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AGRICULTURE PRODUCTIVITY AND LAND USE EFFICIENCY OF TEHSILS IN CHHATRAPATI SAMBHAJI NAGAR DISTRICT OF MAHARASHTRA

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ABSTRACT

Agriculture is one of the most crucial economic activities in almost all developing countries. The stellar working forces of India are busy in agriculture. Agriculture productivity is an important factor in agriculture development of any region and productivity is based on land use efficiency. Land use efficiency is a critical aspect of geographical analysis. The main objective of the present study was to analyse the agriculture productivity and land use efficiency of Chhatrapati Sambhaji nagar, Maharashtra for the year 2022-23. Focusing on nine tehsils: Kannad, Soegaon, Sillod, Phulambri, Chhatrapati SambhajiNagar, Khultabad, Vaijapur, Gangapur, Paithan the research examined the cultivation of five major crops namely maize, wheat, sorghum, gram and sugarcane. The present study was based on the primary and secondary data. The results showed comprehensive variation in agriculture development in tehsils of the Chhatrapati Sambhaji nagar district. Production of wheat, sorghum, sugarcane, and maize was high in the Khultabad tehsil. Also, Khultabad tehsil excels as compared to other tehsils of the study region. In the other hand agriculture productivity and land use efficiency in Soegaon and Chhatrapati Sambhaji nagar were very low as compared to other tehsils.It is due to a lack of capital, water management, and awareness about government policies, soil testing, and drip irrigation. The study suggests that for the improvement of agriculture productivity and land use efficiency, proper use of organic fertilizers, adoption of modern agriculture practices, and improvement in irrigation are very important. The government can take the initiative to conduct camps for soil testing, and proper use of fertilizers. Also, agro -based industries can take the initiative to provide capital to the farmers so that they can adopt modern technologies. This study contributes to the comprehensive understanding of regional geography and provides a ground work for sustainable land management practices that balance socio-economic development with environmental stewardship.

(Key words: Agriculture, agriculture productivity, ranking, land use efficiency, Chhatrapati Sambhaji nagar)

INTRODUCTION

Agriculture has always been India's most important economic sector. It plays a strategic role in the process of economic development of a country. It has already made a significant contribution to the economic perspective. (Pathak, 2009). This field is bound by the culture and heritage. As India is an agricultural nation, 70% of the total Indian population depends on agriculture, It contributes a high share of net domestic product by sectors in India. (Barakade *et al*, 2011). Agriculture is also responsible for the change in socio-economic status as well as the development of our society. Agricultural development is one of the major challenges in the less developed districts in the country as these are poor in terms of natural resources and also in socioeconomic aspects (Pawar *et al.,*2019).

Land use plan has a unique importance in agricultural management. Agricultural development is seen in areas where land use is organized and planned. (Deshmukh,2022). Development in agriculture 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 *et al*., 2010).Academia generally measures development in terms of productivity. Productivity refers to the utilization efficiency of human, material, and financial resources, which reflects the influence of resource allocation, technological level, and labor force on production activities. From the initial single factor, productivity has evolved into the commonly used total factor productivity. It is generally believed that agricultural productivity growth is the most effective long-term strategy to tackle the problems of poverty, hunger, and malnutrition. (Shane , 2000).

Agricultural productivity largely depends upon land use efficiency, so it plays an important role in the study of agricultural geography. Land use efficiency is defined as the extent to which the net area sown has been cropped or resownand land use efficiency largely depends upon the fertility of the soil, technological development, availability of irrigational facilities, and socio-economic condition of farmers in the study region (Kushwaha, 2017).

