of the Punjab Province. This city is very famous for Pakistan's best citrus-producing region. The rural-urban fringes of Sargodha City became the location and centre point of the study. The study area was chosen as there was an excessive land-use change, migration of people, an amalgamation of the human activities have been reported as the most common causes of the urban development in the study area.

Data Collection and Sampling

This study aimed at investigating a precise interface for the most urban fringes, an operating valuation and a very precise and systematic example for built-up planning. Data was collected through different procedures such as population sampling, data collection and data analysis. Direct Observation methods, Interviews, Questionnaires and GIS were used for the current study. To acquire the precise spatial maps of the selected sites, remote sensing images of Sargodha city were acquired from the software Google Earth and point data. The same was acquired through the support of the GPS (Global positioning system). The collected data was calculated, investigated and explored using images and graphs. The personal interviews technique was adopted with most dwellers of the area to ascertain the already land values in various segments of Sargodha City. Primary and secondary data resources were utilized for field surveying and a fully designed questionnaire. Fifty (50) persons were chosen randomly for an interview and their responses were noted with the help of designed questionnaires. The entire population was homogeneous and researchers were having a sampling frame, providing a sound basis for probability sampling studied area consisted of a total of 24 union councils. Among them 22 were rural and 2 were urban. Out of 22 rural union councils, 5 were selected randomly. From each selected union council, 2 villages were also selected randomly. From each of the selected villages, 10 growers were selected by simple random sampling technique, thereby making a sample size of 100 respondents. The required secondary data were

gathered via various sources like websites, the internet, Google Maps and census reports of the Sargodha District. This data was administered through different methods. Resulted data was explained and presented in the shape of tables, maps and various graphs.

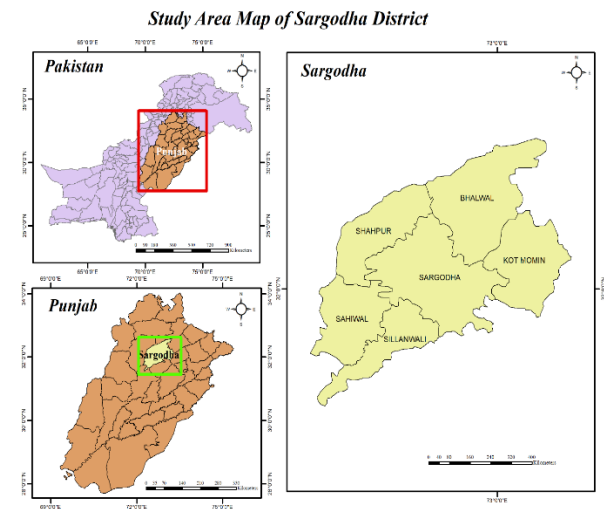


Fig. 1 Map of the study area.

Data Analysis

The present research entails the “breakpoint” method and the evidence selected information index to find out the areas of the urban fringe. Neighbourhood analysis was used in this research to study the rural and urban fringes. With the accuracy of the satellite images, and analyzing the findings of the field observations were made with the sample points of actual observation. The analysis of data was performed in a GIS environment to delimit the fringes of the city. ArcGIS 10.3 is used for this purpose by applying georeference, overlaying functions on data derived from Google Earth and portrayed in the form of maps. MS Excel was used for displaying the socio-economic data in percentage, frequency, graphs and tables.

