



Quick Response Code:



Website: <https://wgges.us>



Creative Commons (CC BY-NC-SA 4.0):

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

Manuscript ID:
IJWGAFES-2025-021208

DOI: 10.5281/zenodo.18740702

DOI Link:
<https://doi.org/10.5281/zenodo.18740702>

Volume: 2

Issue: 12

December

Year: 2025

E-ISSN: 3066-1552

Submitted: 06 Nov.2025

Revised: 11 Nov.2025

Accepted: 04 Dec 2025

Published: 31 Dec. 2025

¹Research Scholar, Department of Geography, Shankarrao Mohite Mahavidyalaya, Akulj
Email: prof.ravirajsonawane@gmail.com

²Prof., Research Guide, D. B. F. Dayanand College of Arts & Science, Solapur

Address for correspondence:

Raviraj Laxman Sonawane
Research Scholar, Department of Geography, Shankarrao Mohite Mahavidyalaya, Akulj
Email: prof.ravirajsonawane@gmail.com

How to cite this article:

Sonawane, R. L., & Shinde, N. G. (2025). Spatio-Temporal Analysis of Cropping Pattern in Nashik District: A Geographical Analysis. *International Journal of World Geology, Geography, Agriculture, Forestry and Environment Sciences*, 2(12), 41–46.
<https://doi.org/10.5281/zenodo.18740702>

Spatio-Temporal Analysis of Cropping Pattern in Nashik District: A Geographical Analysis

Raviraj Laxman Sonawane¹, Dr. N. G. Shinde²

Abstract

The present research paper has been made an attempt in to analyse the cropping pattern in Nashik district. This study is based on secondary data collected from socio-economic abstract of Nashik district. The Physical, climatologically, socio-economic, technological, organizational factors, and farmer's attitude, etc. determinants closely influenced on the cropping pattern in study region, but in the study area irrigation is an important determinant affected on the cropping pattern. The collected data regarding area under different crops has been computed with the statistical techniques. It has observed that the more variations in the cropping pattern in tahsil to tahsil in study area. The distribution of cropping pattern is generally adjusting to the physical environment, availability of irrigation facilities and food habits of the farmer community. It reveals that the proportion of cereal crops in the study region is 69.40 per cent through the period of 1991, it is rapidly declined up to 46.13 per cent to the total cropped area in the period of 2024. Pulses in the entire district has 12.33 percent in 1991 and 12.90 percent in the gross cropped area in 2024. The proportion of sugarcane cultivation in Nashik district has 2.59 per cent in 1991 and it is to some extent up to 2.70 per cent in 2024. The fruits and vegetables have 6.32 per cent to the total cropped area in 1991, it is quite increased up to 23.43 per cent to the total cropped area in 2024. The proportion of fodder the entire Nashik district has 6.06 per cent area under fodder in 1991 and it is declined up to 4.63 per cent in 2024.

Keywords: Irrigation, Cropping Pattern, Crop Combination, Determinants.

Introduction

The process of land is used for agricultural purposes for agronomy of different crops and formation agricultural production in a specific unit of space at a given point of time, i.e. in an agricultural year. The land is used for the cultivation of different crops known as agricultural land use. The cropping pattern is an important aspect in agricultural land use. "Cropping pattern means the proportion of area under different crops at a point of time as its variations over space and time" (Husain, 2012). "The agricultural land use of a region is allied with the physiographic, climatic, socio-cultural, economic, historical, political and technological factors" (Das, 1990).

The role of agronomists in cultivation of precise crops is a quite important. The capability of decision making of farmers is an important determinant motivated on the agricultural land use. An effective cultivation of crops suggests the most efficient use of arable land, application of water resources, consumption of bio-chemical inputs and scientific cultivation, etc. Therefore, agricultural land use is energetic concept; it cannot be suitable for all times in the all-region.

