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AGRICULTURAL PRODUCTIVITY IN THE COMMAND AREA OF DOODHGANGA IRRIGATION PROJECT IN KOLHAPUR DISTRICT: A SPATIO-TEMPORAL ANALYSIS

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ABSTRACT

Agricultural productivity means, the total agricultural output per unit of cultivated area or the level of existing performance of a unit of land. Among the various determinants of agriculture it is assumed that irrigation positively affects the agricultural productivity. An attempt has been made in this paper to analyze the change in the agricultural productivity in the command area of Doodhganga irrigation project on both pre (1980-82) and post (2010-12) period. Such spatio-temporal study is based on secondary sources of data. Jasbir Singh's (1976) yield and concentration indices ranking co-efficient method is used to measure the agricultural productivity. The productivity levels in the study region are categorized in to high, medium and low productivity. The analysis reveals that, irrigation development has boosted to the development of agricultural productivity in the study region.

KEYWORDS:*Productivity, Command Area, Irrigation project, Development.*

1.INTRODUCTION

Due to fast population growth the need of food production is also growing. Since, the population of cultivable land per head has been decreasing considerably there is need for increasing the agricultural production. The increase in crop production is a must in Indian since the areal spread of crop land has almost reached to its saturation limit (Vaidyanath, 1985). It needs, therefore, to improve the agricultural productivity.

Agricultural productivity is a function of various factors like physical, socio-economic, technical and organizational. The levels of agricultural productivity as a concept, means the degree to which the economic, cultural, technical and organizational variables are able to exploit the abiotic resources of the area for agricultural production (Singh, J. 1974). The agricultural productivity is also defined as 'the level of existing performance of a unit of land which differentiates from one area to another (Mohammad Ali, 1978). The study of agricultural productivity thus provides a rational base for future agricultural planning of any area. In view of this, the author has proposed to examine as to how irrigation has affected the productivity of the crops in the Doodhganga irrigation project command area.

2. STUDY AREA:

The region under study is the command area of Doodhganga Irrigation Project in Kolhapur district of South Maharashtra. The command area covers 96 villages occupying an area of 59024 hectares with the population of 284006 (2011). The region has monsoon type of climate where the rainfall is received mainly in the months from June to September, ranging from 5000 mm to the west and 600 mm to the east. The alluvial and black soils are found in the flood plain of a river and away from it

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the laterite soil is covered.

