

Agricultural Development and Land use Pattern in Nashik District of Maharashtra, India

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Abstract

The paper aims to analyse the agricultural development and land use pattern in Nashik district. Nashik, lying between 19° 33' and 20° 53' north latitude and 73° 16' and 75° 16', with an area of 15530 Sq. K.M. North south length is 120 k.ms. East West length is 200 k.ms. Forest, Agricultural Land, Area not available for cultivation, Cultural waste is different distribution of land use pattern. The total irrigated area is 6.6 % and unirrigated area is 54.6 %.The highest irrigated area is in Niphad and lowest irrigated area is in Surgana. The highest unirrigated area is in Igatpuri Tahsil. The Girna and Godavari is drained by two chief rivers and several dams have been built across the main stream.Rafullah's method is use for crop combination analysis, the nine crop combination in Dindori Tahsil , four crop combination in Yevla, three crop combination in five tehsils that are Surgana, Kalwan, Deola, Peint, Trimbak and two crop combination in Satana(Baglan), Malegaon, Nandgaon, and Chandvad Tahsil. Nashik has population of 6,109,052 of which male and female are 3,164,261 and 2,944,791 respectively, Average literacy rate of Nashik district in 2011 are 82.91 compared to 80.96 of 2001.

Keywords: Agricultural Development, Land use Pattern, irrigation, Crop Combination, Population.

Introduction

Agriculture is the main economic activity of the district and about 70 per cent working population is dependent on agriculture occupation. Grapes of Nashik district are famous for their exhilarating taste and rich flavour and Onion, Pomegranate and tomato is also famous in all over India.

The national horticultural research and development foundation (NHRDF) was establish by national agricultural co-operative marketing federation of India Ltd. (NAFED) and its associate shippers of onion on 3 Nov, 1977 under societies registration act 1860 at new Delhi. During 1989, the head office of NHRDF was shifted to Nashik but the registered office is at New Delhi. The head quarter of NHRDF is located 20 km away from Nashik towards north-east on the Nashik-Aurangabad road at 20° north latitude and 73° 57' east longitudes at 492 m above mean sea level at Chitegaon Phata in Niphad talukas of Nashik district.

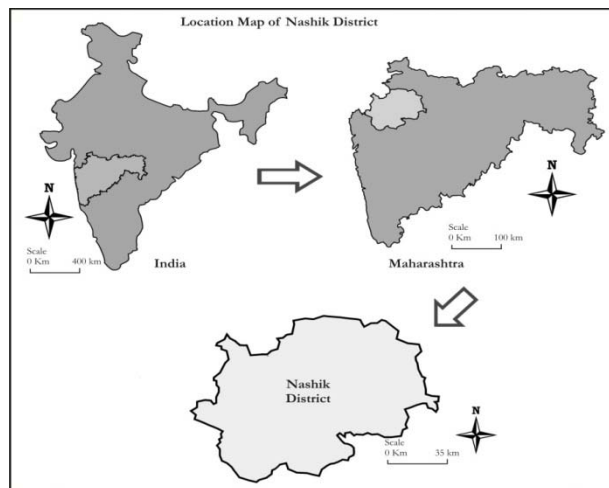
Weather of Nashik generally compares well with that of Pune or Bangalore .Generally climate is pleasant, dust free and non-corrosive. The Coldest month is December with minimum temperature of up to 5° c and maximum temp.28.3° c. The hottest month is May with minimum temp.21.5° c and maximum temp. Up to 42.5°c. The average rainfall of the District is between 2600 and 3000 mm, there is wide variation in the rainfall received at various blocks. Most of the rainfall is received at various blocks. Most of the rainfall is received from June to September. Relative humidity is maximum 62% and minimum 43%. It may be mentioned that the average temperature is rising and rain fall is decreasing slowly.

Nashik is also deemed "the third most industrialised city of Maharashtra after Mumbai and Pune", mainly due to extensive industrial development in recent times. It is home to an important thermal power plant (Eklahare) and a National Treasury Printing Press (India Security Press at Nashik Road). There are five "Industrial Zones" in the Nashik area and its outskirts (Satpur, Ambad, Sinnar, Igatpuri and Dindori). These estates house corporations like Mahindra and Mahindra, MICO (Bosch), VIP Luggage, Crompton Greaves, GlaxoSmithKline, Graphite India Ltd. (Formerly Carbon Everflow Ltd), Larsen & Toubro, ABB Group, Siemens, Samsonite, Ceat and Hindustan Aeronautics Limited. Software companies like Aress Software and WNS.

