# Land Use And Cropping Pattern Improve By Using The Remote Sensing And Gis In Nalgonda District, Telangana

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Abstract : Nalgonda has recently gone through intense land use and land cover changes (LULC). This study aims to assess the changes of land use of Nalgonda, which were surveyed from 2000 to 2020 by utilizing Landsat TM, ETM + & OLI-TIRS imageries. The ArcGIS-10.4 & the ERDAS-14 Imagine software were used to deal with satellite images and surveyed measurable data for land cover change evaluation of the study area. Both pre- and post- classification change detection scenarios and NDVI analysis were observed to assess the change result from 2000 to 2020. Maximum likelihood classification was utilized to create unsupervised land cover category (water body, urban, fallow, agriculture, vegetation and lowland). After ensuring acceptable value for each classified image (82.16% for 2020, 76.15% for 2010 & 70.96% for 2000 with Kappa values of 0.64, 0.62 & 0.62 for 2020, 2010 and 2000), a change detection study was performed. This study discovered that the highest growth 69.22% of urban area has been improved within 20 years followed by 49.75% and 21.74% of water bodies, fallow lands; whereas the annual change rate was 14.95%, 7.91% and 10.31% respectively. In contrast, 16.28%, 10.48% and 37.20% of vegetation, agriculture and lowland had been reduced and an (-) annual change rate of 16.03%, 7.15% and 9.99% respectively. In addition, NDVI analysis was also observed a decreasing trend of the vegetation and agricultural lands. The results of this assessment could be supportive to design and appliance significant managing appraisals to protect the agricultural degradation, fruitless urbanization of Nalgonda district.

Keywords : Accuracy Assessment, Landsat, Relative Change, Unsupervised classification.

# **1 INTRODUCTION**

Agricultural activities and cropping patterns are closely controlled by the physical factors and socio-economic factors. Physical environment plays an important role in agriculture. In fact, terrain, topography, slope, altitude, climate, soils, surface drainage and underground water table are quite vital determinants of agricultural activities and cropping patterns. All these factors are affecting the growth and distribution of crops in a particular area. Hettner (1947) had stressed that nature in its diverse manifestations viz. soil, water, and climate provides man in different areas with a variety of possibilities for development of agriculture. Hence, physical environment isvery important determining the crop pattern and agricultural operations. Thus, physical parameters influence the type of crops growing, the degree of threat involved in agriculture and its development. Moreover, the duration of time period is also determined by physical environment especially temperature. If all the physical parameters of a particular area are favourable for farming that area will be agriculturallymore developed. Thus, the present chapter deals with the study of physical and socioeconomic environment and its relevance to agricultural practices in Nalgonda district. In this chapter an attempt is made to study all the important parameters of physical and socio- economic environment because of their significance for analysing the patterns of agricultural transformation in the study region. The changing the agricultural practices is compelling to comprehend the resources in Nalgonda district. On the whole, Nalgonda district is experiencing several changes which require systematic study in this concern the understanding of geographical setup of district is very much essential. The assessment of physical and socio-economic condition helps to understand the present geographical setting and its potentialities for futuristic development. Therefore, with this view an attempt is made in this chapter to know the geographical setting of Nalgonda district.

# 2.Study Area

The Nalgonda district is situated in western part of Telangana. Nalgonda district is a district in the Telangana state of India. Nalgonda district has the highest number of mandals in the state. The district shares boundaries with Suryapet, Rangareddy, Yadadri and Nagarkurnool districts and with the state boundary of Andhra Pradesh. It is divided into eleven tahsils which form essentially an important agro-economic region. This district comes under Nalgonda Administrative. Administratively, it is bordered by the Nalgonda district on the whole of the northern side, by the district on the east, by the district on the southeast and south, by the district on the west and by district to the north-west. Although the boundaries of the district are mainly administrative, along several lines these coincide with physicalfeatures, in that the Krishna river practically forms a border over the entire north, the main Nalgonda range on the west and south-west, and the section of the hills on the east to demarcate to some extent the lands of the Nalgonda district.

# 3.Methodology

# 3.1 Data Collection

The secondary technique information was used in this study to assess the various meteorological characteristics and their impact on horticulture productivity at the mandal and locale levels in the Nalgonda area.