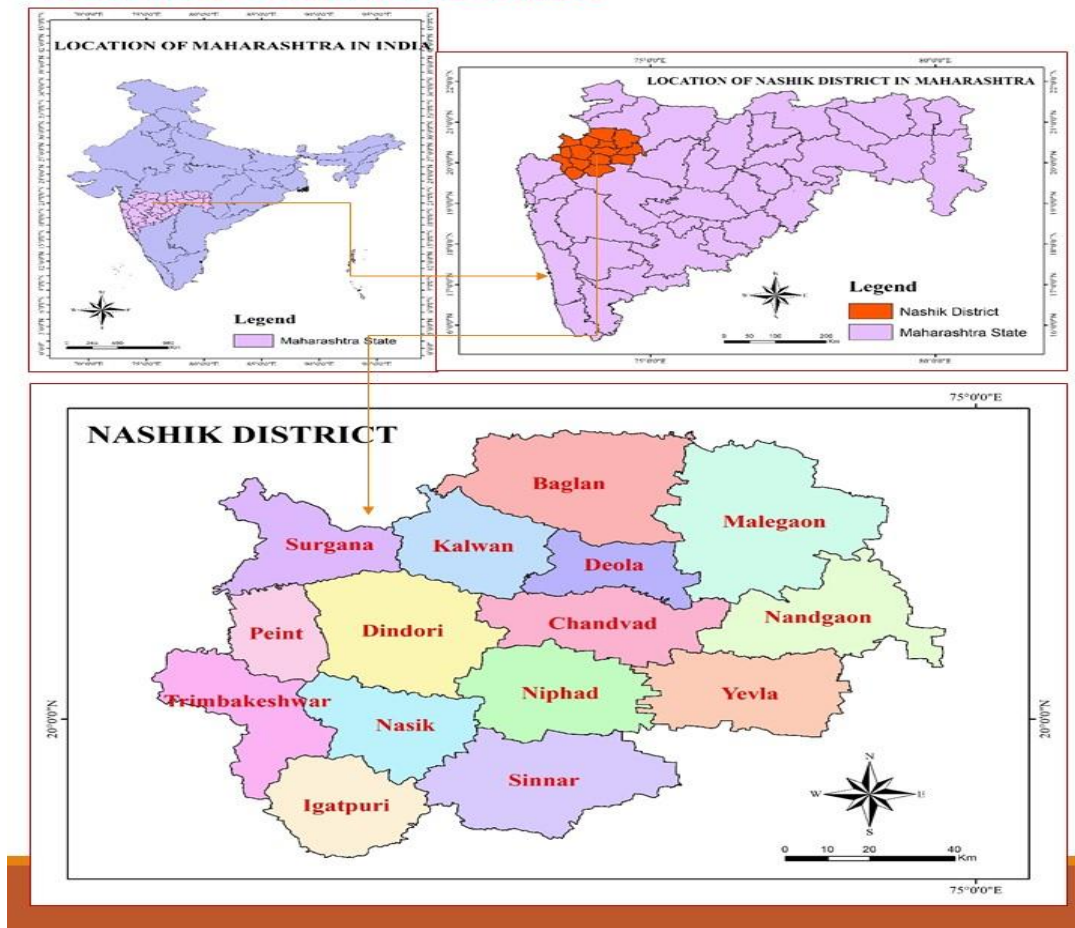
The cropping pattern is not only having closely relation to the physical and agro-climatic conditions but socio-economic and infrastructural facilities mainly irrigation facilities are important. The statistics of area under different crops are used by published government records for the analysis of cropping pattern associated with the expansion of irrigation in the study area.

The Study Region

For the present investigation Nashik district is selected as a study region. Geographically Nashik district is located between 18⁰33' North to 20⁰53' North latitude and 73⁰16' East to 75⁰16' East longitude. Total area of Nashik District of 15530 sq. km.