The highest density in Malegaon and lowest density in Nandgaon. The Progressive growth rate from 1901 to 2012 is 642.

The study area

Nashik, lying between $19^{\circ} 33'$ and $20^{\circ} 53'$ north latitude and $73^{\circ} 16'$ and $75^{\circ} 16'$, with an area of 15530 Sq. K.m. Nashik has population of 6,109,052 of which male and female are 3,164,261 and 2,944,791 respectively, average literacy rate of Nashik in 2011 are 80.96 compared to 74.36 of 2001. If things are looked out at gender wise, male and female literacy were 88.03 and 73.43 respectively. For 2001 census, same figures stood at 83.65 and 64.35 in Nashik District. Total literate in Nashik District are 4,294,045 of which male and female are 2,408,876 and 1,885,169 respectively. River Godavari passes through Nashik. Jalgaon district is at its east and north east. Surat and Dang district is at north. Thane district is at south west and west. Aurangabad district is at south east and Ahmednagar is at south. There are 15 talukas in Nashik district.



Objectives

- 1) To study the agricultural development in Nashik district of Maharashtra
- 2) To study the land use pattern
- 3) To study the irrigated land
- 4) To study the crop combination region with the help of Rafiullah's method
- 5) To study the population growth and development

Methods and procedures

The present study is based on primary and secondary sources. District census handbook and Socio-economic reviews have been used for data analysis. Corel draw x3 and adobe Photoshop CS3 used for map preparation. The Tahsil has been taken as unit for study and the statistical data extracted from district office pertains to 2004-2005. The crop combinations regions derived from the application of Rafiullah's method. The analysis of population growth of the study area depends entirely upon the census report.

Land Use Pattern of Nashik District Table No-1

Tahsil	Area (Sq. Km.)	Forest	Agricultural Land		Area not available for cultivation	Cultural waste
			Irrigated	Unirrigated		
Malegaon	1825.13	34261.7	10357.4	109864.8	19587.6	8441.3
Baglan	1477.83	41618.9	11808.4	73047.0	16401.5	4907.3
Kalwan	859.71	32028.1	2653.6	43433.4	5413.1	2442.8
Nandgaon	1089.82	25951.9	3261.0	62751.7	8093.4	8923.9
Surgana	845.65	45626.3	156.4	33823.7	4729.3	229.3
Nashik	810.57	13990.2	3488.3	43148.8	8531.1	11898.7
Dindori	1342.19	19483.7	5243.3	81751.4	16522.1	11218.6
Igatpuri	846.32	16631.2	453.8	58624.7	7887.8	1034.5
Peint	560.60	26718.1	463.7	15717.6	5770.9	7389.7
Niphad	1053.65	1976.1	34568.7	47523.7	14268.9	7027.7
Sinnar	1352.61	14739.9	12046.9	84972.0	17334.6	6167.6
Yevla	1064.47	11146.0	5256.0	65863.4	12106.1	12075.4
Chandvad	958.75	8704.4	8236.8	60056.0	11871.4	7006.4
Trimbak	874.7	33668.0	830.0	37025.0	8465.0	7482.0
Deola	568	7809.0	2917.0	30699.0	10180.0	5195.0
	15530	334353.6	101741.3	848302.3	167162.7	101440.1

Percentage of Land Use Pattern in Nashik District Table No -2

Tahsil	Tahsil percentage	Forest	Agricultural Land		Area not available for cultivation	Cultural waste
			Irrigated	Unirrigated		
Malegaon	11.8	18.8	5.7	60.2	10.7	4.6
Baglan	9.5	28.2	8.0	49.4	11.1	3.3
Kalwan	5.5	37.3	3.1	50.5	6.3	2.8
Nandgaon	7.0	23.8	3.0	57.6	7.4	8.2
Surgana	5.4	54.0	0.2	40.0	5.6	0.3
Nashik	5.2	17.3	4.3	53.2	10.5	14.7
Dindori	8.6	14.5	3.9	60.9	12.3	8.4