#### 3.2 Physical background

The physical setting for agriculture constitutes the physical environment which determines to a large extent our agricultural activities, the physical base, particularly the relief, drainage, geology, climate and soil play a vital role in shaping the

agriculture activities.

# 3.2.1 Physiography

Physiography plays an important role in the agricultural activities such as cropping pattern, cropping intensity, agricultural productivity, agricultural development, etc. and so on. The agricultural patterns are strictly dependent on the conditions of terrain, topography and altitude of the area. These physiographical elements are influenced on the land use pattern.

#### 3.2.2 Rainfall

Rainfall is one of the factors to determine the cropping pattern in study area. The study area experiences tropical monsoon climate. Due to uneven topography, rainfall is unevenly distributed in study region. The rainfall in the belt roughly 30 to 35 km. wide, parallel to the crests of the range is considerably higher than in the rest of the district. While at an elevation of 1,372 metres gets an average annual rainfall of 6,226 mm. other stations in this belt gets annual rainfall ranging between 1,723 and 1865 mm.

Sr.	Name of	Average Boinfall in mm	Received Rainfall in mm					
110.	1 811511	Kannan in inni	1981	1991	2011	2021		
	Nalgonda	2343.9	5983.0	5863.4	4501.2	6456.8		
	Suryapet	808.9	972.4	958.8	678	873.2		
	Thirumalgiri	499.8	742.6	638.3	349.2	434.8		
	Miryalguda	463.1	489.3	470.1	478.2	342.2		
	Bhongiri	536.9	391.7	468.3	357.3	225.8		
	Yadagirigutta	498.9	467.3	544.6	518.1	373.1		
	Mattampalle	747.6	757.4	851.2	519.1	497.4		
	Huzurnagar	1023.9	1087.7	1032.0	1031.3	777.6		
	Kodad	1724.5	1843.0	1744.7	1092.3	1737.2		
10	Garide Palle	1826.1	1873.7	1800.5	1203.3	1804.0		
11	Nered Cherla	742.7	993.2	1046.3	655.1	593.6		
12	District	1019.7	1418.3	1401.6	1034.83	1283.2		

 Table 1: Distribution of Rainfall in Nalgonda District, 1981-2021

Source: Socio-Economic Review and District Statistical Abstract of Nalgonda district.

# 3.2.3 Temperature

In Nalgonda district the cold season starts by about the end of November and continues to about the middle of February, December being the coldest month. In this season the mean daily maximum temperature in the plains is 28.4 degrees C while the mean daily minimum temperature is 14.4 degrees C. At Telangana the mean daily maximum temperature in December is only 23.5°C and the mean daily minimum is 13.9°C.

		20	11	20	20	
Sr. No.	Months					
5111101		Maximum Temp. in °C	Minimum Temp. in °C	Maximum Temp. in °C	Minimum Temp. in °C	
l	January	29.0	11.0	29.5	13.9	
	February	30.8	12.6	30.8	15.8	
3	March	34.6	17.3	34.6	19.2	
ļ	April	36.3	20.1	36.3	21.7	
5	May	34.8	22.4	36.8	22.8	
Ó	June	29.4	21.6	29.9	21.8	
1	July	25.4	21.0	25.4	21.1	
}	August	25.7	20.4	25.7	20.5	

Table 2: Normal Temperature of Telangana district, 2011 and 2020

9	September	27.2	20.1	27.2	20.1
10	October	30.2	18.6	30.2	19.7
11	November	28.6	14.7	28.6	16.7
12	December	28.4	11.2	28.4	14.4

Source: Socio-economic Abstract of Nalgonda district.



Figure 1: Temperature of Nalgonda district, 2011 and 2010-21

# 3.2.4. Geology

The district as a whole is monotonously covered by Deccan Trap basaltic lava flows, which, in turn, are covered by a thin mantle of soil almost everywhere. These flows, on account of differential weathering, give rise to undulating relief. There are prominent hill ranges in western part of the district and the region is characterised by typical Deccan trap geomorphology. The Deccan traps, as mentioned earlier, cover almost the whole of the district and constitute the innumerable rugged and bold, flat- topped hills, forming extensive plateaux of the entire Western Ghats. They also constitute the small hill ranges in the eastern and central parts of the district. Besides, lava flows also blanket the plains with a soil covering of varied thickness. The individual flows; vary greatly in thickness from a few feet to as much as 120 feet although the average-thickness is about 40 feet.

