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Trends of Major Crop Produdictivity in Nashik District: A Geographical Analysis

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Abstract

The present research paper an intend to analyse the trends of agricultural productivity of different crops in Nashik District through the period of 1991 to 2024. This study is based on secondary data collected from socio-economic abstract of Nashik district. The cropping productivity is based on physical, climate, social, economic, technological and organization factors, and attitude of farmers, etc. The data regarding trends of cropping productivity have been calculated and presented with the r value and trend line graph. There are several factors such as Physiographic, temperature, rainfall, soil, drainage, etc influenced on the trend of agricultural productivity in Nashik district. Because Nashik district of same part found in dry area and some part found as hilly area as well as some position obtained in the vicinity of river basin so there is high variation in the trends of different crops. Amongst these, rice, wheat, maize, gram, tur, mung, sugarcane, etc having a positive correlation through the period of 1991 to 2024 and bajra, jowar and groundnut having negative correlation with declined trends of the productivity. The current study gives an idea of real situation of agricultural productivity and helps to minimize the regional inequalities in Nashik district and also helps to planners, agricultural scientists and research scholars.

Keywords: *Agriculture productivity, crop ranking, Technology, planning.*

Introduction

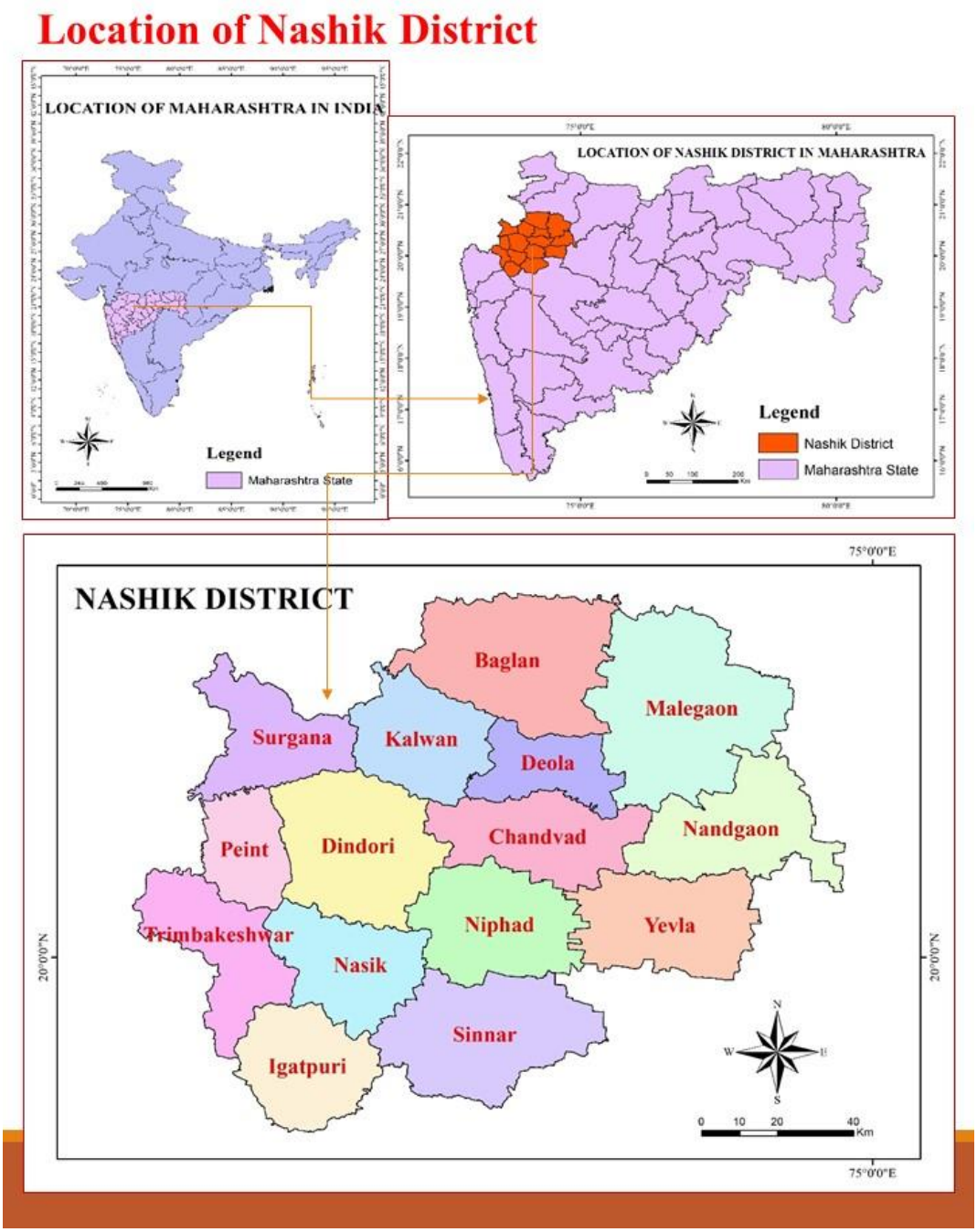
Agriculture productivity is the measurement of a product's productivity in relation to the inputs required for its production. Costs for the production of agricultural goods include inputs like labour and capital. In measuring agricultural productivity, factors like soil sustainability, ecosystem health, and social acceptability are becoming increasingly significant. Physical, socioeconomic, political, institutional, and organizational factors influence agricultural productivity. According to Sule and Tonape (2013), "Furthermore, agricultural productivity depends on farmers' attitudes toward work and their aspirations for a better standard of living."