The Nashik district of Maharashtra had 1,931 villages in 2011. The district has several tahsils, including Nashik, Igatpuri, Dindori, Peth, Surgana, Deola, Satana, Kalwan, Chandwad, Niphad, Sinnar, Yeola, Malegaon, Nandgaon, and Trimbakeshwar. According to Census 2011, population of Nashik District is recorded as 61,07,187 showing an addition of 11,13,391 persons after 2001 Census with decadal growth rate of 22.3 percent. The decadal growth rate for the rural and urban areas of the district is 14.8 and 34.1 respectively. The percentage share of urban population has witnessed an increase from 38.8 in 2001 to 42.5 in 2011. The district shows a density of population of 393 per km², whereas it is 236 for rural and 4013 for urban. The district has reported work participation rate as 45.25 percent, constituting 41.31 percent main workers and 3.93 percent marginal workers. The literacy rate of the district is 82.31, which is 77.19 for rural and 89.12 for urban.

Location of Nashik District



Aim and Objective

- To examine the spatial-temporal distribution of cropping pattern and their changes in the Nashik district.

Database and Methodology

The secondary information has been collected from Directorate of Economics and Statistics of Nashik District. The cropping pattern can be expressed as following formula:

$$Cp = \left(\frac{Ca}{N}, \frac{Cb}{N}, \frac{Cc}{N}, \dots, \frac{Cr}{N} \right) \times 100$$

Where,

C_p represents the cropping pattern; $C_a, C_b, C_c, \dots, C_r$ the cropped area under crops a, b, c, r in an enumeration unit and N the total cropped area in the same unit.

Spatio-Temporal Distribution of Cropping Pattern

The proportion of area under different crops at a point of time in a specific space is called as cropping pattern. The proportion of area under different crops is highly uneven throughout the study region because high variations in the physiography, climatic condition and socio-economic development. The distribution of cropping pattern is generally adjusting to the physical environment, availability of irrigation facilities and food habits of the farmer community. Bajra is the principal cereal crop as it is the principal food of the people in the district.

Cereal Crops

Table 1 reveals that the cereal crops are the leading crop in Nashik district. The quantity of cereal crops is 69.40 per cent through the period of 1991, but it is quickly decayed up to 46.13 per cent to the total cropped area in the period of 2024 in Nashik district. The rice, wheat, jowar, bajra and maize are major cereal crops cultivated in the Nashik district.

The high proportion of cereal crops was recorded in Baglan, Malegaon, Chandwad, Yeola tahsils in 1991 and Surgana, Peth and Trimbak tahsils in 2024, due to these tahsils are located in the mountainous area, thin soil, uneven landscape and low development of surface irrigation resulted in high area under cultivation of jowar and Bajra which is based on rainfall.

The moderate proportion of cereal crops was enumerated in Surgana, Kalwan, Dindori, Peth, Igatpuri tahsils in 1991 and Kalwan, Deola and Malegaon tahsils in 2024.

Table 1

Proportion of Area under Major Category of Crops and its absolute Change in Nashik District, 1991 and 2024.

Sr. No.	Name of Tahsils	Cereals			Pulses			Oil Seeds		
		1991	2024	Change	1991	2024	Change	1991	2024	Change
1	Surgana	69.43	76.91	7.48	11.83	11.93	0.1	12.31	3.55	-8.76
2	Kalwan	69.6	61.15	-8.46	9.7	7.28	-2.43	8.38	9.47	1.09
3	Deola	0	68	68	0	6.34	6.34	0	2.22	2.22
4	Baglan	76.06	72.83	-3.23	7.04	7.7	0.65	6.88	2.59	-4.29
5	Malegaon	77.64	60.67	-16.96	6.07	5.12	-0.94	5.84	5.02	-0.82
6	Nandgaon	76.64	0	-76.64	9.4	5.34	-4.07	8.15	1.66	-6.49
7	Chandwad	77.63	48.97	-28.65	7.87	8.61	0.74	2.5	3.85	1.34
8	Dindori	60.38	33.45	-26.94	9	31.5	22.5	7.25	12.15	4.9
9	Peth	73.22	78.84	5.62	18.01	13.46	-4.55	7.43	4.53	-2.89
10	Trimbakeshwar	0	81.66	81.66	0	9.85	9.85	0	6.04	6.04
11	Nashik	44.19	12.65	-31.54	6.81	2.24	-4.58	7.89	17.66	9.77
12	Igatpuri	74.78	0	-74.78	5.6	12.86	7.26	2.14	8.51	6.37
13	Sinner	51.54	21.92	-29.62	8.17	4.46	-3.71	11.73	6.95	-4.78
14	Niphad	58.11	22.72	-35.39	3.73	11.14	7.41	5.9	8.29	2.39
15	Yeola	80.54	38.66	-41.87	7.64	10.44	2.8	2.23	4.62	2.4
Entire District		69.4	46.13	-23.27	7.74	9.49	1.75	6.28	6.46	0.18