# 3.2.5 Soil

Soil plays an important role in the cropping pattern and farming cultivation in the study area. Growth of crops depends on the property of soil. Formation of soil in any region is based on the parent material, climatic condition, living organism, physiography, geology. Relief influences on soil formation, primarily through its affect upon the drainage, runoff and erosion and secondary through variations in exposure to the sun, wind and air drainage (Jagtap, 1985). The soils in the study area are essentially derived from the underlying basalt and under different climatic conditions show variations in the texture and structure. It varies from deep black soil in the river valleys to shallow soil and laterite soil. The soils of the district can be broadly grouped into three types viz. black (Kali) soils, coarse grey (Barad) soils and reddish (Tambadi) soils.



Figure 2: Distribution of Soil in Nalgonda District

#### 3.2.6 Drainage System

The drainage system or river basin is known as an area that is drained by a river and its tributaries. In Nalgonda district mainly four river basins viz. northern part of district captured river basin, south-eastern covered by Krishna river basin. Krishna is the main river basin in Nalgonda district. River Krishna is one of the largest sacred rivers of southern India. are joined to the Krishna river in the district. The valley floors are well-cultivated and well-populated; the streams draining in the valleys have carved out small amphitheatres into the sides of the intermediate ridges .



Figure 3: Drainage System in Nalgonda District

# 3.2.7. Digital Elevation Model

Digital Elevation Model (DEM) is useful for better visualization of the relief over space or it is a 3-dimensional model of topography. The contour lines of 5m interval from 1:25000 scale toposheet were digitized and using interpolation procedure DEM of the study area is prepared.



Figure 4: Digital Elevation Model (DEM) of Nalgonda District

# 4. SOCIO-ECONOMIC BACKGROUND

In this study socio-economic status of Nalgonda district is checked through some important indicators such as demographic dimensions, sex composition, literacy, and occupational structure, agricultural workers, size of landholdings, irrigation, use of chemical fertilizers, transport facilities, agricultural mechanization etc. are discussed individually.

# 4.1 Demographic Dimensions

Population plays an important role in transformation of agriculture and agricultural development. Population provides labours to agriculture sector. Population also influences on the agriculture sector by demand and level of consumption. Increase in population with increase the demand and consumption of food-grains, fruits and vegetables, etc. Therefore, dynamics of population is one of the prime aspects of socio- economic studies. The demographic attributes such as growth of population, population density and its distribution, etc. are used to understand the condition of the study area.

# 4.2 Growth of Population

Growth of population is the most fundamental demographic processes with which change in population during specific time is understood. Table 3 elaborates the population growth and its decadal and annual variation for the period of 1981 to 2021.

# Table 3 : Growth of Population in Nalgonda District

404

	Period	Population	Actual Decadal Variation	% of Decadal Variation	% of Annual Variation
	1981	265792	-	-	-
Urban	1991	315840	50048	18.83	1.88
	2011	398121	82121	25.99	2.60
	2021	570378	172257	43.27	4.33
	1981	1772885	-	-	-
Rural	1999	2135532	362647	20.45	2.05
	2011	2410873	274873	12.87	1.29
	2021	2433363	22490	0.93	0.09
	1981	2038677	-	-	-
Total	1991	2451372	412695	20.24	2.02
	2011	2808994	356994	14.56	1.46
	2021	3003741	194747	6.93	0.69

Source: District Census Handbook of Nalgonda, 1981 – 2021





Figure 5 : Growth of Population in Nalgonda district, 1981-2021

It has been observed that the urban population is continuously increased from 1981 to 1999. The decadal growth of urban population is represented in table 2.3 and figure 2.7. The urban population was increased 18.83 per cent during the period of 2010-2021. The growth rate of population was increased 25.99 per cent in the decade of 2019-2020 and during the period of 2020-21, it is increased to 43.27 per cent.

Decadal Changes in Distribution of Population in Nalgonda District

Within the district there are significant differences in the growth of populationin various tahsils.