Agricultural efficiency is one of the most important

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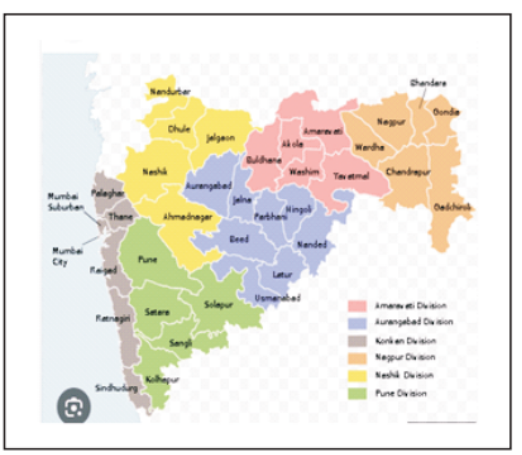
agronomic techniques to understand the overall development of agriculture. (Dey and Mistri, 2018). Agricultural land use efficiency is an indicator of land utilization for agriculture. Agricultural land use efficiency represents the degree of optimum use and performance of cultivated as well as cultivable land (Jadhav , 2015). Analysis of land-use efficiency also provides useful input for sustainable land management practices in different areas.The best and the most efficient land use and to provide land-use planning and the implementation of spatial development plans.(Auzinsa *et al.,* 2013). So it is important to study agricultural efficiency and is also very useful to understand the spatial development of agriculture in the study area. In the state of Maharashtra, for shaping its economy and cultural identity agriculture practices are very important.

Study area

Chhatrapati Sambhaji Nagar was previously recognized as Aurangabad district. The city was founded in 1610 A.D. by Malik Ambhar, the Prime Minister of Murtaza Nizam Shah of Ahmadnagar on the sight of a Village called Khirki.It is situated in the central part of the Maharashtra State. It lies between 19º 18' and 20º 40' North latitudes and 74º 34' and 76º 04' East longitudes. It is encircled by Jalgaon district to the north, Jalna and Buldana districts to the east, Ahmadnagar and Bid districts to the South, and Nashik district to the West.

The district's total area is 10,100 square kilometers out of which 141.1 square kilometers is urban area and 9,958.9 square kilometers is rural area. The total population of the district is 3,701,282 persons according to the 2011 Census. While the area of the district accounts for 3.29 per cent of the total area of the state, the district population constitutes 3.29 per cent of the total population of the state. The density of population is 365 sq^{-1} km among the 35 districts of the state. The main rivers in the Chhatrapati Sambhaji nagar district are Godavari and Tapi and also Purna, Shivna, Kham, Dudhna, Galhati and Girja rivers are the sub-rivers of Godavari. The district has 9 tehsils namely Kannad, Seogeon, Sillod, Phulambri, Chhatrapati Sambhaji nagar, Khultabad, Vaijapur, Gangapur, Paithan. There are three mountains namely Antur – its height is 826 mtr. Satonda – 552 mtr.Abbasgad – 671 mtr. and Ajintha 578 mtrs. The average height of the southern portion is 600 to 670 mtrs.

