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ORIGINAL ARTICLE

SPATIO-TEMPORAL ANALYSIS OF AGRICULTURAL DEVELOPMENT IN COMMAND AREA OF DOODHGANGA IRRIGATION PROJECT IN KOLHAPUR DISTRICT.

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Abstract:

Agricultural development in any area is a multidimensional process. Irrigation has been playing a vital role in the agricultural as well as the overall development of a region. The transformation of agriculture has become possible mostly because of the development of irrigation particularly in the command areas of irrigation projects. The present study attempts to analyze the agricultural development in the command area of Doodhganga Irrigation Project. The development of irrigation in the command area has been measured spatio-temporaly, before and after the irrigation project. The composite index method is used to measure the agricultural development in the area. The present study is based on the 97 benefitted villages in six tahasils in Kolhapur District. The study concludes that there are greater differences in the agricultural development before and after the irrigation dam project.

KEY WORDS:

Analysis , Agricultural , Spatio-temporal , Doodhganga.

.INTRODUCTION

Irrigation is one of the significant inputs in the transformation of agriculture. It encourages the farmers to adopt scientific techniques. The availability of adequate irrigation facilities transforms the subsistence agricultural landscape gradually in to commercial one, making agrarian economy market-oriented. (Pujari, 2004) The main aim of the agricultural development is to achieve the increased amount of agricultural production and a high rate of economic growth in order to bring about an improvement in the standard of living of the people.(S.H.Siddqui,2002)

The Kolhapur district in south Maharashtra has essentially an agrarian economy, where 63 percent of district's total population depends on agriculture. The district has been remained as one of the agriculturally developed districts of Maharashtra having 23.80 percent agricultural land in the district is under irrigation. It possesses 4 major, 12 medium and 38 minor irrigation projects (2011). The irrigation development in the district has changed the socio-economic conditions of the people in the command areas of such projects. In view of this, an attempt has been made to analyze and measure the spatio-temporal agricultural development in the command area of Doodhganga Irrigation Project in Kolhapur district.

2.STUDY AREA :

The region under study is the command area of Doodhganga Irrigation Project in Kolhapur district which extends from 16026'15" north to 16043'12"north latitudes and 74001'54"east to 74039'22"east longitudes, occupying the middle part of the Kolhapur district (fig-1). The command area in Kolhapur

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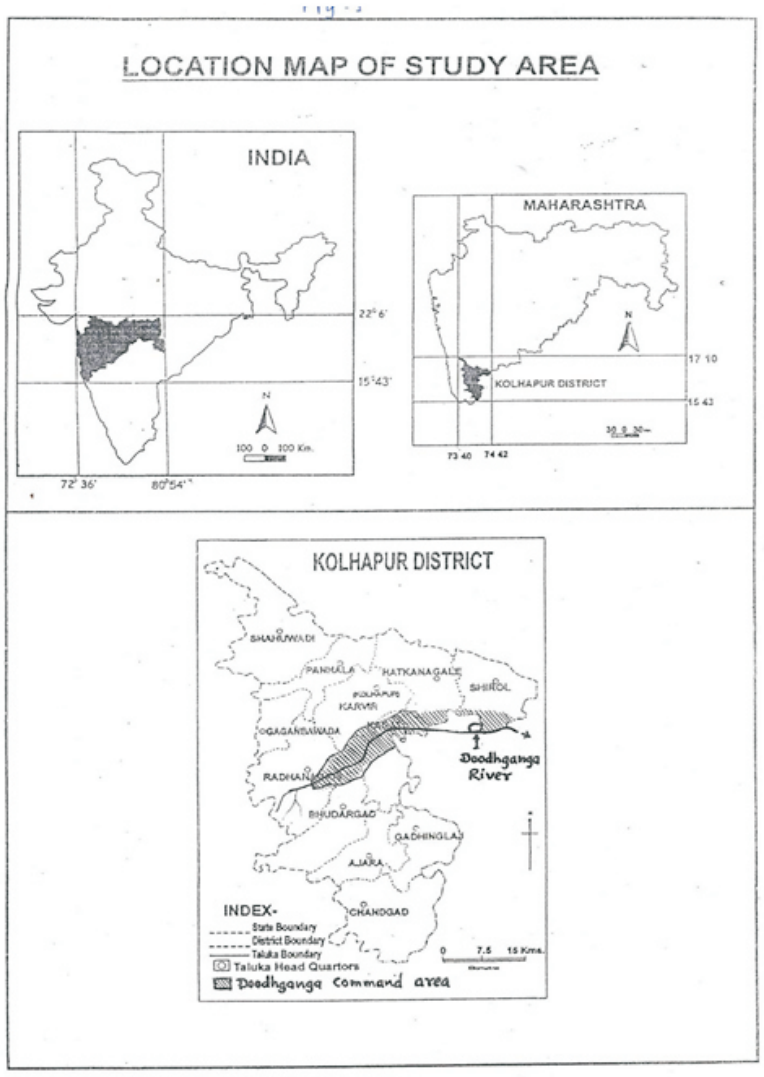
district comprises 97 villages with an irrigated area of 61,899 hectares and 2,88,767 population (2001). The western part of the region is a narrow erosional plain with small hillocks and the eastern part is comparatively a broader plain. The altitude of the region ranges from 700 meters to 1000 meters. The average maxi mum temperature in the region is 30°c and minimum 14°c. The rainfall ranges from 4000 mm in the west to 600 mm. in the east. The region has laterite soil in west and black soil in the east.