Results and Discussion

Delimiting fringes of Sargodha City

The results exposed that Sargodha City's designated rural-urban fringes were the Gulberg Town, 85 Jhaal, 49 Tail, Jhaal Chakian and Johar Town Colony. Such fringes had a great impact on the Sargodha City's economic base. The industrial area was the Gulberg Town from where various products were supplied to the adjacent areas. At 85 Jhaal, a very huge range of vegetables was sown which were supplied to the entire city area. It was a centre of the business also. Mohsin and Anwar (2015) also identified in a study being conducted in Bahawalpur that industrial units are developed at the fringes due to cheap land and as there is less space and environmental concerns are involved in the inner city. While Chauncy D. Harris asserted that the Gulberg Town fringe comes into the sphere of industrial category “B”. It is located on Lahore Road in

Sargodha City. It is the eastern side fringe and was the Sargodha City's Industrial Estate which was approximately one kilometre from Quenchi Mor and was near the bypass of Lahore Road. Its population is about 5,000 persons. Fields, marriage halls, vegetables and showrooms are located in its surroundings. The water issue was the largest difficulty of this area. Approximately 90% of water was salted. Inhabitants had to adopt various sources of drinking water. The drainage system was in very poor condition. Jhal Chakian is very fertile and famous for citrus and vegetables. The profession of most people is agriculture and they are very strong and hard workers. This area produces 60% citrus of Sargodha. It surrounds by a hospital. Rural-urban fringes landscape dynamics varied highly. Where the arable land is available, the rural and urban fringe had occurred largely.

Figures 2 and 3 show various physical and location aspects of the present research. Figure 2 explains the geographical location of the selected urban fringes in the Tehsil premises while figure 3 exposed the ease of use of these fringes from the centre of the city. The major land uses were infrastructures, built-up areas, barren lands, deep water, housing colonies, scarce agriculture, thick vegetation, city periphery and unorganized land.

Socioeconomic characteristics of the respondents

Table 1 demonstrates the selected socioeconomic characteristics of the fringes of the study area. Results showed that general facilities provided by the government roads, water supply, sanitation were scanty in the area. The share of these facilities was in Johar Colony, Jhal Chakian, Tail, Gulberg Town and 85 Jhal. The majority of the residents were engaged in private jobs as in Johar colony, Jhal Chakian, in Gulberg town and 85 Jhal. Only 49 Tail was the fringe where the majority of the government servants was engaged in various low grades jobs.

The development of the periphery in Sargodha is quickened with the advancement of car transportation. Innovative turns of events, for example, the augmentation of electricity, water and sewerage frameworks into the peripheral territory along with different favourable circumstances given motivations to the population to live in the open and comfortable parts of life. But this haphazard development geared up the encroachment and conversion of prime agricultural land into less dense urban and semi-urban uses. Various studies point out these consequences especially the conversion of agricultural land like a study conducted in Bahawalpur city (Punjab) show that rapid urban development in the form of housing colonies consumed prime farmland in the fringing areas (Mohsin et al., 2016). This encroachment is also causing a change in the municipal limits and poses challenges for the Tehsil Municipal Administration (Mohsin and Bhalli, 2015).



Fig. 2 Map of fringes of Sargodha.

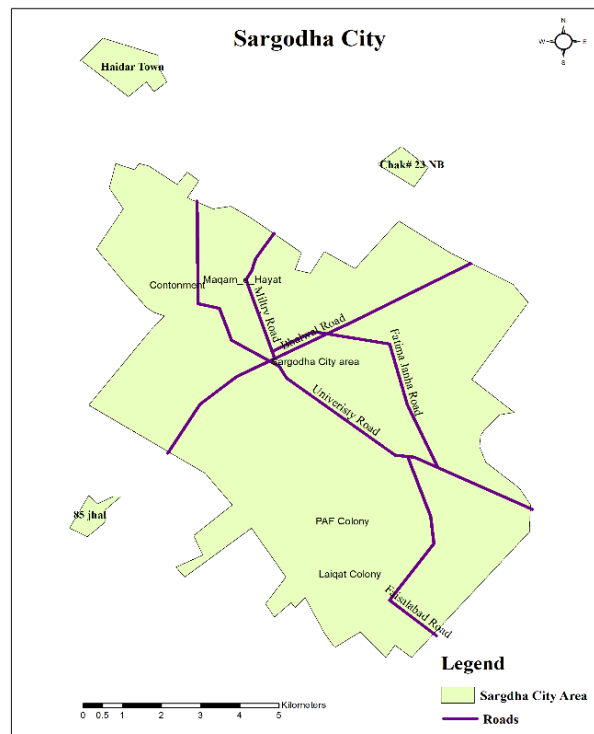


Fig. 3 Urban area and fringes of Sargodha city.