Cont.

Table 1

Sr. No.	Name of Tahsils	Sugarcane			Fruits and Vegetables			Fodder		
		1991	2024	Change	1991	2024	Change	1991	2024	Change
1	Surgana	0	0.01	0.01	0.08	0.89	0.81	6.16	6.58	0.42
2	Kalwan	2.45	4.82	2.37	6.15	12.83	6.69	1.42	1.3	-0.12
3	Deola	-	1.03	-	-	18.83	-	-	2.36	-
4	Baglan	3.41	3.53	0.13	2.66	11.21	8.56	1.39	1.2	-0.19
5	Malegaon	1.17	0.99	-0.18	5.47	9.48	4.01	0.86	2.05	1.18
6	Nandgaon	1.46	0	-1.46	2.63	66	63.37	0.36	0.89	0.52
7	Chandwad	1.17	0.12	-1.05	8.96	31.56	22.6	1.13	6.53	5.41
8	Dindori	1.87	4.31	2.44	10.1	0.72	-9.38	9.81	16.45	6.65
9	Peth	0.06	0.21	0.15	0.33	2.96	2.62	0.77	0	-0.77
10	Trimbakeshwar	-	0.19	-	-	2.27	-	-	0	-
11	Nashik	1.13	0.42	-0.71	14.41	61.65	47.25	23.62	0.76	-22.85
12	Igatpuri	0.91	5.42	4.51	4.63	18.31	13.68	10.01	54.27	44.26
13	Sinner	0.04	2.43	2.38	1.34	61.93	60.58	26.9	0.69	-26.21
14	Niphad	14.11	10.12	-3.99	14.36	35.19	20.82	2.34	0	-2.34
15	Yeola	1.82	0.54	-1.28	5.59	16.81	11.22	1.7	8.73	7.03
Entire District		2.59	2.7	0.11	6.32	23.43	17.11	6.06	4.63	-1.43

Source: Computed by researcher on the basis of Socio-economic Abstract of Nashik District, 1994-95 and 2024.

The low quantity of cereal crops was obtained in Nashik, Sinner and Niphad tahsils in 1991 and Nandgaon, Chandwad, Dindori, Nashik, Igatpuri, Sinner, Niphad and Yeola tahsils in 2024. Due to this region is diversified for agriculture, such as fruits, vegetables, or livestock, outdated farming practices such as continued use of traditional farming methods and there are also high urbanization leads to conversion of agricultural land to urban uses.

Absolute Change in Cereal Crops

The changes of cereal crops have been fast declined in the some tahsils of district therefore negative change in the proportion of cereal crops during the period of 1991 and 2024 in the Nashik district. The district as a whole has -23.27 per cent change in the proportion of cereal crops during the period of investigation, but their spatial distribution differs from tahsil to tahsil. The positive change in cereal crops is found only in Surgana and Peth tahsils due to the extreme physiographic and climatic conditions.

The high negative change in cereal crops is recorded in Nandgaon, Chandwad, Dindori, Nashik, Igatpuri, Sinner, Niphad and Yeola tahsils due to the development of surface irrigation facilities through the different irrigation as well as outdated farming practices resulted as reduces the proportion of cereal crops rapidly.

The low negative change in proportion of cereal crops i.e. below -25 per cent is obtained in Kalwan, Baglan and Malegaon tahsils. Because these tahsils are located in monotonous area regions with temperate climates, moderate temperatures, and adequate rainfall are suitable for cereal crop production.