Agricultural productivity is affected by irrigation and modern tools like farm equipment, high-yielding varieties, and chemical fertilizers. "Farming in irrigated areas is generally done in a systematic and profitable manner." Farmers in such areas prefer modern technology to increase agricultural production" (Husain, 2012). The region's cropping patterns and agricultural productivity have been significantly affected by the variable extent of irrigation. Mechanized changes in the rural economy and a shift from traditional to modern agriculture in rural India followed independence's introduction of economic planning.

There have been significant changes in many factors affecting agricultural production, such as irrigation and other factors. Therefore, its impact is seen in changing agricultural production. Therefore, a review of how production per hectare has changed has been taken here.

The Study Region

The Nashik district has been selected as the study area for this investigation. The Nashik district spans the latitudes of $18^0$33' North to $20^0$53' North and the longitudes of $73^0$16' East to $75^0$16' East. Nashik District covers a total of 15530 square kilometers. There were 1,931 villages in the Nashik district of Maharashtra in 2011. Nashik, Igatpuri, Dindori, Peint, Surgana, Deola, Satana, Kalwan, Chandwad, Niphad, Sinnar, Yeola, Malegaon, Nandgaon, and Trimbakeshwar are just a few of the district's tahsils. The Nashik District's population was recorded at 61,07,187 at the 2011 Census, representing an increase of 11,13,391 people since the 2001 Census, or a 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. From 38.8 percent of the population in 2001 to 42.5 percent in 2011, more people live in cities. The district has a population density of 393 per km2, compared to 236 for rural areas and 4013 for urban areas. The district has reported a work participation rate of 45.25 percent, with main workers making up 41.31 percent and marginal workers making up 3.93 percent. The district's literacy rate is 82.31, compared to 77.19 in the rural area and 89.12 in the urban area.



Aim and Objective

- To study the productivity of major crops and their changes in the Nashik district.
- To examine the trends of major crops in the study region.

Database and Methodology

The secondary information has been collected from Directorate of Economics and Statistics of Nashik District. The collected information calculated with the correlation formula and present with trend line graph.

Productivity of Major Crops and their Changes

Humans are unable to expand land horizontally; however, the development of irrigation has made vertical expansion of land possible. As a result, more advanced agricultural inputs like high yielding seeds, manures, insecticides, and improved agricultural equipment are utilized. Modern agriculture benefits from these elements, which also contribute to increased hectare productivity. The population in the study area is increasing daily, but the area under cultivation has not kept pace with the growing population. Fruit trees and other cash crops like grapes, sugarcane, cotton can succeed more if irrigation facilities are providing; consequently, more cultivable land should be developed.