It is also revealed in a study conducted in Bahawalpur City that due to changes in land use, as it converted to residential and commercial lands at the urban fringe of Jhangli Wala, the speedy hike in land prices was noted (Mohsin et al., 2019). Likewise, a study conducted in Dhaka City by Rahman et al., (2008)

Table 1 Socioeconomic characteristics of the respondents of the study area.

Characteristics		Gulberg Town n=20		85 Jhal n=20		Jhal Chakian n=20		49 Tail n=20		Johar Colony n=20	
		Frequency	%	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Facilitated by Government	Yes	9	45	9	45	7	35	16	80	2	10
	No	11	55	11	55	13	65	4	20	18	90
Effective Sewerage System	Yes	16	80	16	80	14	70	14	70	7	35
	No	4	20	4	20	6	30	6	30	13	65
Disease Occurrence	High	13	65	12	60	10	50	8	40	11	55
	Low	7	35	8	40	10	50	12	60	9	45
Occupation	Govt. Servant	5	25	10	50	8	40	15	75	7	35
	Private Job	15	75	10	50	12	60	5	25	13	65

revealed that decreasing advancement of agricultural land at the expense of the growth of urban sprawl and the fertile agricultural lands nearby should be saved against urban growth to the extent which is possible. A study conducted in Multan (Pakistan) also explored the risks of changing land use on agricultural production that was recorded a significant decline in production as well as the land area (Sajid et al., 2020). Proper urban planning and its application is the solution to such issues. Another study conducted by (Csatári et al, 2013) reveals that in the course of economic transitions, alike procedures took place in rural-urban fringes of Kecskemét in Hungary. Several reasons lead to the accelerated speed of change like the declining importance of agriculture, the rapid conversion of land possession rights etc. A study conducted in Islamabad, Pakistan concluded that the form of urban development comprises sprawl from the urban fringes related to filling inside of a city. The sprawl of fringe constitutes the transformation of different land-use types at the urban fringes to constructions and roads (Liu and Jiang, 2020).

Conclusion and Suggestions

In this paper, an attempt was made to explore the spatial and structural pattern of Sargodha, city including aspects of rural-urban fringe such as identification of fringe, its linkage, and socioeconomic characteristics of the residents. It has been deduced that the rural-urban fringes are highly significant for cities as if the cities centre places are inadequate then the targets of the urban expansion moves towards the rural-urban fringes. A number of the urban population prefers to inhabit rural-urban fringes in addition to the housing builders because of excessive desire for housing to reside in and around the inexpensive lands. There are a lot of reasons for these phenomena, for example, the lands are inexpensive, little traffic crowd and public, roads improved infrastructure and amusing surrounding with extra open areas. A number of the housing societies are striving very hard to build houses in the rural and urban areas since they desire to use the lands for numerous objects like housing growth in the

urban areas, big outlets, office apartments, restaurants and allied business points. Further, it is revealed that the urban growth was not only the result of the population growth but also due to the agglomeration of facilities along with improved socio-economic conditions near and around the cities. City urban fringes or the planned boundaries, is spreading of the cities like the food and recreation in various areas. Many population densities around these boundaries were populated. The extension of the urban areas has given rise to the rural and urban fringes. The land converted to the urban areas was agriculture-based.

So to bring sustainability in the rapidly changing fringing areas of the city it is a dire need to suggest effective and implementable policies to curb the pace of conversion. So, there is an acute requirement to make better policies of housings in or around rural-urban fringes. So, it is our prime obligation to recognize the locality of the rural-urban fringes areas based on the land-use model for rural or urban areas, only then we can detect the locations of such rural-urban fringes solely based on the structural or spatial models.

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