Igatpuri	5.4	19.7	0.5	69.3	9.3	1.2
Peint	3.6	47.7	0.8	28.0	10.3	13.2
Niphad	6.8	1.9	32.8	45.1	13.5	6.7
Sinnar	8.7	10.9	8.9	62.8	12.8	4.6
Yevla	6.9	10.5	4.9	61.9	11.4	11.3
Chandvad	6.2	9.1	8.6	62.6	12.4	7.3
Trimbak	5.6	38.5	0.9	42.3	9.7	8.6
Devla	3.7	13.7	5.1	54.0	17.9	9.1
Total %	100.0	21.5	6.6	54.6	10.8	6.5

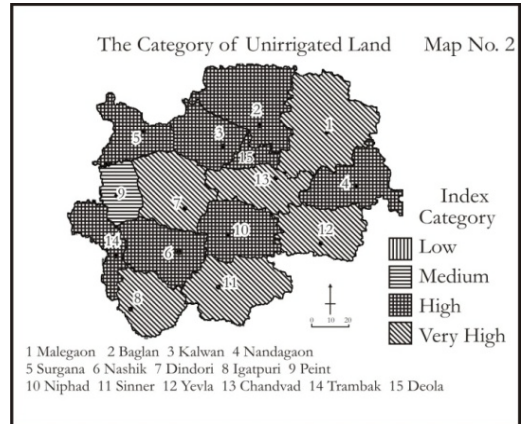
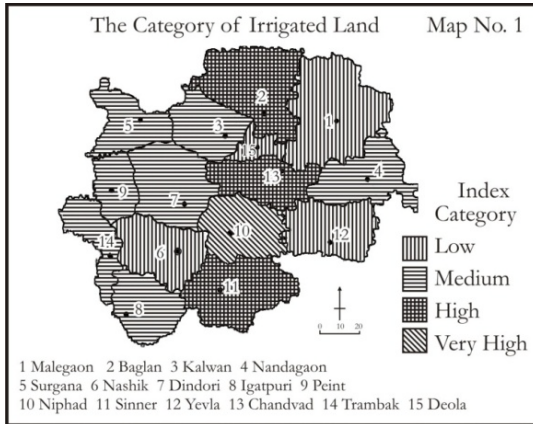
The Malegaon is the largest area i.e. it's first ranking in area i.e. 1825.13 Sq. Km in the Nashik district. The land use pattern is not uniform; the total forest area is 21.5% in the Nashik district, more than 37 % forest area in Surgana, Trimbak and Kalwan Tahsil. The Niphad Tahsil is the lowest forest area i.e.1.9 % area but the irrigated area is the highest i.e. 32.8 % area. The low irrigated area in Surgana, Igatpuri, Peint and Trimbak because this Tehsils receiving the highest rainfall in the Nashik district and farmer depends on rainfall. The total unirrigated area is 848302.3 hector. Igatpuri Tahsil is the highest unirrigated area i.e.69.3% area and low unirrigated (40%) in Surgana Tahsil. The total area not available for cultivation is 10.8 %, the highest area in Deola Tahsil and 5.6% area in the Surgana Tahsil. The total cultural waste is 6.5% area and the highest (14.7) cultural in Nashik Tahsil.

Irrigation Land and unirrigated landuse category Table No -3

Irrigated land			Unirrigated Land	
Category	Range in %	Tahsil	Range in %	Tahsil
Low	Below 4	Kalwan, Nandgaon, Surgana, Dindori, Igatpuri, Peint, Trimbak (07)	Below 20	
Medium	4 to 8	Malegaon, Nashik, Yevla, Deola (04)	20 to 40	Peint, (01)
High	8 to 12	Baglan, Sinnar, Chandvad(03)	40 to 60	Baglan, Kalwan, Nandgaon, Surgana, Nashik, Niphad, Trimbak, Deola. (08)
Very High	More 12	Niphad, (01)	More 60	Malegaon, Dindori, Igatpuri, Sinnar, Yevla, Chandvad (06)