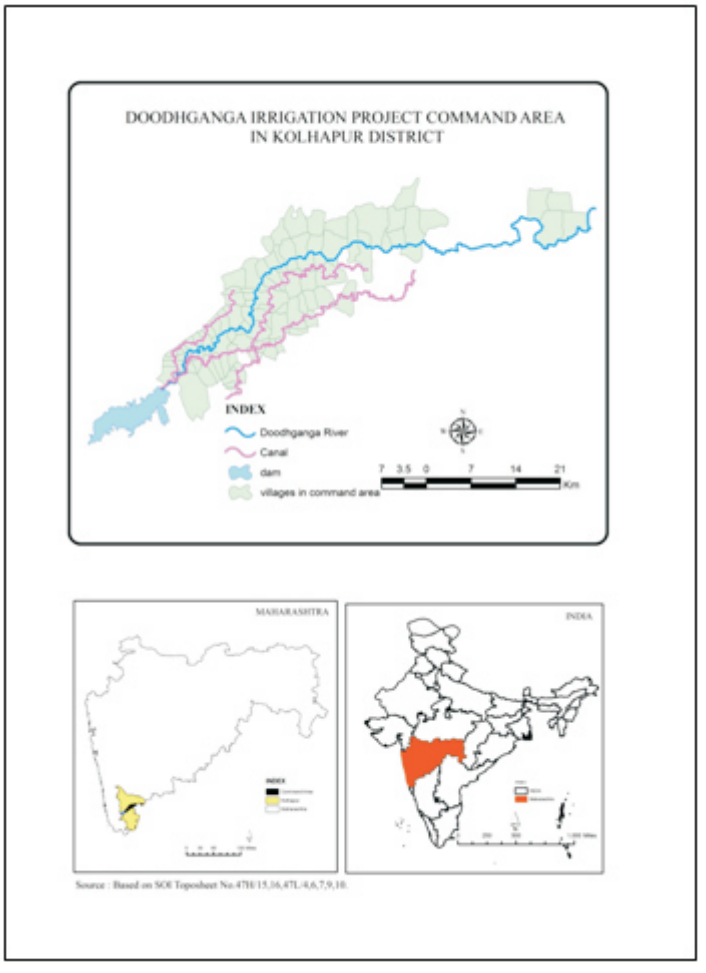

Figure: 1

3. OBJECTIVES:

The main objectives of the study are

1. To analyze the spatio-temporal change in the agricultural productivity in the command area before and after the irrigation project.
2. To identify disparities in the levels of agricultural productivity.

4. DATA BASE AND METHODOLOGY:

The present work is based on primary and secondary sources of data. The information regarding farm mechanization in its spatio-temporal perspectives has been collected from 96 benefited villages in Doodhganga irrigation command area. The agricultural productivity has been measured differently by many scholars. However, I have adopted Jasbir Singh's (1976) yield and concentration indices ranking co-efficient method. It is expressed as below.

I) Crop Yield Index

$$Y_i = \frac{Y_{a_g}}{Y_{a_r}} \times 100$$

Where,

Y_i = The crop yield index.

Y_a = The average yield per hectare of the crop 'a' in a village.

Y_r = The average yield per hectare of crop 'a' in the entire region.

ii) Crop Concentration Index

$$C_i = \frac{\frac{A_{a_u}}{C_u}}{\frac{T_{a_r}}{C_r}} \times 100$$

Where,

C_i = Crop concentration index.

A_{a_u} = Area under 'a' crop in a zone.

C_u = Total cropped area in a zone.

T_{a_r} = Area under 'a' crop in the entire region.

C_r = Total cropped area in entire region.

iii) Ranking Co-efficient

Crop yield and crop concentration indices for all the zones (villages) are ranked separately. Now, the two ranks are added and divided by 'n' (two crops) to find out the ranking co-efficient for each crop.

$$\text{Crop Yield and Concentration Indices of Ranking Co-efficient Index of Crop 'a'} = \frac{\textit{Yield Index of Crop 'a'} + \textit{Crop Concentration Index of Crop 'a'}}{2}$$

In order to measure regional disparities in levels of crop production and delimit the weaker areas in agricultural production, dominant crops in terms of land occupancies are considered. The ranking coefficients for individual crop are derived for the year 1981 and 2011 separately and they are categorized into high, moderate and low. Further overall ranking co-efficient have been derived by adding the ranking co-efficient for six crops selected for each village and divided by 'n'. (Number of crops selected). The values, thus obtained, indicate that the lower is the ranking co-efficient; the higher is the level of agricultural production and vice-versa. The result, thus are derived, and mapped. These maps are co-related with intensity of irrigation by interpolation method to examine the impact of irrigation.

A. TEMPORAL CHANGE IN YIELD AND AREA UNDER DIFFERENT CROPS

Despite the spatial changes, the region experiences the temporal disparities in crop production. Table 1 shows that there is 15015 hectare net increase in irrigated area from 1980-81 to 2010-11. Due to the development in the irrigation the gross sown area increase 39233 hectare in 1981 to 53399 hectare in 2011 and also increase the productivity is clearly seen in the Doodhganga irrigation command area.

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Table 1: Irrigated Area and Production of Different Crops in Doodhganga Irrigation Command Area (1981- 2011).

