

**“Geographical Analysis of Agricultural Productivity and Land Use
Efficiency in Tribal Areas of Nashik District of Maharashtra”**

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Abstract:

Agricultural productivity largely depends upon the land use efficiency, therefore both studies are very important to understand the agricultural development of any region. Good agricultural productivity is the main indicator of assessment of agricultural development of a region. The study of land use efficiency also plays vital role in agricultural planning. The tribal areas generally mean areas having preponderance of tribal population, where tribal population is more than 50 percent of their total population. There are five tribal tehsils (Surgana, Peth, Trimbak Kalwan and Dindori) are fully tribal, where tribal population is more than 50 percent of their total population. Other two tehsils (Igatpuri and Satana) are partially tribal where tribal population is around 40 % of their total population. This tribal area covers 43.83 percent area and 26.46 percent population of the district. In this tribal area, agriculture is a main occupation, but agricultural development is not observed too much. Especially agricultural productivity and land use efficiency is very less as compared to non-tribal areas of the country. Therefore to improve the agricultural productivity and land use efficiency of this tribal area is an important challenge.

The main aim of the present paper is to analyze the spatial pattern of Agricultural Productivity and Land use efficiency in tribal areas of Nashik District of Maharashtra for the year 2022-23. The present study is based on the primary and secondary source of data and field observation. Dindori tehsil is well developed with respect to agricultural productivity and land use efficiency as compared to other tribal tehsils of the study region. In other hand agricultural productivity and land use efficiency in Trimbak and Igatpuri tehsil is very less as compared to other tribal tehsils of the study region. It is due to lack of irrigation facilities, and proper use of fertilizers in the farms.

The study suggests that for overall improvement of agricultural productivity and land use efficiency the use of high yielding varieties, proper use of organic fertilizers, and improvement in irrigation facilities are very useful in this region. Most of the farmers of tribal areas are not too aware about soil testing and proper use of fertilizers therefore in this regard the government should create awareness in this areas by conducting seminars and camps for soil testing. The government and agro-based industries should take initiative for providing capital for use of new agricultural technology and develop irrigation facilities in this region.

Key Words: Tribal Area, Partially Tribal Area, Agricultural Productivity, Agricultural Land Use Efficiency & Net Sown Area

1. Introduction:

Agricultural productivity largely depends upon the land use efficiency, therefore both studies are very important to understand the agricultural development of any region. Good agricultural productivity is the main indicator of assessment of agricultural development of a region. The tribal areas generally mean areas having preponderance of tribal population, where tribal population is more than 50 percent of their total population. There are five tribal tehsils (Surgana, Peth, Trimbak Kalwan and Dindori) are fully tribal, where tribal population is more than 50 percent of their total population. Other two tehsils (Igatpuri and Satana) are partially tribal where tribal population is around 40 % of their total population. This tribal area covers 43.83 percent area and 26.46 percent population of the district. In this tribal region agriculture is controlled by physical factor such as relief, slope, soil and climate. For development of this tribal area, agricultural development is a very important foundation. For that purpose to increase agricultural productivity and efficiency is also very important, therefore in this regard this study is carried out in the study region. For the development of agricultural productivity, basic infrastructure for agricultural development is very important. In this regard, the role of the government to provide facilities such as irrigation, roads, market, fertilizers and good seeds and capital etc. is very important.

Agriculture is responsible for the change in socio-economic status as well as the development of our society (Gaikwad & Sonawane, 2022). Agricultural development has recently returned to the forefront of development issues, drawing attention to the impacts of agricultural productivity change on economic growth and poverty reduction in both rural and urban areas (Derek Headey & others, 2009). Agricultural efficiency is one of the most important agronomic techniques to understand overall development of agriculture (Dey & Mistri, 2008). Therefore the study about Agricultural efficiency is also very useful to understand spatial development of agriculture in the tribal part of the study area.