Out of fifteen Tahsil only one Niphad Tahsil 32.8% area is highly irrigated. Three Tehsils are high irrigated i.e. Baglan, Sinnar and Chandvad. Medium irrigated four Tehsils are Malegaon, Nashik, Yevla and Deola. Seven Tehsils are low irrigated area.(Map No.1). The total 54.6 % area is unirrigated; Peint Tahsil is medium unirrigated area. The eight Tehsils are highly unirrigated and six Tehsils are very high unirrigated.(Map No.2)

The drainage pattern depends upon the structure of the underlying basaltic rock. The Girna and Godavari River are drained by two chief rivers and several dams have been built across the main stream, irrigating large areas of garden land.



Major and medium project **Table no-4**

Basin/ Sub Basin	Name of Project	Talukas	Project		Designed Live Storage (Mcft)
			Major	Medium	
Girna	Chankapur, Haranbari, Kelzar Nagyasakaya	Kalwan, Satana(2), Nandgaon	01	03	4849
Godavari	Gangapur, Alandi, Kashyapi	Nashik(02)	01	02	8452
Darna	Darna, Kadwa, Mukne	Igatpuri	03		13444
Kadwa	Palkhed, Karanjwan, Ozerkhed. Waghad, Tisgaon, Punegaon	Dindori	06		11873
Pravara	Bjojapur	Sinner	01		361
Total			12	05	38979

Last Updated data 2/3/2012

The district is drained by two chief rivers, the Girna and Godavari, and their tributaries. Dam is constructed on Girna, Godavari, Darna, Kadwa and Pravara River. These 12 dams play the very important role in agricultural development and designed live storage is 38979 (Mcft). Igatpuri Tahsil areas which are cultivated under purely rained conditions are treated as unirrigated lands. Some important dam is following.

Gngapur Dam: - The total catchment area of the dam is 357.4 Sq.km. The total dam length is 3810 m. and maximum height of the dam is 36.57m. The total Gross storage of the dam is 215.88 MCM (7624 mcft) the length of the waste weir is 102 m. There are total 9 radial gates of size (9.15x6.10 m.) having the discharge capacity of 2294 cumecs (81013 cusecs). The dam has two canals, the left bank canal is 64 Km. long and right bank canal is 30 Km. long. The total irrigable area of this dam is 15960 Ha.

Darna Dam: - The dam constructed by British Government in 1916. The total length of dam is 1634 meters, and the maximum height of the dam is 28 meters. There are 50 automatic Reynolds type gates for passing the discharge of 2017.55 cumecs (71250 cusecs). In 1972 additional 6 radial gates of size 12.19 x 4.27 m. are constructed for passing the discharge of 1318.40 cumecs (46560 cusecs). There are 6 irrigation outlets on left bank and 2 irrigation outlets on right bank. The total catchment area at the dam site is 404 Sq.Km. The Gross irrigation command area is 79697 Ha. And irrigation command area of the dam is 33170 Ha.

Crop combination is significantly

The Tahsil has been taken as unit for study and the statistical data extracted from district office pertains to 2004-2005. Tahsil has been taken as a unit for study. Tahsil wise crop data collected from the revenue department of the Nashik and processed for crop combination. The crop combination has been estimated in a several ways. The present investigation is based on Rafiullah's' (1965) technique, which may be expressed as -

$$\delta = \frac{\sum Dp^2 - Dn}{N^2}$$

Where

δ = Deviation

Dp = Positive difference from the median value of theoretical curve of crop Combination

Dn = Negative difference from the median value of theoretical curve of crop Combination