Pulses

Pulses are one of the important categories of crop growing in the Nashik District. There are numerous pulses grown in Nashik district, among them the foremost crops being gram, urid, kulith, tur, and mug. The entire Nashik district has 7.74 percent pulses in 1991 which is slightly increased up to 9.49 percent in the gross cropped area in 2024, it has been positive change during the period of 1991 and 2024, but the spatial distribution differs from tahsil to tahsil.

The high proportion of pulses cultivation i.e. above 10 per cent was registered in Surgana and Peth tahsils in 1991 and Surgana, Dindori, Igatpuri, Niphad and Yeola tahsils in 2024. Because pulses crops are rainfed and required low water for growth so high proportion of this cultivated in hilly tahsils with rough topography, low fertile soil and less expansion of surface irrigation.

The moderate percentage of the pulses i.e. occupies between 5 to 10 per cent was registered in Kalwan, Baglan, Malegaon, Nandgaon, Chandwad, Dindori, Nashik, Sinner and Yeola tahsils in 1991 and Kalwan, Deola, Malegaon, Nandgaon, Chandwad, Trimbak and Yeola tahsils in 2024.

The low percentage of pulses i.e. below 5 per cent was recorded Niphad tahsils in 1991 and Nashik and Sinner tahsils in 2024. Because this tahsil is sited in plane area, moderate rainfall, fertile soil, adequate availability of water for irrigation leads to high cultivation of fruits and vegetable and low in pulses.

Absolute Change in Pulses

The positive change in the proportion of pulses such as 1.75 per cent in the entire district through the period of 1991 and 2024. The high positive change in which is more than 5 per cent is noted in Dindori, Igatpuri and Niphad tahsils due to suitable physiographic and climatic condition.

The low positive change in proportion of pulses occurs less than 5 per cent is recorded in Surgana, Baglan, Chandwad and Yeola tahsils.

The negative change in pulses is recorded in Kalwan, Nandgaon, Peth, Nashik and Sinner tahsils due to the development of surface irrigation, outdated pulses cultivation resulted as reduces the area under pulses cultivation.

Oil Seeds

Groundnut, soybean, and sunflower are the significant oil-seeds cultivated in Nashik district. The area under oil seeds was 6.28 per cent in 1991 and it is slightly increased up to 6.46 per cent through the period of 2024 in the entire Nashik district.

The high proportions of oilseeds i.e. above 10 per cent was registered in Surgana and Sinner tahsils in 1991 and Dindori and Nashik tahsils in 2024, due to the suitable light fertile soil for the growth of groundnut, adequate availability of irrigation facilities, the successful cultivation of groundnut and soybean resulted in farmers have grown oilseeds.

The moderate percentage of oil-seeds i.e. occupies between 5 to 10 per cent was registered in Kalwan, Baglan, Malegaon, Nandgaon, Dindori, Peth, Nashik and Niphad tahsils in 1991 and Kalwan, Malegaon, Trimbak, Igatpuri, Sinner and Niphad tahsils in 2024.

The low proportion of oil-seeds which is below 5 per cent was recorded in Chandwad, Igatpuri and Yeola tahsils in 1991 and Surgana, Deola, Baglan, Nandgaon, Chandwad, Peth and Yeola tahsils in 2024. Because these tahsils are situated in hilly area, undulating structure and large share of fodder crops in shallow soil and low growth of surface irrigation resulted as low proportion of oil-seeds.

Absolute Change in Oil Seeds

Table 1 indicates that the positive change in the proportion of oil-seeds in the district throughout the period of 1991 and 2024.

The high positive change in ratio of oil-seeds which is above 5 per cent is itemized only in Nashik and Igatpuri tahsils due to the development of the surface irrigation facilities through the different lift irrigation schemes and change of attitudes of the farmers to the cultivation of cropping pattern.

The low positive change in proportion of pulses i.e. below 5 per cent is verified in Kalwan, Chandwad, Dindori, Niphad and Yeola tahsils due to change the attitude of the farmers from food grain and oilseeds crops to cash crops fruit farming like pomegranate and grape.