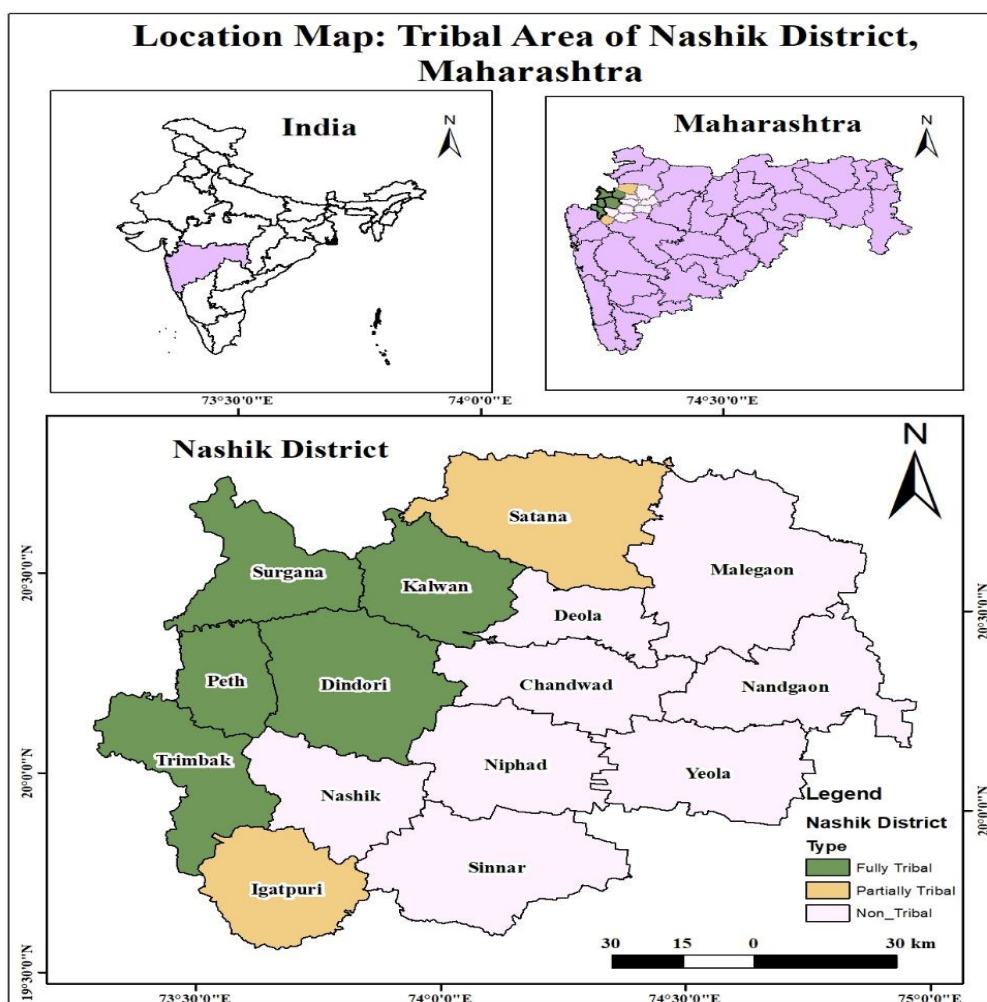
Agricultural land use efficiency is indicators of land utilization for agriculture. Agricultural land use efficiency represents the degree of optimum use and performance of cultivated as well as cultivable land (Jadhav, 2015). Analysis of land-use efficiency also provides useful input for sustainable land management practices in tribal areas. The best and most efficient land use and to provide land-use planning and the implementation of spatial development plans (Auzinsa, 2013).

2. Study Area:

Nashik District is situated partly in the Tapi basin and partly in the upper Godavari basin. It lies between 19° 33` to 20° 53` north latitude and 73° 15' to 75° 16' east Longitude. Nashik District has an area of 15530 Sq.K.M and population of 6107187.as per the 2011 census. In Nashik district seven tehsils are tribal, where more than 40 percent of their total population is tribal. Surgana, Peth, Trimbak Kalwan Dindori, Igatpuri and Satana are major tribal tehsils, where tribal population is too much observed. This tribal area covers 43.83 percent area and 26.46 percent population of the district. Location of the study area is shown in Map No.1. The tribal areas of study region

are characterized by the hilly and rugged topography. The slope of the tribal region is 80 to 150 meters per k.m. The main system of hills is the sahyadries, which run north- south in the western portion of the district. The entire Nashik district is underlain by the basaltic lava flows. From the main sahyadrian range three prominent spurs stretch out to the east. In the extreme north is the selbari range. The Satmala range which runs right across the district. Kalsubai range is located in the south part of the district (Nashik District Gazetteer, 1983).