Figure1. Maharashtra State



Source- Wikipedia

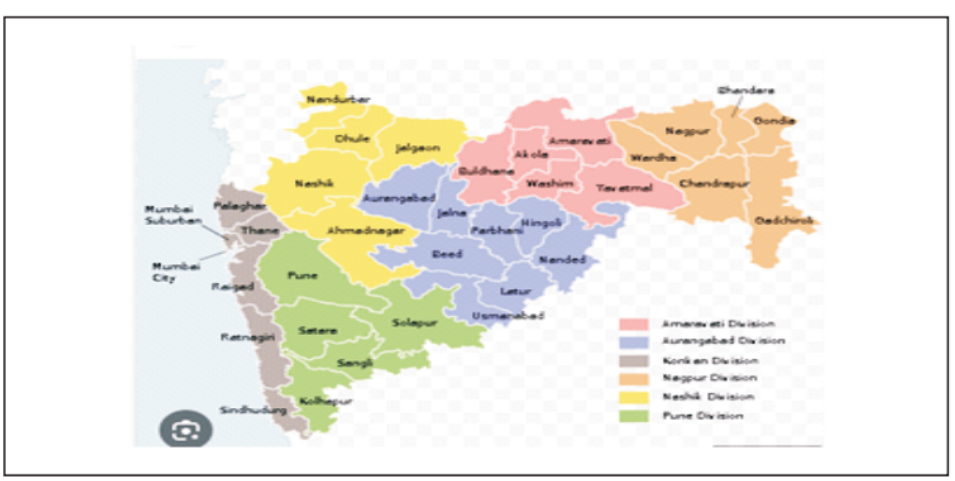


Figure 2.Chhatrapati Sambhaji Nagar district **Source- Maps of India**

MATERIALS AND METHODS

To analyze the agriculture productivity and land use efficiency of Chhatrapati Sambhaji Nagar, Maharashtra for the year 2022-23, five crops were considered namely maize,wheat, sorghum, gram and sugarcane. The present study was based on primary and secondary data. Primary data were collected through direct interviews with 90 farmers in the study area. Secondary data were obtained from different sources like the district census handbook, district gazetteers, and the socioeconomic abstract of the Chhatrapati Sambhaji nagar district. The tehsils have been considered as a unit for analysis. In this study, Kendall's Ranking Co-efficient (1955) was employed in measuring the agriculture productivity of different tehsils of the district on the basis of five crops production and production in hectare^{-1} were considered. To calculate agriculture land productivity following formula was used

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

Where $\sum R$ = sum of ranks and N = Number of crops

The coefficient index is inversely related to development which means the higher the index lower thev development. The analysis of land use efficiency was carried out for nine tehsils of thestudy area. For this purpose, Singh's (1976) method of calculation of the Index of Land Use efficiency (LUEI) was applied. The index of land use efficiency was calculated by using the following formula.

$$\text{Index of land use efficiency} = \frac{\text{Grossed cropped area}}{\text{Net sown area}}$$

Based on this formula land use efficiency was estimated. This index is directly related to land use efficiency.

RESULTS AND DISCUSSION

Spatial analysis of agricultural productivity

For the calculation of productivity, five crops production were considered (maize, wheat, sorghum, gram, and sugarcane). Production was expressed in kg hectare^{-1} and it is shown in Table 1 and Table 2. By considering the overall productivity of crops and the tehsils overall ranking to production, all tehsils were grouped into threecategories, namely high agriculture productivity, moderate agriculture productivity, and low agriculture productivity. It is shown in Table 3.

Table 1.Chhatrapati Sambhaji nagar district : tehsils productivity of major crops

Sr. No.	Name of the tehsils	Maize		Wheat		Sorghum	
		kg ha^{-1}	Rank	kg ha^{-1}	Rank	kg ha^{-1}	Rank
1	Kannad	1873	6	1762.00	4	846.62	3
2	Soegaon	1702	8	1264.50	8	961.49	2
3	Sillod	1920	5	1389.80	7	600,00	6
4	Phulambri	2952	3	2038.29	2	698.49	4
5	Chhatrapati Sambhajinagar	1857	7	1610.50	6	679.88	5
6	Khultabad	2865	4	2847.10	1	1120.35	1
7	Vaijapur	4860	1	1045.95	9	525.78	8
8	Gangapur	3212	2	1713.62	5	439.61	9
9	Paithan	1458	9	1887.90	3	593.23	7

Table 2.Chhatrapati Sambhaji nagar district : tehsils productivity of major crops

Sr. No.	Name of the tehsils	Gram		Sugarcane		Sum of ranks	Rank coefficient
		kg ha^{-1}	Rank	t ha^{-1}	Rank		
1	Kannad	638	6	46	7	26	5.2
2	Soegaon	951	1	45	8	27	5.4
3	Sillod	643	5	42	9	32	6.4
4	Phulambri	552	8	77	1	18	3.6
5	Chhatrapati Sambhaji nagar	867	2	52	6	26	5.2
6	Khultabad	525	9	74	4	19	3.8
7	Vaijapur	682	4	76	2	24	4.8
8	Gangapur	604	7	75	3	26	5.2
9	Paithan	752	3	66	5	27	5.4

Table 3.Chhatrapati Sambhaji nagar district : tehsils level of productivity (2022-23)

Sr. No.	Productivity Level	No.of tehsils	Included tehsils
1	High (< 4)	2	Phulambri,Khultabad
2	Moderate (4-5)	1	Vaijapur
3	Low (> 5)	6	Kannad,Soegaon,Chhatrapati Sambhajinagar,Sillod,Gangapur,Paithan

High agriculture productivity area

High productivity was recorded in two tehsils which were Phulambri, and Khultabad.In these areas rank coefficient was less than 4. In Phulambri maize, wheat and sugarcane productivity was good whereas in Khultabad wheat,sorghum, sugarcane and maize had high productivity. During the field visit, it was observed that high productivity can be attributed to a combination of favourable natural conditions, the adoption of modern agriculture practices, and active community efforts.