The negative change in the proportion of oilseeds is shown in Surgana, Baglan, Malegaon, Nandgaon, Peth, Sinner tahsils due to outdated cropping pattern resulted as reduces the area under oilseeds.

Sugarcane

In the Nashik district, sugarcane is one of the main cash crops. The sugarcane cultivation has remained relatively constant due to the limited development of irrigation facilities, and farmers in the district are more interested in fruit and vegetable farming. Therefore, in the whole Nashik district has 2.59 per cent of the area under sugarcane to the gross cropped area in 1991 and it is to some extent up to 2.70 per cent in 2024.

The high proportion of sugarcane which is more than 3 per cent was recorded in Baglan and Niphad tahsils in 1991 but it has been increased in the tahsils of Kalwan, Baglan, Dindori, Igatpuri and Niphad tahsils in 2024. Because sugarcane is high water consuming crop and suitable for the growth in alluvial and black soil resulted in high water for irrigation, fertile alluvial and black soil.

The moderate proportion of sugarcane i.e. ranging from 1.5 to 3 per cent was registered in Kalwan, Dindori and Yeola tahsils in 1991 and Sinner tahsil in 2024.

The low ratio of sugarcane i.e. below 1.5 per cent was found in Surgana, Malegaon, Nandgaon, Chandwad, Peth, Nashik, Igatpuri and Sinner tahsils in 1991 and Surgana, Deola, Malegaon, Nandgaon, Chandwad, Peth, Trimbak, Nashik and Yeola tahsils in 2024. Because Surgana, Peth and Igatpuri tahsils are sited in mountainous area, high rainfall, jagged

landscape, thin soil resulted as low proportion of sugarcane. Whereas, Malegaon and Nandgaon tahsils are positioned in the dry area, low progress of irrigation resulted in high area under the bajra and pulses which is rainfed crops.

Absolute Change in Sugarcane

The Nashik district as a whole has only 0.11 per cent positive change in the proportion of sugarcane through the period of 1991 and 2024.

The high positive change in proportion of sugarcane i.e. more than 2 per cent change is recorded in Kalwan and Dindori, Igatpuri and Sinner tahsils due to the progress of surface irrigation and changes the attitudes of the farmers.

The low positive change in sugarcane cultivation i.e. less than 2 per cent is registered in Surgana, Baglan and Peth tahsils. These tahsils are located in mountain area, extreme climatic condition for the sugarcane cultivation.

The negative change in sugarcane cultivation is recorded in Malegaon, Chandwad, Nashik, Niphad and Yeola tahsils due to the adverse physiographic and climatic conditions so reduces the area under sugarcane cultivation.

Fruits and Vegetables

Potato, sweet potato, carrot, onion, brinjal, tomato, fenugreek, lady finger, radish and cabbage are the major vegetables and mango, banana, grape, pomegranate, guava are major fruits grown in Nashik district. The total fruits and vegetables have 6.32 per cent to the gross cropped area in 1991, it is quite increased reached to 23.43 per cent to the gross cropped area in 2024.

The high share of fruits and vegetables which is greater than 10 per cent was registered in Dindori, Nashik and Niphad tahsils in 1991 and Nandgaon, Chandwad, Nashik, Sinner and Niphad, Kalwan, Deola, Baglan, Igatpuri and Yeola tahsils in 2024. It has been observed that the proportion area under sugarcane increased during the period of investigation due to the expansion of irrigation facilities.

The moderate proportion of fruit and vegetables i.e. fluctuating as of 5 to 10 per cent was registered only in Kalwan, Malegaon, Chandwad and Yeola tahsils in 1991 and Malegaon tahsil in 2024.

The low percentage of fruits and vegetable i.e. less than 5 per cent was obtained in Surgana, Baglan, Nandgaon, Peth, Igatpuri and Sinner tahsils in 1991 and Surgana, Malegaon, Dindori, Peth and Trimbakeshwar tahsils in 2024. Because these tahsils are placed in hilly area, heavy rainfall, uneven landscape, shallow soil resulted as low proportion of fruits and vegetables cultivation.