The district has two main rivers the Girna and the Godavari. Deep black, medium black, shallow black, brown red, laterite soils are found in the tribal area of the study region. The climate of the district is generally dry except during the monsoon season. The rainfall of the tribal region is 150 c.m. to 300 c.m. The rainfall in general decreases from west to east. The summer season is moderately hot and the temperature varies from 36⁰ c to 43⁰ c. The air is humid during the monsoon season and is generally dry during the rest of the year. The major cereals crops of the tribal region are Rice, Nachani and pulses like black gram and brown gram along with fodder also found in some part of the region.



Map.No.1

3. Objectives: The main focus of the present study is on spatial analysis of Agricultural Productivity and Land use efficiency in tribal areas of Nashik District of Maharashtra.

4. Data and Methodology:

The present study is based on the primary and secondary source of data and field observation. Primary data is collected from field study from the study area with help of structural questionnaires from the 50 farmers'. Secondary data is obtained from the socio-economic abstract of the Nashik district (2023), District Census Handbook and District Gazetteers. The Tahsil has been taken as a unit for analysis of Agricultural Productivity and Land Use Efficiency in the study region.

Kendall's ranking coefficient method (1955) is used for analysis of agricultural productivity. For this purpose seven crops (Rice, Nachani, Tur, Groundnut, Sugarcane, Wheat and Gram) production per hectare is considered. Rankings were assigned for each crop as per crop productivity of each tehsil crop. To calculate the co-efficient all crops ranks were added and the summation is divided by the number of crops that is seven. To calculate the Agricultural Land Productivity following formula is used.

$$\text{Kendall's Co-efficient Index} = \frac{\sum R}{N}$$

Where,

$\sum R$ = Sum of rank

N = Numbers of crops.

The co-efficient index is inversely related to development i.e. lower the index the more development and higher the index low the development.

The analysis of Land Use Efficiency also carried out for seven tribal tahsil of the study area. For this purpose Jasbir Singh's (1976) method of calculation of Index of Land Use efficiency (LUEI) is applied. Index of Land Use efficiency is calculated by using following formula.

$$\text{Index of Land Use Efficiency} = \frac{\text{Cross Cropped Area}}{\text{Net Sown Area}} \times 100$$

On the basis of Index, land use efficiency is explained. The higher the index means higher the land use efficiency and the lower the index means lower the agricultural efficiency, it means low use of agriculture land. Data is processed and represented with Choropleth map by using Q-GIS software.

5. Results & Discussion:

Spatial Analysis of Agricultural Productivity:

For the calculation of Agricultural Productivity of tribal regions, major crops (Rice, Nachani, Tur, Groundnut, Sugarcane, Wheat and Gram) production is considered. Production of each major crop is expressed kg per hectare and it is shown in Table No. 1. By considering the overall productivity of crops and tehsils overall ranking with respect to production, all tribal tehsils are grouped into three categories. It is shown in Table No.2.

**Table No.1 Nashik District: Tribal Area's Productivity of Major Crops
(Kg/Hect.) 2022-23 (Part -1)**

Sr. No.	Name of Tahsil	Rice		Nachani		Tur		Groundnut		Sugarcane	
		Kg/Hect.	Rank	Kg/Hect.	Rank	Kg/Hect.	Rank	Kg/Hect.	Rank	Kg/Hect.	Rank
1	Surgana	2464.56	7	1321.82	2	484.2	5	1211.69	3	52	5
2	Kalwan	4084.6	2	893.33	6	490	4	1211	4	48.6	7
3	Satana	2502.81	6	911.11	5	789.37	1	1060.17	7	77.81	2
4	Dindori	2563.84	5	911.18	4	704.25	2	1362.54	2	81.85	1
5	Peth	4832.6	1	2322.8	1	287	6	1704.6	1	52	6
6	Trambak	3494	3	1021	3	640	3	1094	6	70	3
7	Igatpuri	3214.68	4	642.32	7	Nil	7	1150	5	55	4

Source: Computed by Researcher based on Socio-economic abstract of Nashik District 2023.