Table 1
Productivity of Major crops, 1990-91 and 2024 (Productivity in Kg/Ha)

Sr. No.	Crops	Nashik District			Maharashtra State		
		1990-91	2023-24	Change in %	1990-91	2023-24	Change in %
1	Rice	756	1756	132.28	756	873	15.77
2	Wheat	1256	1986	58.12	1049	1740	65.87
3	Jowar	305	289	-5.25	941	702	-25.4
4	Bajra	782	424	-45.78	575	955	66.09
5	Maize	1455	2629	80.69	1025	2056	100.59
6	Nachani	369	769	108.40	532	1006	89.1
7	Tur	221	335	51.58	417	1455	248.92
8	Moog	380	233	-38.68	341	542	58.94
9	Udid	305	433	41.97	357	585	63.87
10	Sugarcane	74	90	21.62	1132	1183	4.51
11	Groundnut	699	672	-3.86	947	1194	26.08
12	Soyabean	716	800	11.73	86.4	86	-0.46

Source: Calculated by investigator on the basis of Statistical Officer of Divisional Agriculture Joint Director, Nashik from 1992 to 2024 and Socio-Economic Abstract of Maharashtra, 2024.

Table 1 compares major crops in the study area to those in the state of Maharashtra in terms of productivity and changes between 1991 and 2024. Almost crops, with the exception of Jowar, Bajra, Moog and Groundnut in Nashik District and in Maharashtra in Jowar and Soyabean crops shows that the negative change through the period of 1990 and 2024 other crops having positive change in the productivity.

Rice and Nachani in the Nashik District and maize and Tur in Maharashtra both show significant positive changes in agricultural productivity, exceeding 100 percent. Because rice and nachani are kharif crops, this season's adequate supply of water for irrigation resulted in a high use of high-yielding varieties (HYVs), fertilizers, high mechanization, and advanced technology, resulting in high agricultural productivity.

In Nashik District, low productivity of bajra is only 782 kg/ha in 1991, it is declined up to 424 kg/ha in 2024, as compared to study region the higher the bajra productivity in Maharashtra is 575 kg/ha in 1991 and but it is high in 2024 which is 955 kg/ha.

The high productivity of maize in Nashik District is 1455 kg/ha in 1991 and which is increased up to 2629 kg/ha in 2024, while it is lesser in Maharashtra than study region i.e.1025 kg/ha in 1991 and 2056 kg/ha in 2024. The productivity of tur in Nashik District is only 221 kg/ha in 1991, it is increased up to 335 kg/ha in 2024.

Rice and Nachni in the Nashik district have seen a significant positive change in agricultural productivity, which has doubled between 1991 and 2024, as shown in Table 1.

Wheat, maize, and tur exhibit moderate crop productivity between 1991 and 2024, it has increased by up to 50% in the Nashik district and Wheat, Bajra, Nachni, and Udid in Maharashtra.

The low positive productivity of crops is obtained in Udid, Sugarcane, and Soybean in Nashik district, and Rice, Sugarcane, and Groundnut in Maharashtra. The low change in agricultural productivity of the crops is caused by the undulating topography of the landscape, shallow soil, small holdings, dry climate, a vast area of land that is dependent on rainfall, expensive fertilizers, and other factors. Groundnut and soybean have low change in productivity in Maharashtra, and the reasons are close to the study area.

Jowar, Bajra, Moong, and Groundnut in the Nashik district, and Jowar, Soybean in Maharashtra, have seen a decline in crop productivity between 1991 and 2024, because these crops depending on rainfall and whether traditional seeds are used to sow Jowar. Jowar and sugarcane are the only crops that show a negative change in cop productivity when compared to the study region.

In a nutshell, it has been observed that the development and expansion of irrigation facilities, which resulted in increased inputs and increased agricultural output from 1991 to 2024.

Trends of Major Crop Productivity

The productivity trend of major crops is shown in Table 1. The trend value is calculated using the linear regression method $Y = a + bx$. Understanding the agricultural productivity of specific crops in the district is essential. Productivity trends reveal specific crops and their corresponding positive or negative changes over a relevant period. The trend line is calculated in such a way that it can be determined how well the regression line fits the data and the degree of trend, ensuring that the regression accounts for the variation in the observed values of the dependent variable.

The trend of major crop productivity pattern from 1991 to 2024 is depicted in Table 1 and Figure. During the observation period, the major crop productivity trend has been recorded as high fluctuation i.e. the correlation between the period and productivity of major crops which is some crops having moderate negative correlation to high positive correlation such as maize crops.