Absolute Change in Proportion of Fruits and Vegetables

The Nashik district as a whole has 17.11 per cent positive change in the proportion of fruits and vegetables through the period of 1991 and 2024. Except for the Dindori tahsil, almost all tahsils have seen a positive change in the area under fruits and vegetables; however, the distribution of these crops varies from tahsil to tahsil. Only in Nandgaon, Chandwad, Nashik, Sinner, and Niphad tahsils is there a positive change in the area under fruits and vegetables that is greater than 20%. This is due to the expansion of irrigation infrastructure and shifts in farmers' attitudes from traditional farming to cash crops and commercial farming.

In the tahsils of Igatpuri and Yeola, there has been a 10% to 20% positive change in the area under fruits and vegetables.

In Surgana, Kalwan, Baglan, Malegaon, and Peth tahsils have a low proportion of positive change in fruits and vegetables—less than 10%. There are also unfavourable climate conditions, such as high temperatures or a lack of rainfall, soil degradation, such as nutrient depletion or erosion, and limited access to water for irrigation, which can limit the potential for fruit and vegetable cultivation to make positive changes.

Due to climate instability, the area under fruit and vegetable cultivation in Dindori tahsil has changed negatively. Crop rotation and terracing, two effective methods for conserving soil, can support fruit and vegetable cultivation in the absence of severe weather, but unreliable access to water for irrigation can prevent consistent cultivation.

Fodders Crops

In the Nashik District, one of the most important crops for livestock feed is fodder. Fodder crop is grown in the area. However, it thrives in shallow soil and requires a lot of rain to grow. According to Table 1, fodder covered 6.06 percent in 1991 and will only cover 4.63 percent by 2024 in Nashik district. Fodder crops, on the other hand, are distributed differently from tahsil to tahsil.

The high percentage of fodder crops such as more than 10 per cent was noted in Nashik, Igatpuri and Sinner tahsils in 1991 and Dindori and Igatpuri tahsils in 2024, because Igatpuri and Sinner tahsils are placed in hilly area, high rainfall, dense forest as well as shallow soil, limited expansions of irrigation facilities and low development of technology therefore there are high livestock ranching.

The moderate share of fodder crops lies in the tahsils of Surgana and Dindori in 1991 and Surgana, Chandwad and Yeola tahsils in 2024 which is lies between 5 to 10 per cent.

The low proportion of fodder crops which is less than 5 per cent was found in Kalwan, Baglan, Malegaon, Nandgaon, Chandwad, Peth, Niphad and Yeola tahsils in 1991 and Kalwan, Deola, Baglan, Malegaon, Nandgaon, Peth, Trimbak, Nashik, Sinner and Niphad tahsils in 2024. Because these tahsil is located in river basin area, fertile soil, high development of surface irrigation.

Absolute Change in Fodder Crops

Nashik district has negative change in fodder cultivation which is -1.43 per cent throughout the period of 1991 and 2024. The high proportion positive changes in fodder crop which is more than 5 per cent are recorded in Chandwad, Dindori, Igatpuri and Yeola tahsils.

The low positive change in proportion of fodder crops i.e. below 5 per cent is noted in Surgana, Malegaon and Nandgaon tahsils.

The negative change in percentage of fodder crops is verified in Kalwan, Baglan, Peth, Nashik, Sinner and Niphad tahsils due to change the technology and attitudes of the farmers rapidly declined the fodder crops and cultivated high returns crops like oil seeds, pulses and sugarcane.

Conclusion

In the study area, different crops cover a very different percentage of the land. In the rainfed study region, agricultural land is typically used primarily for food crops and seasonal crops. The physical environment, the availability of irrigation facilities, and the food habits of the farmer community all influence the distribution of cropping patterns. Because it is the primary source of food for the residents of the district, bajra is the primary grain crop.