**Table No.1 Nashik District: Tribal Area's Productivity of Major Crops
(Kg/Hect.) 2022-23 (Part -2)**

Sr. No.	Name of Tahsil	Wheat		Gram		Sum of Rank	Rank Coefficient
		Kg/ Hect.	Rank	Kg/Hect.	Rank		
1	Surgana	1338.39	6	610.83	6	34	4.86
2	Kalwan	3275.33	1	858.33	3	27	3.86
3	Satana	2342.61	3	1059.89	1	25	3.57
4	Dindori	2814.7	2	1023	2	18	2.57
5	Peth	1825	5	812.5	4	24	3.43
6	Trambak	0000	7	384	7	32	4.57
7	Igatpuri	2081.1	4	637.2	5	36	5.14

Source: Computed by Researcher, 2024

**Table No.2 Nashik District, Tribal Area's: Level of Productivity
(Rank Co-efficient) 2022-23**

Sr.No.	Level of Productivity (Rank Co-efficient)	Included Tahsils
1.	High (Less than 3)	Dindori
2.	Moderate (3-4)	Peth, Satana & Kalwan
3.	Low (More than 4)	Trimbak, Surgana & Igatpuri

Source: Computed by Researcher, 2024

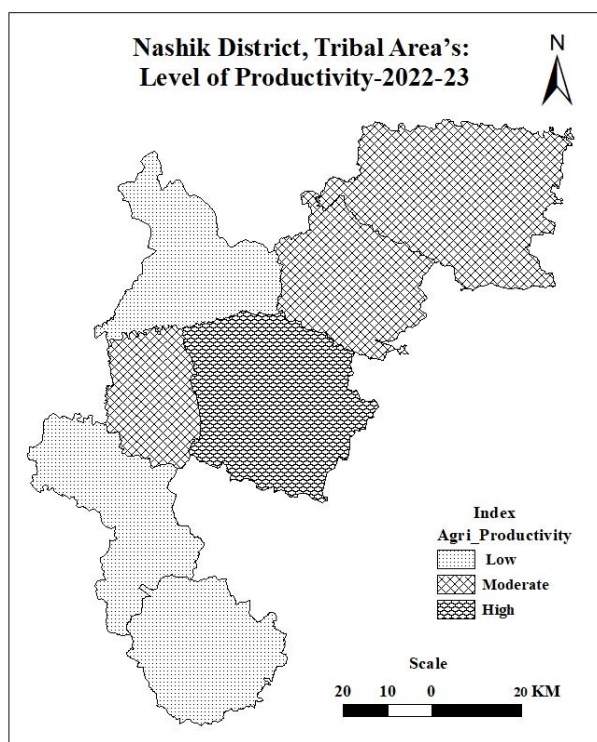
Low Agricultural Productivity Area:

Low agricultural productivity is found in 3 tehsils during the year 20223-23. These tehsils are Trimbak, Surgana & Igatpuri. In this area rank co-efficient is more than 4. In this area topography is uneven and rugged. In this area irrigation facilities are also very less. Ranking of all these tehsils with respect to agriculture productivity is not good as compared to others tehsils of Nashik district therefore overall here less agriculture

productivity is observed. During the field visit it is observed that awareness regarding soil testing is not too much. Only 5 percent farmers have an idea of soil testing and application of fertilizers as per recommendation of soil testing report. This is also one important cause of low agricultural productivity of the region.