The high correlation is recorded in rice, wheat, maize and sugarcane crops due to the expansion of irrigation leads to application of more chemical fertilizers, use of improved HYVs of seeds. So, there are high correlation between the two variables increasing the period as well as increased agricultural productivity. Since these crops are dependent on rain, limited

development of irrigation, high development of seeds of highly tropical varieties, and technological developments have increased productivity.

Table 2
Trends of Major Crop Productivity in Nashik District, 1990 to 2024
(All Figures in Kg per Hectares and Sugarcane in Tones per Hectares)

Years	Rice	Wheat	Jowar	Bajra	Maize	Nachani	Tur	Udid	Mung	Groundnut	Soybean	Sugarcane
1990	756	1256	305	782	1455	369	221	305	380	999	636	74
1995	874	1411	660	776	1518	324	321	401	442	814	773	78
2000	675	1575	569	674	1756	499	365	362	475	674	608	82
2005	984	1666	556	768	2163	421	345	419	453	628	857	76
2010	890	1682	620	940	2254	385	420	397	525	767	948	93
2015	1123	1986	202	907	2657	411	408	406	394	776	800	92
2020	1107	1890	260	675	2543	435	374	387	432	643	597	88
2024	1576	2191	289	424	2629	769	335	433	672	672	671	90
r=	**0.84**	**0.97**	**-0.49**	**-0.37**	**0.96**	**0.63**	**0.61**	**0.68**	**0.56**	**-0.65**	**0.01**	**0.81**

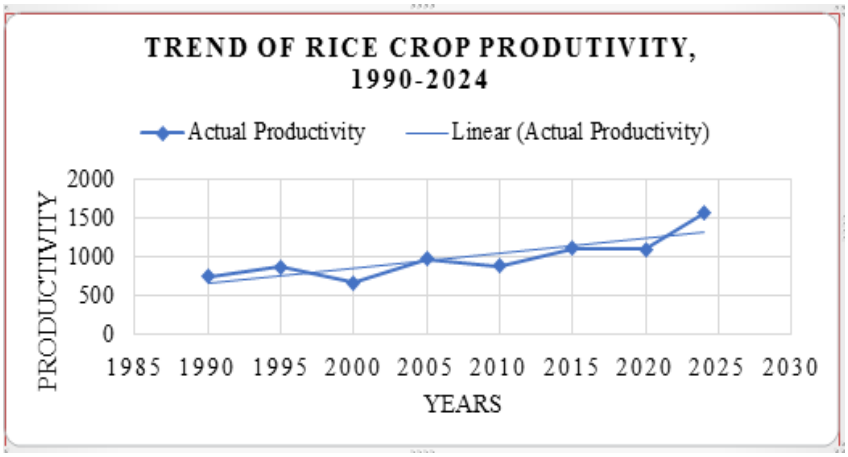
Source: Computed by researcher on the basis of Statistical Officer of Divisional Agriculture Joint Director, Nashik from 1991 to 2024.

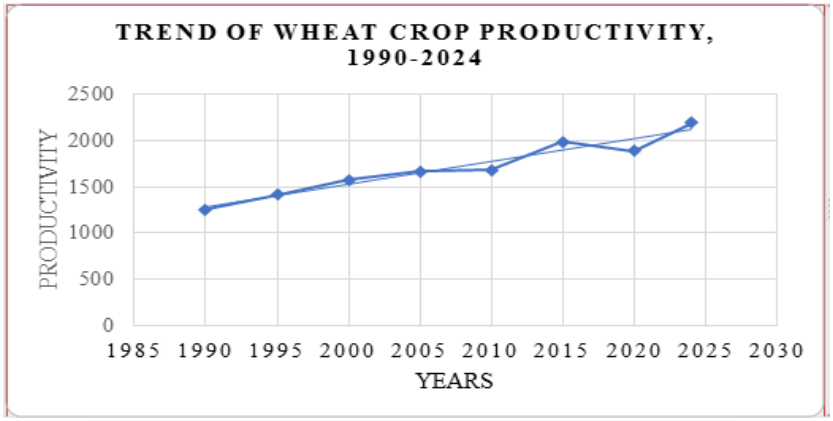
The proportion of moderate positive correlation of agricultural productivity is registered in Nachni, Tur, Udid, and Mung because of Nachni is a staple food crops in some tahsils of the Nashik district and tur, udid and moog crops are major pulses crops dependent of the rainfall. Wherever, high rainfall there are moderate to high productivity.