Doodhganga Irrigation Project:

It is one of the major irrigation projects in the Maharashtra. The dam is constructed on the river Doodhganga which is a tributary of Krishna river. The water for irrigation from this project was made available from 1985. The command area or the benefited area (59933 hectares) as estimated, is extended in Kolhapur district of Maharashtra (46948 hectares) and in Belgaum district of Karnataka state (12985 hectares).

Fig.-1



3. OBJECTIVES:

The main objectives of the study are -

1.To analyze the spatio-temporal change in the agricultural development in the command area, before and after the irrigation project.

2.To identify disparities in the levels of agricultural development.

4. DATA BASE AND METHODOLOGY:

The present work is based on secondary source of data. The information regarding different aspects of agricultural development in its spatio-temporal perspectives, from 97 benefited villages of Doodhganga irrigation command area in Six tahasils of Kolhapur district has been collected from the revenue records, District Gazetteer, Census Report and other government offices.

In the present study, village is the unit of study. The village-wise Composite Index is calculated to measure the levels of agricultural development and regional disparities. The temporal change in the present investigation is considered from 1980-81 to 2010-11. The collected data through different sources were processed and represented by statistical and cartographic techniques. To measure the agricultural development in the pre and post irrigation project period at village level, eleven indicators have been chosen. They are –

X_{1}- Percentage to net sown area to total geographical area.
X_{2}- Percentage of irrigated area to net sown area.
X_{3}- Per capita cultivated land holding.
X_{4}– Number of electric and oil operated irrigation pumps for per10 hectare of irrigated land.
X_{5}- Number of tractors to per 10 hectare of net sown area.
X_{6}- Number of other agricultural implements to per 10 hectare of net sown area.
X_{7}- Percentage of area under cash crops to net area sown.
X_{8}- Number of national and co-operative banks.
X_{9}- Number of agricultural credit societies.
X_{10}- Percentage of literate population to total population.
X_{11}- Availability of weekly market.

Since all the indicators of agricultural development are not equally important, we have assigned different weights to different indicators, by the method of 'Proportional Standardized Mean' (Shrivastava, 1983) that is to say, the weight assigned to one indicator is measured by calculating x / for any indicator.
Where,

$\bar{x}$ is the average of the series of one particular indicator.
- is the standard deviation of same series.

This x/ is the weight of any indicator. Thus we have calculated the Composite Index by the following formula.

$$\textbf{C.I.} = \frac{x_1 \frac{\bar{x}_1}{1} + x_2 \frac{\bar{x}_2}{2} + x_3 \frac{\bar{x}_3}{3} \ldots\ldots\ldots\ldots\ldots + x_{11} \frac{\bar{x}_{11}}{11}}{\frac{\bar{x}_1}{1} + \frac{\bar{x}_2}{2} + \frac{\bar{x}_3}{3} \ldots\ldots\ldots\ldots\ldots + \frac{\bar{x}_{11}}{11}}$$

Where,
C.I. - Composite Index
X_1 - is the value of indicator – 1 for particular village.
$\bar{X}_1$ - is the average of the series of one particular indicator.
- is the standard deviation of same series.

With the help of the above formula, the Composite Index for both the years 1980-81 and 2010-11 has been calculated separately. Further, the Simple Aggregate Method is used to calculate the Agricultural Development Index with the following formula -

Development Index = B/A X 100

Where,
A – is the Composite Index of village 'A' in 2010-11

B – is the Composite Index of village 'A' in 1980-81
100 - Constant figure

'The difference between the composite index value of 1981 and 2011 for different villages in the command area is multiplied by 100, indicates the Development Index.'

When the Development Index value is above 100, the village is considered as agriculturally developed whereas a weak agricultural development shows an index value below 100. By calculating the village-wise development index, the region is grouped in to four categories of agricultural development.

5. DISCUSSION:

With the help of 11 indicators, the spatio-temporal development of agriculture in the villages in the command area has been measured. This attempt of measurement of agricultural development has been made with the following way-

1.Levels of agricultural development from 1980-81 to 2010-11:

The analysis of agricultural development in the study region in the pre and post period of irrigation project indicates an ununiform picture. The range of Composite Index varies from the minimum of 4.48 (1981) and maximum of 26.92 (2011) in Aini village (Radhanagari Tahasil) and 49.61(1981) and 65.25(2011) as minimum and maximum respectively in Kasaba Sangav village (Kagal Tahasil).