Moderate agricultural productivity area

In the study area, only one tehsil was under moderate productivity, which is Vaijapur. Wheat and sorghum's productivity was low in Vijiapur. Agriculture heavily depends on water availability but in this tehsil, water management was not as per the requirement. It was observed that the productivity of this tehsil was mainly influenced by traditional or less efficient agriculture practices.

Low agriculture productivity area

Low agriculture productivity was found in a total of six tehsils out of nine tehsils. So, maximum region of Chhatrapati Sambhaji Nagar was under a low productivity level. During the survey,it was observed that awareness regarding soil testing was not too much. The balanced use of fertilizers continuously either alone or in combination with organic manure is necessary for sustaining soil fertility and productivity of crops (Khamparia *et al*., 2018). In these areas,few farmers had an idea of the application of fertilizers and soil testing as per the recommendation of the soil testing report. This is one important cause of the low agricultural productivity of the region.

Spatial analysis of land use efficiency

Land use efficiency is nothing but the ratio between gross cropped area and net sown area. Land use efficiency depends upon the availability of irrigation facilities, fertility of soil, rainfall, and climate. Following Table 4 is an indication of the land use efficiency of all nine tehsils of Chhatrapati Sambhaji Nagar for the year 2022-23. By considering the land use efficiency, tehsils were grouped into three categories, namely high land use efficiency, moderate land use efficiency, and low land use efficiency. It is shown in Table 5.

Table 4.Chhatrapati Sambhaji nagar agriculturall and use efficiency-2022-23

Sr.	Tehsils	Irrigation intensity	Rainfall (mm)	Net area (%)	Total gross cropped area (Hectare)	Irrigated area in (%)	Chemical fertilizers (Mt tons)	Land use efficiency
1	Kannad	20.7403	870.2	14.4253	160371	19.6515	54978	105
2	Soegaon	17.9193	911.1	5.2071	55120	3.0857	18564	100
3	Sillod	7.561	708.9	13.1668	152797	16.3515	52897	120
4	Phulambri	18.5548	802.4	7.4924	73667	7.3230	29709	105
5	Chhatrapati Sambhajinagar	22.8865	779.0	8.4833	94907	9.8908	36990	100
6	Khultabad	22.1292	1069.5	4.5453	56401	4.9774	14879	124
7	Vaijapur	23.4415	708.2	19.2693	170500	13.1895	62911	102
8	Gangapur	25.6600	855.4	13.4310	125166	11.9263	52126	111
9	Paithan	27.6912	753.7	13.9791	118545	13.6033	48617	111

Table 5 .Chhatrapati Sambhaji nagar district : tehsils land use efficiency (2022-23)

Agriculture land use efficiency	Category	No.of tehsils	Name of tehsils
High productivity	111 and Above	2	Sillod, Khultabad
Moderate productivity	104-111	4	Kannad,Phulambri,Gangapur ,Paithan
Low productivity	102-104	3	Soegaon,Chhatrapati Sambhajinagar,Vaijapur

High agriculture land use efficiency

During 2022-23 high land use efficiency was observed in Sillod, and Khultabad. In these tehsils, farmers were cultivating crops for which they were familiar for high land use efficiency. The majority of farmers were conversant with the recent developments in agriculture which have been adopted by them. The use of different machines and implements for farm operations and other inputs was widely accepted in these areas.

Moderate agriculture land use efficiency

A total of four tehsils come under moderate land use efficiency namely Kannad, Phulambri, Gangapur, and Paithan. In these areas, few farmers knew about many modern technologies in farms but they were not ready to implement them they gave preference to old methods. After communicating with farmers it was observed that there was a lack of capital so farmers prefer old methods. So there was a lack of confidence in modern technologies.