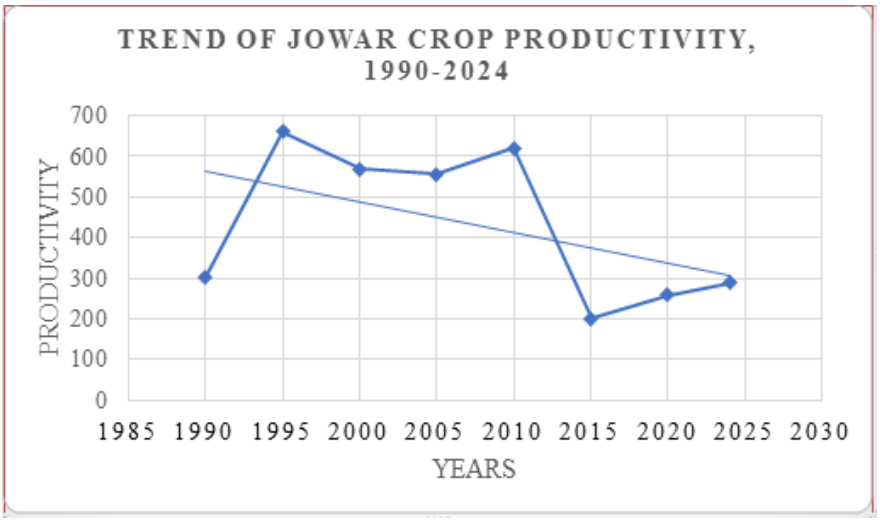
The low positive trend of productivity which is less than 0.50 r value is recorded in Soybean. Because, soybean is irrigated crops but limited development of irrigation the study region as well as duplicate or limited expansion of HYVs of seeds leads to inadequate use of fertilizers and poor the mechanization resulted as low the trend of productivity. The soybean is early developed and cultivated oil seed crops therefore low change in the productivity.

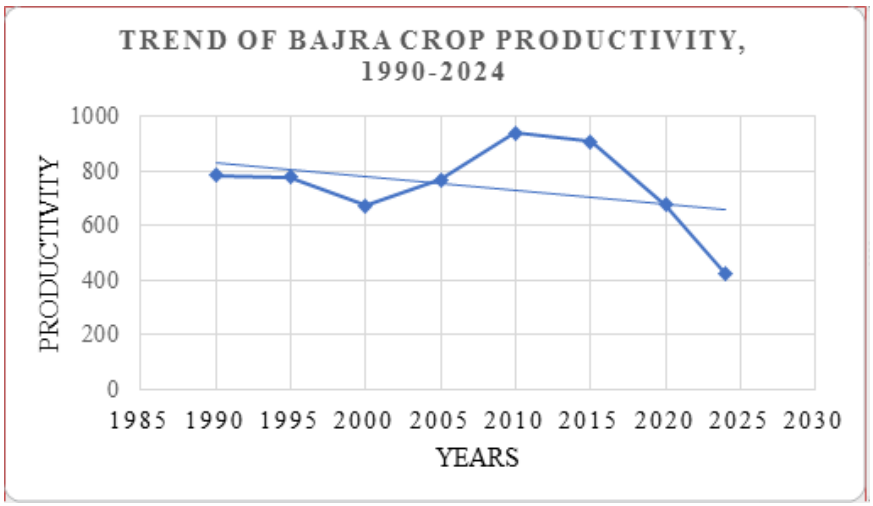
The negative trend of crop productivity is recorded in Jowar, Bajra and Groundnut crops. Because jowar and bajra crops are totally dependence on the rainfall. Therefore, these crops sowing traditional seeds, low or inadequate fertilizers so these crops having very low productivity. The groundnut is dependent on the irrigation, its required more water for the growth as resulted to low development of irrigation as well as expansion of fruits, vegetables and sugarcane case crops resulted to limitation of the groundnut cultivation and soybean is alternative choice for the groundnut so the productivity of groundnut declined through the period of investigation.