The proportion of area under different crops is highly uneven throughout the study region. Normally, dominate the agricultural land to a large extent in food crops in the study region which is rainfed and seasonal crops. The distribution of cropping pattern is generally adjusting to the physical environment, availability of irrigation facilities and food habits of the farmer community. Bajra is the principal food-grain crop as it is the principal food of the people in the district. It reveals that the proportion of cereal crops in the study region is 69.40 per cent through the period of 1991, it is rapidly declined up to 46.13 per cent to the total cropped area in the period of 2024. Pulses in the entire district has 12.33 percent in 1991 and 12.90 percent in the gross cropped area in 2024. The proportion of sugarcane cultivation in Nashik district has 2.59 per cent in 1991 and it is to some extent up to 2.70 per cent in 2024. The fruits and vegetables have 6.32 per cent to the total cropped area in 1991, it is quite increased up to 23.43 per cent to the total cropped area in 2024. The proportion of fodder the entire Nashik district has 6.06 per cent area under fodder in 1991 and it is declined up to 4.63 per cent in 2024.

Acknowledgment

I express my deep sense of gratitude to my research guide Dr. N. G. Shinde, Professor, D. B. F. Dayanand College of Arts & Science, Solapur, for his valuable guidance, constant encouragement, and scholarly suggestions throughout the course of this research work. His insightful comments and constructive criticism greatly helped in shaping this study.

Financial support and sponsorship

Nil.

Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

References

- 1 Barakade, A. J. et al. 2011. "Agricultural Land Use Pattern in Satara District of Maharashtra." *Research Analysis and Evaluation* 2(17): 12-15.
- 2 Barakade, A. J., Kadam A.S. and Sule, B.M. 2011. "Pattern of Sugarcane Concentration in Satara District of Maharashtra." *International Journal of Crop Science* 45-50.
- 3 Bhagabati, A.K. (1985): "Pattern of Land Utilization in the Brahmaputra Valley", *Journal of Landscape Systems and Ecological Studies*, Vol. 18, Issue 2, Pp. 62-69.
- 4 Buck, J.L., (1967): *Land Utilization in China Volume I*, Nanking, University of Nanking.
- 5 Coppock, J. T. (1964): "Crop Livestock and Enterprise Combination in England and Wales." *Economic Geography* 40, Pp. 65-81.
- 6 Das, M.M. (1990): *Agricultural Land Use and Cropping Pattern in Assam*, *Land Utilization and Management in India*. Pp.120-130.
- 7 Dhindsa, K. S. and Sharma, A., (1995): "Analysis of cropping pattern changes in Punjab during 1965-66 to 1990-91". *Indian Economic Review*, 30(1), Pp. 79-86.
- 8 Government of Maharashtra, *Socio-Economic Abstract of Nashik District, 1994 to 2019*.
- 9 Husain, Majid (2012): "Systematic Agriculture Geography", Rawat Publication, Jaipur, Pp. 216, 236.
- 10 Kumbhar, A.R., (1978): "Agricultural Land Use in Upper Godavari Basin." Unpublished Ph.D. Thesis University of Pune.
- 11 Pawar, C.T. and Phule, B.R. (1999): "Spatio-temporal Perspectives on Cropping Pattern in Drought Prone Area of Maharashtra: A Case Study of Solapur District". *National Geography, Journal of India*, Vol. 45, Pp.1-4.
- 12 Singh, J. (1974): "An agricultural Atlas at India- A Geographical Analysis", Vishal Publication, Kurukshetra, Pp. 297-299.
- 13 Singh, Jasbir and Dhillon, S.S. (2004): *Agriculture Geography*, Tata McGraw Hill publishing Company Limited, New Delhi, Pp.108-121, 234.
- 14 Sule, B.M. and Barakade, A. J. (2016): *Spatio-Temporal Analysis of Land Use Pattern in Satara District Using Geo-Informatics Techniques*, *Journal of Research Front*, Pp. 167-178.
- 15 Weaver, J.C. (1954): "Crop-Combination Regions in Middle West", *Geographical Review of India*, Vol. 44, Issue 2, Pp.175-240.