Table	A. Decedal	Changelin	Distant bandi and	of Domilar	ion in Mal	
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		Population			Decadal (	Frowth Rate	e in %	
Sr. No.	Name of Mandal	1981	1991	2011	2021	1981- 1982	1991- 1992	2020- 2021
1	Nalgonda	36475	44513	54546	72830	22.04	22.54	33.52
2	Suryapet	143217	167532	189336	200269	16.98	13.01	11.52
3	Thirumalgi ri	82574	101105	119819	137418	22.44	18.51	15.62
4	Miryalguda	224018	273451	313627	342667	22.07	14.69	12.81
5	Bhongiri	145223	184489	199598	225634	27.04	8.19	7.57
6	Yadagirigut ta	202701	234182	260951	275274	15.53	11.43	10.26
7	Mattampall e	190605	225002	253128	257500	18.05	12.50	11.11
8	Huzurnagar	292635	368871	451870	502049	26.05	22.50	18.37
9	Kodad	102287	117988	124600	106506	15.35	5.60	5.31
10	Garide Palle	233265	274284	298095	299509	17.58	8.68	7.99
11	Nered Cherla	382677	459955	543424	584085	20.19	18.15	15.36
12	District	2038677	2451372	2808994	3003741	20.24	14.59	12.73

Source: District Census Handbook of Nalgonda, 1981 – 2021.

All the 11 Mandals of the district have registered a positive growth rate during 1981-2021. In the decade of 1981-1991, the highest growth rate (27.04per cent) was recorded in Man tahsil followed by Nalgonda(26.05), while the lowest in with 15.35 per cent followed by as 15.53 per cent of the district. The decadal population growth rate in Man, Nalgonda, Suryapet, Miryalguda are above the district average i.e. 20.24 per cent. The remaining 6 Mandals viz. have the growth rate below the district average.

#### 5. Density of Population

Density of population is expressed as number of persons per unit area. Population pattern influences the utilization of the

land and the latter with changes in the agricultural practices to a great degree also determines the pattern of farm population (Singh 1974). The spatial distribution of population refers to the way people are spread over the region. It is clear that Nalgonda district has a highly uneven distribution of population density.

Sr. No.	Name of Tahsil	Density of Population					
		1981	1991	2011	2021		
1	Nalgonda	161	196	245	137		
2	Suryapet	141	282	306	321		
3	Thirumalgiri	157	192	229	258		
4	Miryalguda	190	231	261	288		
5	Bhongiri	101	128	138	146		
6	Yadagirigutta	154	177	231	199		
7	Mattampalle	202	238	275	273		
8	Huzurnagar	320	403	516	554		
9	Kodad	118	132	144	183		
10	Garide Palle	175	206	226	209		
11	Nered Cherla	358	430	561	512		
12	District	194	233	268	287		

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Table	5: Mandal	wise Density	of Population in	Nalgonda District

Source: District Census Handbook of Nalgondadistrict, 1981-2021

#### Areas with High Density of Population

In this category includes the Mandals of Nalgonda and Huzurnagar in 1981 and Huzurnagar and Suryapet in 2021. In these tahsils have an urban agglomeration; headquarter of district and commercial city. In these tahsils the population density obtained above the 300 per sq. km.

# Areas with Moderate Density of Population

In this category the density of population lies between 150 and 300 persons per sq. km. It has been recorded as six Mandals fall under this category in 2021 and also six Mandals comes under this category, viz. Suryapet ,Huzurnagar and Miryalguda during the period of 2021.



Areas with Low Density of Population

Low density population in the year 1981 and in 2021 Nalgonda and Suryapet Mandal are fall under this category. There have low densities mainly due to natural factors such as uncertain rainfall, infertile soil as well as declining population growth rate in last decade e.g. Nalgonda and lack of irrigation facilities.

# Sex Composition

Sex ratio is one of the important social indicators to assess the balance of male female population in the society. Sex ratio

is defined as the number of females per thousand males. The sex composition details are useful in the planning of agricultural activities, analysis of other demographic characters and economic aspect. In Nalgonda district as whole there were 1061 females per 1000 males in 1981 and 995 females per 1000 males in 2011. It has been continuously declined from 1981 to 2011 shows intable 6.

Sr. No	Name of Mandal		Census Year					
110.	Name of Manual	1981	1991	2010	2021			
1	Nalgonda	940	892	873	937			
2	Suryapet	1112	1076	1021	1005			
3	Thirumalgiri	1062	999	960	947			
4	Miryalguda	972	952	953	944			
5	Bhongiri	1039	996	995	976			
6	Yadagirigutta	1107	1064	1024	1012			
7	Mattampalle	1099	1050	1000	999			
8	Huzurnagar	1064	1013	973	976			
9	Kodad	1231	1176	1100	1068			
10	Garide Palle	1177	1131	1089	1065			
11	Nered Cherla	968	985	961	972			
12	Districts	1061	1029	995	988			

 Table 6: Mandal wise Sex Composition in Nalgonda District

Source: District Census Handbook of Nalgonda District.