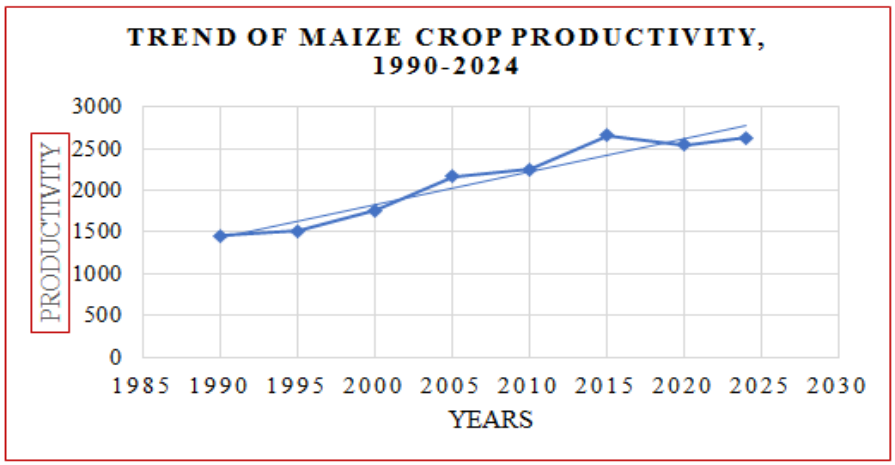
The following figures shows that the trend of major crop productivity in the study region through the period of 1991 to 2024.