Sr. No.	Contents	Year		Increase/ Decrease
		1981	2011	
1.	Gross Sown Area	39233	53399	14166
2.	Total Irrigated Area (hectare)	5034	20049	15015
3.	Rice Cropped Area (hectare)	16599	11043	-5556
	Rice Yield (Per Hectare/ Quintals)	18.84	30.25	11.41
4.	Wheat Cropped Area (hectare)	3109	2719	-390
	Wheat Yield (Per Hectare/ Quintals)	9.42	19.83	10.41
5.	Jowar Cropped Area (hectare)	1571	1342	-229
	Jowar Yield (Per Hectare/ Quintals)	10.27	16.99	6.72
6.	Sugarcane Cropped Area (hectare)	4640	17769	13129
	Sugarcane Yield (Per Hectare/ tons)	74.00	105.00	31
7.	Pulses Cropped Area (hectare)	3163	1800	-1363
	Pulses Yield (Per Hectare/ Quintals)	4.93	7.43	2.50
8.	Oil Seed Cropped Area (hectare)	7205	10237	3032
	Oil Seed Yield (Per Hectare/ Quintals)	8.59	18.98	10.39

Source: Compiled by researcher.

RICE

The villages situated in the western part have recorded high productivity in both periods of time i.e. 1981 and 2011; comprising Nartawade, Turambe, Mangoli, Kapileshwar, Titave, Talashi, Panori villages. The average area under rice crop in the study region is 16599 hectare in 1981 which decreased to 11043 hectares in 2011. On the other hand average yield of rice is 19.84 quintals in 1981 which increased to 30.25 quintals in 2011. It clearly indicates that the area under rice is decreased but per hectare yield of rice increased tremendously (table-1). This can be well attributed to the favorable agro-climatic conditions prevailing in this part along with assured rainfall and irrigation facilities. Though the rice is a kharif crop dependent mainly upon the monsoon rain the water in the dry spells of monsoon is provided through irrigation. The moderate productivity is noted the villages located in the middle part of the region. The eastern part of the study region the area under rice cultivation is very low and per hectare rice production is high, but the overall result in the crop productivity is less it may be because of the assured irrigation facilities rice is replaced by cash crops like sugarcane and vegetables.

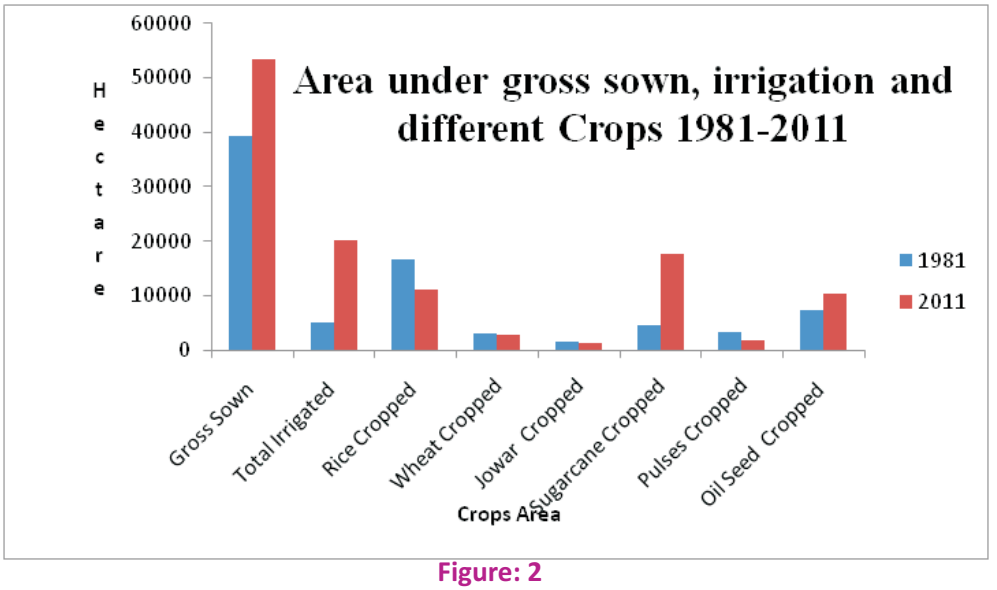

Figure: 2

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2. WHEAT

Wheat is a rabbi crop and grown in the post monsoon period. The high productivity of wheat is significant in the villages located at the middle and eastern part of the study region. The table-1 shows that there is 390 hectare net decrease in wheat area from 1981 to 2011. The average per hectare yield of wheat is 9.42 quintals in 1981which increased to 19.83 quintals in 2011. Because of the agro-climatic conditions in winter and the assured irrigation facilities are available favorably. The low productivity is found in the villages of western part where the agro-climatic conditions are unfavorable.