Low agriculture land use efficiency

During 2022-23 low land use efficiency was ascertained in three tehsils namely Soegaon, Chhatrapati Sambhaji nagar, and Vaijapur. In these regions, socioeconomic factors were not favorable for enhancing agricultural efficiency. Farmers were not aware of the proper selection of seeds and fertilizers for the crops that were cultivated on their farms. So crop selection was not proper in these tehsils. There was the improper allocation of the available resources like irrigation, fertilizer, etc. These were the weaker areas of the region where efforts had to be made to enhance productivity. Farmers can implement drip irrigation in case of water-scarce conditions (Taha *et al*., 2019). So these are the priority areas that need special attention while planning the future development scheme in agriculture.

According to Table 3, it can be concluded that Phulambri, and Khultabad were classified under the high productivity level with a range of less than 4, Vijapur was classified under the moderate productivity level with a range between 4-5. Rathod and Bholane (2022) noticed that after implementation of different government schemes in villages of Vijpur tehsil,water storage capacity, agriculture productivity has been increased. Tehsils i.e. Kannad, Soegaon, Chhatrapati Sambhaji nagar, Sillod, Gangapur, Paithan came under low productivity level with a range of greater than 5. Jadhav *et al*. (2015) also observed that there was short growing period in these areas. According to Table 5, it can be stated that Sillod, and Khultabad were categorized as having a high agricultural land use efficiency with a rating of 111 and above. Kannad, Phulambri, Gangapur, and Paithan were categorized in moderate agricultural land use efficiency with a rating between 104-11 and Soegaon, Chhatrapati Sambhaji nagar,Vaijapur were categorized in low agriculture land use efficiency with a rating between102-104.

In conclusion, it could be said that Khultabad tehsil was well developed with respect and agriculture land use efficiency observed was 111 and above for Khultabad tehsil. Production of wheat, sorghum, sugarcane, and maize was high in this tehsil. Farmers' experience to agricultural productivity and land use efficiency. Productivity level was observed less than 4 was notable in this area. They gave preference to the familiar crops. Major reasons behind high productivity and efficiency were favorable natural conditions, adoption of modern agriculture practices, active community efforts, and proper choice of crops. The agricultural landscape of Khultabad was characterized by good productivity. On the other hand agriculture productivity and land use efficiency were very low in Soegaon and Chhatrapati Sambhaji nagar as compared to other tehsils. Productivity level was observed greater than 5 and agriculture land use efficiency was observed between 102 -104 in Soegaon and Chhatrapati Sambhaji nagar.Furthermore, More (2018) also found low level of agriculture development in Soegaon tehsil. It might be due to a lack of water management, lack of capital, lack of awareness about government policies, soil testing, and drip irrigation.

Masroor *et al.* (2022) stated that there is large variations in climate variables an increase in area under built-up and barren land have influenced the minimum and maximum temperature, precipitation, and soil moisture in the study area.So for overall improvement of agriculture productivity and land use efficiency, proper use of irrigation facilities, use of organic fertilizers, and use of modern technologies are very useful in these regions. Nawale and Mategaonkar_(2024) suggested that employing GIS, RS, and MODFLOW simulation, artificial GW recharge techniques are proposed to mitigate the crisis.

The region having low agriculture efficiency faces the problem of reduction of soil fertility therefore in these areas government has to take the lead and conduct some camps for soil testing. Also, the government can provide capital to the farmers for the use of modern technologies. Many factors are crucial in agriculture and crop yield like promoting drip irrigation, awareness about better water management, promoting the use of compost manures, establishing the chain between farmers and consumers, and awareness about government subsidies or price support programs. There is a regional imbalance in water resources and management.The choice of crops should be according to the availability of water preference of crops is to be chosen, for low water areas pulses, and oilseeds are suitable,for medium water available areas cereals, fruits, and vegetables are suitable, and for high sugarcane and vegetables are suitable.

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