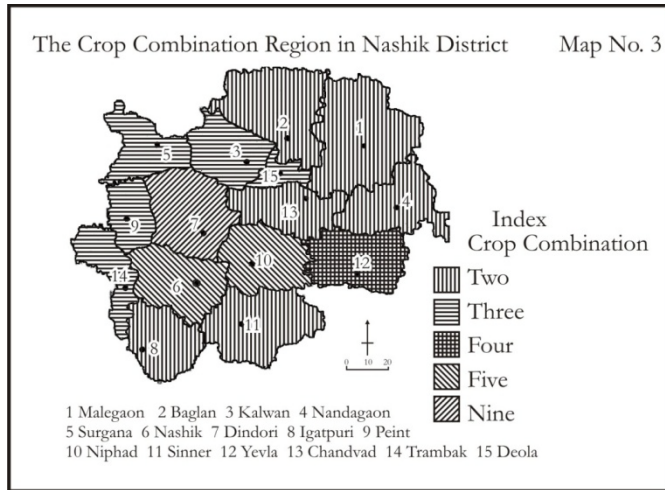
N = Number of crop combination

Fist all absolute values of the crop combinations for 15 Tahsil of Nashik district area determined and resultant cropping patterns. The Nashik district falling different crop associations are given below

Crop combination and average rainfall Table No-5

Tahsil	Total area	Crop combination	Name of The crop	Average Rainfall
Malegaon	1825.13	2	Bajra, Maze	471.9
Baglan	1477.83	2	Bajra, Maze	424.7
Kalwan	859.71	3	Maze, Bajra, Paddy	625.5
Nandgaon	1089.82	2	Bajra, Onion	524.5
Surgana	845.65	3	Paddy, Ragi, vari	1807.2
Nashik	810.57	5	Wheat, Paddy, Nachani, Javari, Onion	613.4
Dindori	1342.19	9	Graps, tomato, Wheat, Paddy, Sugarcane, groundnut, Ragi, Gram, Brigal.	697.6
Igatpuri	846.32	2	Paddy, Gram	3442.1
Peint	560.60	3	Mango, Ragi, wari	2278.6
Niphad	1053.65	5	Grape, Maze, Sugarcane, Onion, Wheat	481.7
Sinner	1352.61	2	Bajra, Wheat	516.8
Yevla	1064.47	4	Bajra, Onion, Maze, Wheat, Gram	488.5
Chandvad	958.75	2	Bajara, Onian	570.6
Trimbak	874.7	3	Paddy, Ragi, Wari	2278.6
Deola	568	3	Bajra, Maze, Onion	625.5

The cropping combination denotes the proportion of land under different crops in various combinations in the time context. The various combinations stretching from two crops to nine crops. Two crops are found in six Tahsil. Nine crop found only in Dindori Tahsil for Grapes, tomato, Wheat, Paddy, Sugarcane, groundnut, Ragi, Gram, Brigal. These are all cash crops and Pipalgaon Market is famous for Graps, Tomato, Wheat, etc. In the western part of the Tahsil receives high rainfall so paddy cultivation is found in the tehsil's i.e. Igatpuri, Trimbak, Surgana, Kalwan and that is correlation in between high rainfall and crop combination. Towards the eastern part of the Tahsil, rainfall is decrease so eastern part of the Tahsil Bajra is fames and mostly people eat the Bajra.



Density and Literacy

Rural and Urban category of density and literacy **Table No - 6**

		Density		Literacy	
				Male	Female
Total (District)	High	Nashik 1625	Trimbak 83	Trimbak 90	Trimbak 75
	Low	Trimbak 154	Nashik 52	Surgana 64	Nashik 40
Rural	High	Niphad 379	Niphad 75	Sinnar 84.96	Niphad 65
	Low	Nandgaon 133	Nashik 49	Nashik 61	Nashik 37
Urban	high	Malegaon 18213	Niphad 87	Igatpuri 93	Niphad 82
	Low	Niphad 1227	Malegaon 79	Malegaon 85	Surgana 73
Total Nashik District	Total	322	74	83	64
	Rural	202	67	78	56
	Urban	4448	83	90	76

Censuses2001

The above table shows the rural, urban and total Nashik district density and Literacy rate in the cense year 2001. The Nashik is the highest total population density is 1625 sq. km, the Malegaon is the height urban density is 18213 sq.km and the Niphad is the lowest population urban density is 1227 sq. km. Niphad is the highest rural density is 379 sq. km. and Nandgaon is the lowest density is 133 sq. km. The Nashik district density is 322 sq. km.(2001) the total density is 322 but urban density is very high i.e. 4448. The total literacy rate is 74% and the total urban literacy is high i.e. 83%. But male urban literacy rate 90%.