The sex ratio reflects the socio-economic and demographic characteristics, so it is essential to study the tahsil wise sex ratio of 1981 and 2021. It has been observed that the favourable condition of sex ratio in district. It means the Mandals have higher the proportion of Suryapet ,Tirumalgiri.

# 7. Changes in the Use of Agricultural Land Over Time

Farmers' decisions are frequently influenced by socioeconomic factors, purchasing power, and price fluctuations in local and regional markets. "The present chapter of Nalgonda concentrates on agricultural crop spatial distribution, shifting cropping patterns, and growth spatial distribution and temporal variations were explored from 2001 to 2013 data was then converted to a percentage of net sown area percentages of these crops were then separated into categories, and the spatial distribution of 12 crops in the research area was examined".

# 7.1 Distribution of Irrigated Land:

"Almost all of the farmers are utilising high-yielding pulse seed varieties, which is worth noting addition to farm yard waste, chemical fertilisers such as DAP, Urea, Super Phosphate, and Potash are used keep pests and diseases away from the crops, pesticides and insecticides are utilized amount of chemical fertiliser used, on the other hand, is less than what is advised. Traditional methods are used to plant, weed, and harvest crops small number of farmers used threshers" Babu, P.V.L.P. (1975 a).

# 7.2 Distribution of Major Crops:

The figure shows how irrigated land is distributed among various crops. Wheat, Jowar, Pulses, Sugarcane, and Rabbit crops crops like Wheat, Jowar, Pulses, Sugarcane, and Rabbit crops like Wheat, Jowar, Pulses, Sugarcane, and Rabbit crops like Wheat, Jo Rice is the most common crop planted on irrigated land, according to research.

Sr. No.	The cropping	2001-2002		2019-2020		Percent of 2001 to 2020 Variation from
		in hectares Total Area	Area Percent	in hectares Total Area	in Percent Total Area	inPercent Change area
1	The Paddy	5539.2	4.8	8221.2	8.04	3.24
2	The Fruits	2161.61	1.87	2854.4	2.79	0.92

Table 7 : Total Crops in Hectares area distribution

3	Thec	9470	8.2	11775	11.51	3.31
4	Spices	252.6	0.22	283.5	0.28	0.06
5	Flower	32990	28.58	25594	25.02	-3.56
6	The jawar	9470	8.2	11775	11.51	-3.56
7	The wheat	8221.2	8221.2	8221.2	4.26	1.07
8	Total Oil Seed	2854.4	2854.4	2854.4	0.1	0.02
9	Total Pulses	1775	1775	1775	8.38	5.29
10	Fodder	83.5	283.5	283.5	8.12	1.37
11	Total Vegetable	8.6	58.6	58.6	3.43	-1.09
12	Bajara	25594	25594	25594	8.01	-0.06
	Total	98781	100	98781	100	0

Source:TRAC

# 7.3 Results and discussion

Fruit crops such as bananas, grapes, chiku, guava, orange, and mango are grown in the research area. In 2001, the area under fruit crops in Nalgonda district was 2161.61 hectares, or 1.87 percent. The total area increased to 28.54 hectares. In 2011, 2.89 percent of the population voted. The highest percentage of land devoted to fruit crops was recorded in the Nalgonda district circle in 2001 (2.93%) and 2011 (3.97%). In 2001 (1.50 percent) and 2011 (2.10 percent) at Villages, Miryalaguda circle had the lowest land occupied by fruit crops. Progressive farmers are harvesting these fruit crops. (Displays map 4.3)

# 8.Conclusion:

During the kharif season [June to October, November], Bajara Onion, Total Pulses, Total Oilseed, Fodder crop, Sugarcane, Fruit (Cash crops), and other crops are planted. During the Rabbi season [October to March], crops such as wheat, Jowar, and other cereals, as well as mix crops (Kharif, Rabbi, and Summer Seasons) such as sugarcane, all fruits, vegetables, flowers, and fodder crops, are grown in the study area. Groundnut and fodder crops are sown in the summer in areas where irrigation and water are available.

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