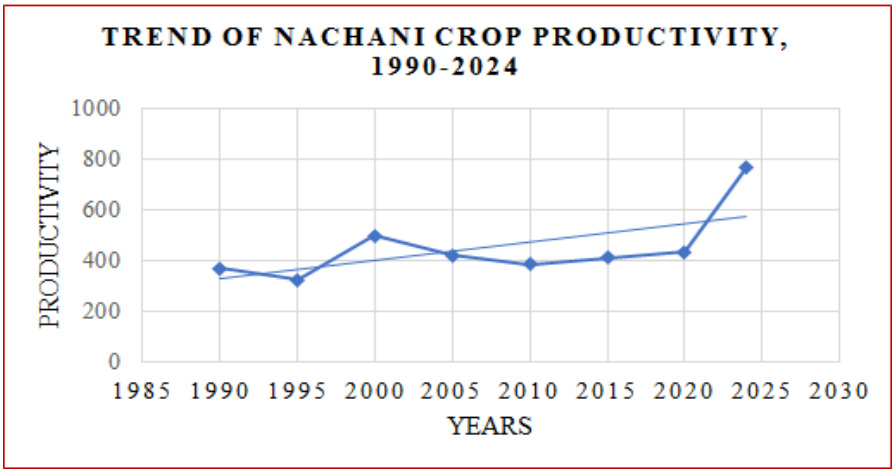


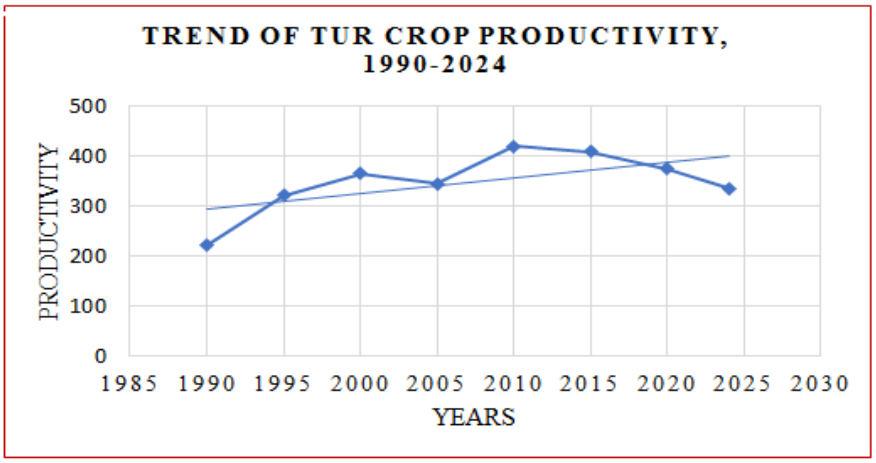


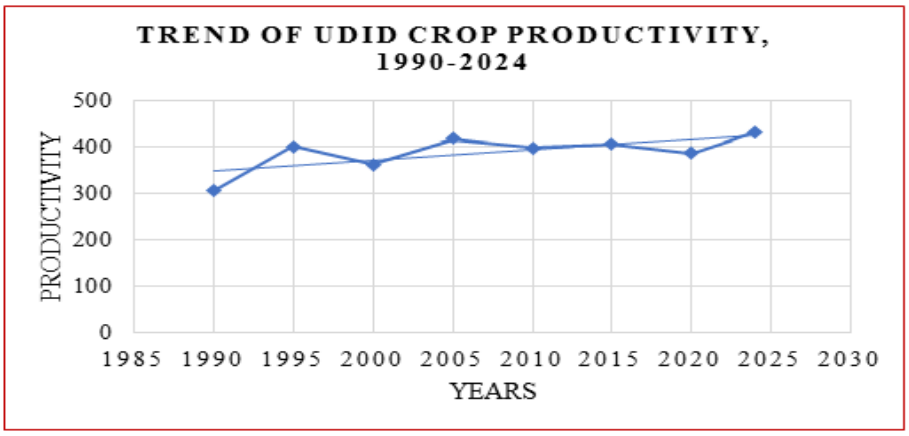

TREND OF JOWAR CROP PRODUCTIVITY, 1990-2024
PRODUCTIVITY
700
600
500
400
300
200
100
0
1985 1990 1995 2000 2005 2010 2015 2020 2025 2030
YEARS

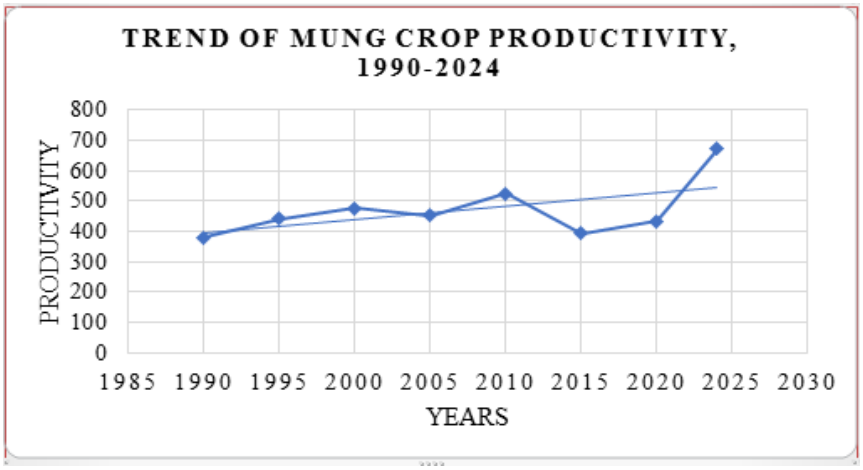

TREND OF BAJRA CROP PRODUCTIVITY, 1990-2024
PRODUCTIVITY
1000
800
600
400
200
0
1985 1990 1995 2000 2005 2010 2015 2020 2025 2030
YEARS

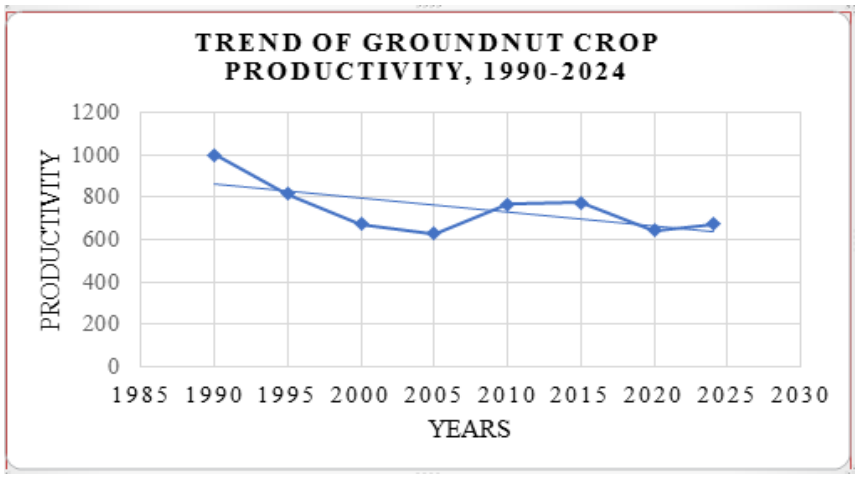

TREND OF MAIZE CROP PRODUCTIVITY, 1990-2024
PRODUCTIVITY
3000
2500
2000
1500
1000
500
0
1985 1990 1995 2000 2005 2010 2015 2020 2025 2030
YEARS