Moderate Agricultural Productivity Area:

In the study area total 3 tehsils i.e. Peth, Satana & Kalwan have a moderate agricultural productivity. Here out of seven crops productivity one or two crops have good but overall productivity of all crops is not good therefore moderate agricultural productivity is observed. In case of Peth tehsil sugarcane and Wheat productivity is not good, whereas in case of Satana tehsil rice and groundnut productivity is not too good. In Kalwan tehsil, sugarcane and Nachani productivity is not good therefore all these tehsil overall productivity is moderate. During the communication with farmers of this region, it is observed that use of high yielding varieties of crops are not used too much in this area. Only 13 % farmers used high yielding varieties and uses of modern irrigation methods also not too much used by farmers. Only 5 percent farmers used new methods of irrigation and remaining all farmers used traditional irrigation methods, therefore overall agricultural productivity is not developed like other tehsils of the Nashik district.



Map No.2

High Agricultural Productivity Area:

During the year 2022-23, high agricultural productivity is recorded only in one tehsil that is Dindori. Major causes of good agricultural productivity of these tehsils are good irrigation facilities and use of modern technology and input like HYV and fertilizers. The establishment of sugar factory and wineries is also useful to create awareness regarding use of new technology and proper land use management, which is important for increasing agricultural productivity in the tehsil.

Spatial Analysis of Land Use Efficiency:

Land use efficiency is defined as the extent to which the net area sown has been cropped or re-sown. Land use efficiency is largely depends upon fertility of soil, technological development, availability of irrigational facilities and socio-economic condition of farmers in the study region (**Kushwaha, 2017**). For overall development of tribal areas of Nashik district, the study of land use efficiency is very vital. The analysis of this study will be very useful not only for agricultural development of the region but also very optimum use of land as a resource in the region. On the basis of agricultural land use for the year 2022-23, the tribal region is grouped into the three area, which are given here and it is also shown in the Table No.4 and Map No.3.

Low Agricultural Land Efficiency Area:

Trimbak, Peth & Igatpuri are the tehsils included in the low agricultural land use efficiency. Here land use efficiency is less than 105. Main causes of low land use efficiency is less net sown area and irrigation facilities and to some extent here terrain of region also not too much suitable for agricultural activity. During the field work it is observed that most areas have a lack of irrigation facilities in this region which is the main controlling factor for increasing land use efficiency in the areas.

Moderate Agricultural Land Efficiency Area:

Moderate agricultural land use efficiency is observed in Surgana, Satana & Kalwan tehsils of the study region. Here land use efficiency is 105 to 115. Here irrigation facilities are not too much exploited, actually all these tehsil have received good amounts of rainfall (Table No.3) but proper use of that water is not reflected in the irrigation. During the field visit and communication with farmers it is observed that most farmers are not ready to adopt the current cropping pattern and modern technology. It is due to lack of capital and new updated technology about agriculture.

Table No.3: Nashik District, Tribal Area: Agricultural Land Use Efficiency-2022-23