According to the data for 2001, Nashik acquired the first rank for degree of urbanisation it had achieved;87 per cent of its population lived in urban areas. Malegaon gained the second rank for the degree of urbanisation is 58 per cent (2001).

According to 2001 there has been a considerable growth of literacy in district. The literacy rate is higher for male (90 %). The male literacy of Igatpuri is 93. Trimbak Tahsil shows the highest literacy for male and females (Table No)

The percentage of urban population is 38.8. (Census 2001)(pp408) The percentage of urban population is 38.8. During the decades of 1951-61 and 1991-2001 it increased proportionately at higher rates vis., by 29.74 per cent and 29.66 per cent respectively. Child sex ratio of Nashik district is 882 females per 1000 males. Female Sex ratio of Nashik district is 931 females per 1000 males

Since 1901 there has been a considerable growth of literacy. The educational progress achieved since 1930 and the compulsory education by state after Independence. Devnagari is one of them used in this district .from the above table it is clear that the literacy rate in the Nashik district have continuously incising over all the decades. While we can derive some satisfaction from the improvement in the literacy rates, it is important to note here, that, even though the number of literates has increased by 82.91 % over the decade censuses 2011, the male literacy rate is 88.03 % and female literacy rate is 73.43 %.

Population decadal growth

Table No- 7

Census Year	Population	Decadal growth		Average annual Exponential Growth rate (Per cent)	Progressive growth rate over 1901 (Per cent)	Density Per Sq. km.	Literacy rate
		Absolute	Per Cent				
1901	823,080					52	
1911	915,698	+ 92,618	11.25	1.13	11.25	58	
1921	845,783	- 69,915	-7.63	-0.76	2.76	58	
1931	1,009,583	+ 163,800	19.38	1.93	22.66	54	
1941	1,127,597	+ 118,014	11.68	1.17	37.00	65	
1951	1,429,916	+ 302,319	26.81	2.68	73.73	72	36.89
1961	1,855,246	+ 425,330	29.74	2.97	125.40	92	36.37
1971	2,369,000	+ 513,754	27.70	2.77	187.82	119	44.36
1981	2,991,739	+ 622,739	26.28	2.63	263.39	152	62.33
1991	3,851,352	+ 860,352	28.76	2.88	367.92	193	74.36
2001	4,993,796	+ 1,142,444	29.66	2.97	506.72	248	80.96
2011	6,109,052	+ 1,115,256	22.33	2.23	642.22	322	82.91

In 2011, Nashik has population of 6,109,052 of which male and female are 3,164,261 and 2,944,791 respectively. There was change of 22.33 present in the population compared to

population as per 2001. In the previous census of India 2001, Nashik District recorded increase of 29.66 percent to its population compared to 1991.

The (No-) presents the growth of Nashik district from 1901 -2011. It will be seen that except for the decade of 1911-1921 when the severe influenza epidemic took a heavy toll of life, the population of the district has increased all along, although not at a uniform rate. During the decades of 1951-61 and 1991-2001 it increased proportionately at the higher rates viz., by 29.74 per cent and 29.66 per cent respectively.

According to the 2001 census, the total population of Nashik district was 4,993,796 and the second highest decadal growth rate of 29.66 per cent. There has been a net addition of 1,115,256 persons during 2011. The decadal growth decreases at the rate -7.33 during 2001-11. During the decade 2011 the growth rate of the district is 22.33 and progressive growth over 1901 is 642.22.

The percentage of urban population is 38.8. During the decades of 1951-61 and 1991-2001 it increased proportionately at higher rates viz., by 29.74 per cent and 29.66 per cent respectively. In 1901 the density is 52 and 2011 the density is 393 Per Sq. Km.

Since 1901 there has been a considerable growth of literacy. The educational progress achieved since 1930 and the compulsory education by state after Independence. Devnagari is one of them used in this district. From the above table it is clear that the literacy rate in the Nashik district has continuously increased over all the decades. While we can derive some satisfaction from the improvement in the literacy rates, it is important to note here, that, even though the number of literates has increased by 82.91 % over the decade censuses 2011, the male literacy rate is 88.03 % and female literacy rate is 73.43 %.