3. SUGARCANE

The table-1 shows that there is 13129 hectare net increase in sugarcane area from 1981 to 2011. The average per hectare yield of sugarcane is 74.00 quintals in 1981which increased to 105.00 tons in 2011.The high productivity of sugarcane is observed in the central and eastern part of the study region along the river course. The assured water supply, black soils, growth of sugar factories, high yielding varieties and favorable climatic conditions have resulted this high status of productivity. Due to the hilly, sloppy nature of land, infertile soil, small size of farms, poor transport facilities have resulted in to low productivity of sugarcane in the western part of the study region.

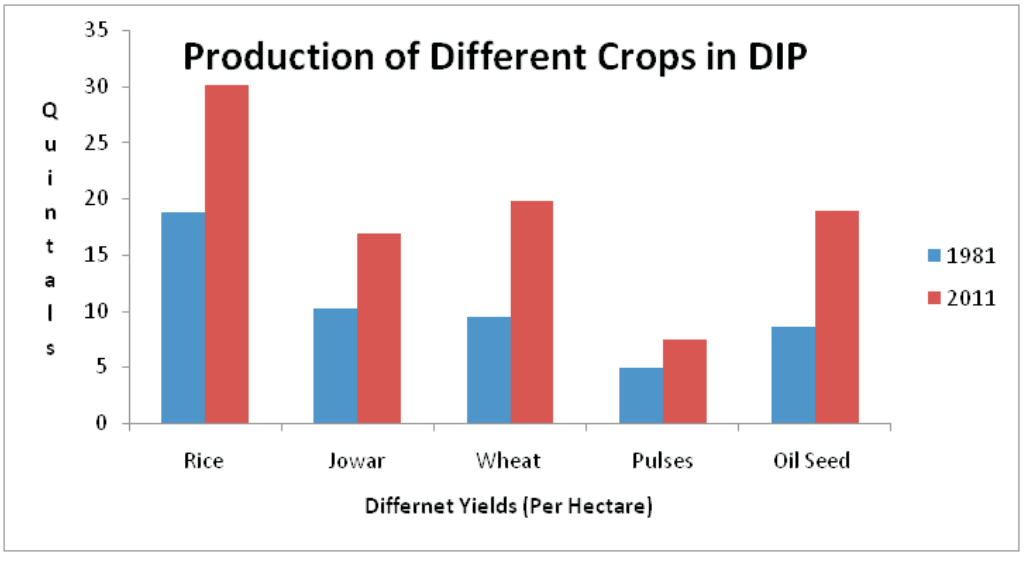

Figure: 3

4. OIL SEEDS

The average area under oil seed crops in the study region is 7205 hectare in 1981 which increased to 10237 hectares in 2011. The average yield of oil seeds is 8.59 quintals in 1981 which increased to 18.98 quintals in 2011. It clearly indicates that the area and per hectare yield of oil seeds increased tremendously (table-1).The high level of productivity of oil seeds are significant in the villages located away from the river course in the middle and eastern part of the study region. The favorable agro-climatic conditions and medium black soils, assured irrigation facilities are the main reasons for this status. The low productivity is found in the village in the western part due to the adverse agro-climatic conditions.

B. OVERALL PRODUCTIVITY PATTERN

The overall productivity of selected crops is grouped in to three classes high, moderate and low. The regional disparities in the crop productivity are well reflected in the level of irrigation development. The overall productivity of different crops has been calculated for both periods which are shown in the table-2.

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Table 2: Overall Productivity in Different Crops of DIP, (1981-2011)

Sr. No.	Productivity Index	Category	Number of Villages	
			1981	2011
1	< 40	High productivity	28	32
2	40- 60	Moderate Productivity	51	43
3	> 60	Low productivity	17	21
Total			96	96

Source: Compiled by Researcher.