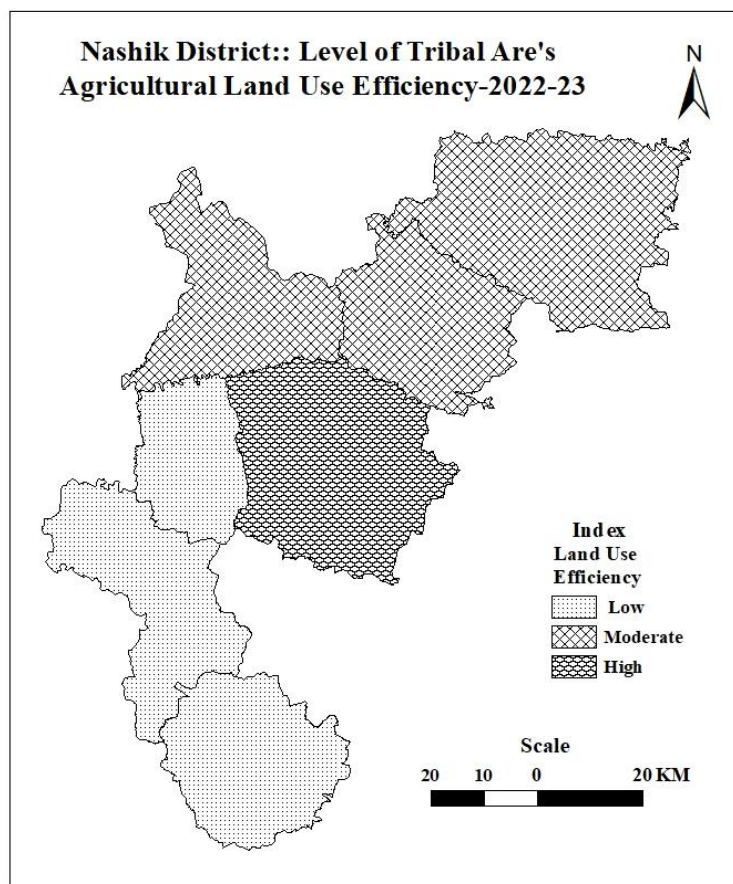
Sr. No.	Tahsil	NET Area (%)	Irrigation Intensity	Total Gross Crop Area (Hect.)	Irrigated Area (%)	Rainfall (MM)	Chemical Fertilizer (Mt. Tons)	Land Use Efficiency
1	Surgana	3.20	2.26	36178.74	0.51	2589.6	17527	110.99
2	Kalwan	6.88	36.51	76609.49	5.78	1304.4	32717	109.31
3	Satana	12.65	42.31	140045.52	11.83	933.7	23494	108.68
4	Dindori	4.16	56.79	54895.8	6.59	1774.1	30867	129.67
5	Peth	2.78	5.28	28262.48	0.27	2914.6	5646	100.00
6	Trambak	2.40	3.39	24390.7	0.15	2370.7	7014	100.00
7	Igatpuri	3.51	5.78	35773.07	0.37	2486.1	16763	100.00

Source: Computed by Researcher, 2024, Percentage is calculated with Districts total figure,

Table No.4 Nashik District, Tribal Area's: Level of Tribal Area: Agricultural Land Use Efficiency-2022-23

Sr.No.	Level of Agricultural Land Use Efficiency	Included Tahsils
1.	High (More than 115)	Dindori
2.	Moderate (105-115)	Surgana, Satana & Kalwan
3.	Low (Less than 105)	Trimbak, Peth & Igatpuri

Source: Computed by Researcher, 2024



Map No.3

High Agricultural Land Efficiency Area:

During 2022-23 high land use efficiency was recorded in the Dindori tehsil. High land use efficiency was observed here due to availability of irrigation facilities & development of infrastructural facilities related to agriculture. During the field visit it is observed that most farmers have good knowledge about the latest technology and proper selection of seeds and fertilizers for crops which are cultivated in their farm. Even most of farmers give preference to cash crops like sugarcane and grapes and vegetables. This tehsil is located in the tribal belt of Nashik District but it lies very close to Nashik and Niphad tahsils which are developed in agriculture that also affects on increasing land use efficiency of the region.

6. Conclusion:

In conclusion it could be said that the Dindori tehsil is well developed with respect to agricultural productivity and land use efficiency as compared to other tribal tehsils of the study region. The main causes of development of Dindori tehsil are improvement in irrigation facilities, use of proper fertilizers and use of High yielding varieties. Even the awareness of soil testing and use of modern technology is also good as compared to rest tribal tehsils of the study region. In other hand agricultural productivity and land use efficiency in Trimbak and Igatpuri tehsil is very less as compared to other tribal tehsils of the study region. It is due to lack of irrigation facilities, and proper use of fertilizers in the farms. Other important cause is that use of new technology in agriculture. Satana, Peth and Kalwan tehsils have recorded moderate agricultural productivity and land use efficiency.

The study suggests that for overall improvement of agricultural productivity and land use efficiency the use of high yielding varieties, proper use of organic fertilizers, and improvement in irrigation facilities are very useful in this region. Most of the farmers of tribal areas are not too aware about soil testing and proper use of fertilizers therefore in this regard the government should create awareness in this areas by conducting seminars and camps for soil testing. The government and agro-based industries should take initiative for providing capital for use of new agricultural technology and develop irrigation facilities in this region. Other supporting facilities such as transportation facilities, storage facilities and availability of local markets with fixed minimum price of agricultural production are also useful for agriculture development.

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