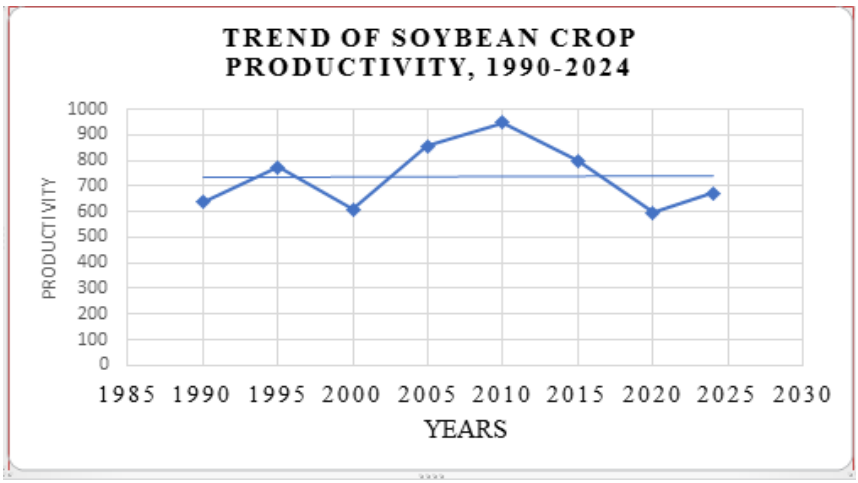

TREND OF NACHANI CROP PRODUCTIVITY, 1990-2024
PRODUCTIVITY
1000
800
600
400
200
0
1985 1990 1995 2000 2005 2010 2015 2020 2025 2030
YEARS

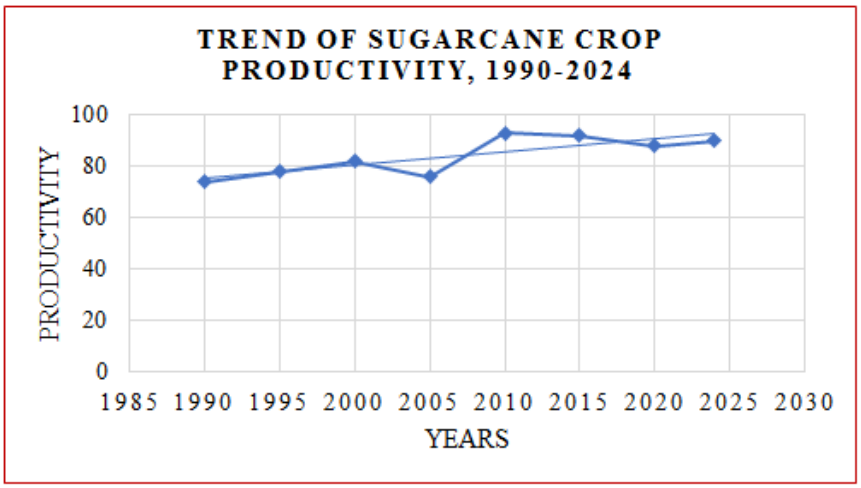

TREND OF TUR CROP PRODUCTIVITY, 1990-2024
PRODUCTIVITY
500
400
300
200
100
0
1985 1990 1995 2000 2005 2010 2015 2020 2025 2030
YEARS


TREND OF UDID CROP PRODUCTIVITY, 1990-2024
PRODUCTIVITY
500
400
300
200
100
0
1985 1990 1995 2000 2005 2010 2015 2020 2025 2030
YEARS


TREND OF MUNG CROP PRODUCTIVITY, 1990-2024
PRODUCTIVITY
800
700
600
500
400
300
200
100
0
1985 1990 1995 2000 2005 2010 2015 2020 2025 2030
YEARS







Conclusion:

The farmers in Nashik district are using much less fertilizer per unit cropped area; fertilizer consumption is low, resulting in poor productivity. Transfer or adoption of improved production technology in uneven rainfall, ecosystem has not picked up its desired momentum. Therefore, productivity of in this eco-system is considerably poor. The complex ecological situation of rainfall eco-system consisting of upland, shallow low land, semi-deep water and deep-water conditions is one of prime reasons for low productivity. It also socio-economic, organizational and technological constraints resulting in low productivity.

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Conflicts of interest

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

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