1. HIGH PRODUCTIVITY REGION

In the pre irrigation project period, 28 villages included in the category of high productivity (Productivity index below 40). These villages are situated in the eastern part and north portion of the mid region. In this zone the irrigation development through Kolhapur Type Weirs has occurred in the post irrigation project period 32 villages comprises the same category this zone is confined to middle and eastern part of the study region. It is due to well development of irrigation use of high yielding varieties, improved technology and use of chemical fertilizers. Murty, (1976) has rightly pointed out that irrigation, the basic input in moist part of the cultivated land in our country; has played a vital role in stepping up food production, as other inputs like fertilizers, improved seeds, etc. contribute their due share only when assured water supply is available''.

2. MODERATE PRODUCTIVITY REGION

In 1981, out of the 96 villages, 51 villages comprise this category of moderate productivity in which productivity index ranges from 40 to 60. These villages are mostly found in the middle portion of the study region. This region is associated with high rainfall in monsoon period affecting slow growth of sugarcane, jawar, oil seeds which affect badly overall productivity of the crops resulting moderate productivity. Similarly due to the low development of irrigation the productivity was hampered in the dry spells in the monsoon periods.

In the post irrigation project period moderate productivity is found in 43 village located in the middle part of the region. Due to the development of irrigation facilities in this period the yield per hectare is increased as compared to the yield in 1981.

3. LOW PRODUCTIVITY REGION

The villages lying in the western and southern part of the study region have experienced low level of agricultural productivity in 1981. In this zone 17 villages are consisted. This region has undulating land, heavy rainfall, small size of land, and economic backwardness resulting this status. In the post irrigation project period this zone consists of 21 villages located in the western part of the region. The rigid topography, course laterite soil, sever erosion, less developed irrigation facilities have restricted such low productivity. The villages in this zone have benefited by canals but it is observed that, due to the poor construction of canals nearly 30 percent of the cultivated area of the villages along the canal has been damaged because of the water logging. This also has resulted in to low productivity. This weaker zone is essentially needed a special attention of agricultural scientists and the government.

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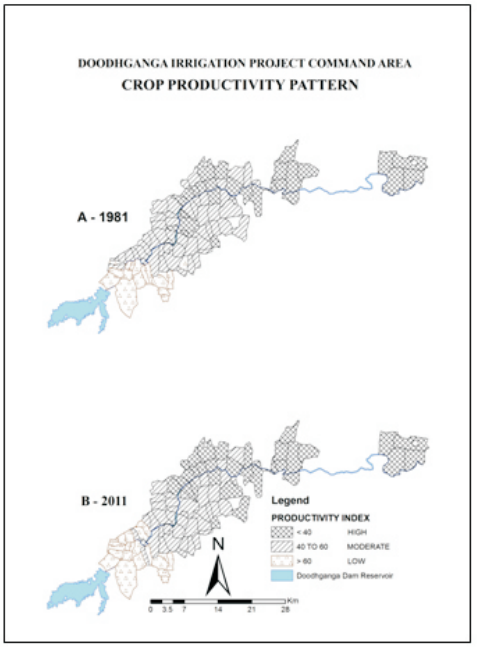

Figure: 4

CONCLUSION

The foregoing analysis reveals the fact that the intensity of irrigation has a profound impact on the development of agricultural productivity in the study region. The intensity of irrigation in 1981 was 13.22 percent which is increased to 44.20 percent in the post irrigation project period (2011). With increase in the intensity of irrigation, the agricultural productivity has been increased remarkably. The eastern part and north portion of the mid region high crop productivity is found. It is due to well development of irrigation use of high yielding varieties, improved technology and use of chemical fertilizers. The villages lying in the western and southern part of the study region have experienced low level of agricultural productivity. The rigid topography, course laterite soil, sever erosion, less developed irrigation facilities have restricted such low productivity. The villages in this zone have benefited by canals but it is observed that, due to the poor construction of canals nearly 30 percent of the cultivated area of the villages along the canal has been damaged because of the water logging. This also has resulted in to low productivity. This weaker zone is essentially needed a special attention of agricultural scientists and the government.

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