Population compare to Maharashtra **Table No-8**

year	1981-91	1991-2001	2001-2011 Nashik	Maharashtra-2011
Total Pop	3851352	4,993,796	6,109,052	112,372,972
Male	1984973	2,590,912	3,164,261	58,361,397
Female	1866379	2,402,884	2,944,791	54,011,575
Population Growth Rate	28.73%	29.66%	22.33%	15.99%
Density(per.sq.km)	248	322	393	365
Literacy rate	62.33	74.36	80.96	82.91 %
Area in Sq. Km			15530	307690
% compare to Maharashtra			5.05	100

As compare to the Maharashtra state Nashik district growth rate is +6.34 in censuses year 2011. The Nashik is 5th growing district. (Thane +35, Pune +30, Aurangabad +27, Nandurbad +25 and Nashik +22. growth rate during censuses 2011). The literacy rate of Maharashtra is high, density of Nashik district is high as well as population growth is high as compare to Maharashtra.

Results

The total 101741.3 sq.km (6.6%) irrigated area plays the important role in agricultural development as well as road, railway, agricultural labour, bank, good climate and modern technology give the support to agricultural development.

The total forest area is 21.5%, irrigated area is 6.6%, and unirrigated area is 54.6 %. Area not available for cultivation is 10.8 % and Cultural waste is 6.6 %. In the district more than 37 % forest area in Surgana, Trimbak and Kalwan Tahsil. The lowest forest area i.e.1.9 % area but the irrigated area is the highest i.e. 32.8 % area in Niphad Tahsil.

The Niphad Tahsil 32.8% area is highly irrigated. The total 54.6 % area is unirrigated, Peint Tahsil is medium unirrigated area. The eight Tahsil is highly unirrigated and six Tahsil is very high unirrigated crop pattern is a very important feature of land use in Nashik district, especially Dindori is nine crop combinations on the economic point of view. The high rainfall region paddy is found and less rainfall region Bajra is found. The western part paddy is found and eastern part of Tahsil Bajra is found means towards the eastern parts rainfall is decreases. Bajra is important crop of the District. However other crops like wheat, paddy and other cereals are also grown in various parts of the District. Paddy is mainly grown in Tribal belt i.e. Igatpuri, Peth, and Surgana Blocks. Vegetables and Onions have been main cash crops for last 30 years.

The percentage of urban population is 38% and urban-rural ratio is 0.63 urban people in Nashik district in 2001. In the present times, because of advances in good climate, industrialization, development of road, religious importance's, cargo services, good quality of grape and onion more and more people are being attracted towards Nashik districts.

Maximum 12% of area is occupied by Malegaon Tehsil. Smallest area 3.63% occupied by Peint Tehsil. 2nd Smallest Tehsil is Deola occupied space is 3.81%. Rest 12 Talukas occupied 5 to 9 % of the area

Conclusion

The 4 lining of national highway no NH- 3, the total length is 231.759 Km from Igatpuri to Zodage and state road network 1639.97Km, the total railway network 287Km from Igatpuri to Nayadoangari play the very important role of agricultural development. Now recently cargo surveys play the very important role for commercial agricultural development. Crop combination is change from east to waste direction due decrease rainfall. The urbanisation growth of Nashik Tahsil is very high. In the present times, because of advances in good climate, industrialization, development of road, religious importance, cargo services, good quality of grape and onion more and more people are being attracted towards Nashik districts. Due to good transport facilities there is an agricultural development. Agriculture has been used to its full potential in Nashik district.

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Botanical name of crop

Crop	Botanical Name
Bajra	<i>Pennisetum glaucum</i>
Brinjal	<i>Solanum melongena</i>
Grape	<i>Vitis Vinifera</i>
Gram	<i>Cicer arietinum.l</i>
Groundnut	<i>Arachis hypogaea.l</i>
Jowar	<i>Sorghum vulgare</i>
Mango	<i>Mangifera indica</i>
Maze	<i>Zea mays</i>
Nachni/Ragi/Vari	<i>Eleusine coracana</i>
Onion	<i>Allium capa.Linn</i>
Paddy	<i>Oryza sativa</i>
Sugarcane	<i>Saccharam officinaram</i>
Tomato	<i>Lycopersicum esculentum</i>
Wheat	<i>Triticum aestivum</i>