The index values, in the western part of the command area, in the tahasils of Radhanagari, Bhudargad, Karveer and Kagal show high positive increase, indicating greater agricultural development during 1981-2011 (Figure 2). This area is highly benefited by the Doodhganga Irrigation Project as other sources of irrigation have less contribution in the irrigation development. On the other hand, the index values, in the eastern part of the command area of Hatkanagale and Shirol tahasils show minimum difference for the years 1981 and 2011. It indicates less agricultural development as this area has already been benefited by the irrigation from Krishna river.

The composite index of agricultural development for different villages in the pre and post irrigation project period in the study region are grouped into five categories which are shown in table No.-1.The table shows marked differences in the agricultural development for different periods.(Figure 2A and 2B)

Table 1 : Ranking of villages in respect to agricultural development

Sr.No.	Composite Index Value	Category	1981		2011	
			No. of Villages	Percent to total villages	No. of Villages	Percent to total villages
1.	Above 40	Very high developed	01	1.01	72	74.23
2.	30 to 40	high developed	09	9.29	20	20.62
3.	20 to 30	Fairly Developed	34	35.06	05	5.15
4.	10 to 20	Poorly Developed	47	48.45	00	00
5.	Below 10	Very poorly Developed	06	6.19	00	00
		Total	97	100	97	100

Source: Compiled by the Authors

Table-1 revels that 72 villages (74.23 percent) out of 97, are grouped in to very high developed zone, 20 villages (20.62%) in high developed and 05 villages (5.15%) in fairly developed zone in 2011. This high development of agriculture is attributed to high development of irrigation, increase in net sown area and area under cash crops, number of credit societies and Banks, regulated market facilities, number of tractors and high literacy rate. It is noteworthy that no single village is recorded in the poorly developed and very poorly developed zone in this post irrigation project period.

On the other hand, in the pre irrigation project period of 1981, the agricultural development exhibits a different picture. In this year, 87 villages (89.70 percent) are grouped in to fairly developed zone, to a very poorly developed zone. It may be because of less irrigation development, less net sown area, low

literacy rate, less number of regulated markets and banking facilities. In the same year, high developed zone and very high developed zone consist of only 09 and 01 village respectively. Such difference in agricultural development for the years 1981 and 2011 can be very well observed in figure 2A and 2B. It is to note that there are 26 villages having the composite index value above 50.

Fig.2 A

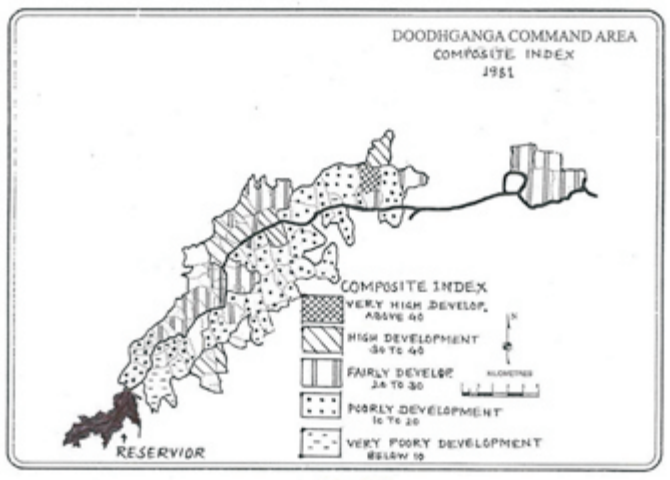
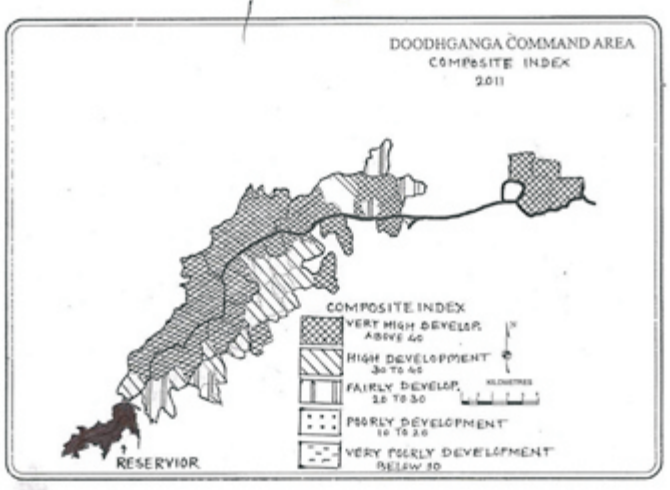


Fig.2 B



B. village level difference in Development:

The study of agricultural development is further measured on the basis of Development Index for all the villages in the command area and they are grouped in to following four categories. Table 2 indicates that very high proportion (61.86 percent) of villages is found in the category of medium developed, followed by less developed (26.80 percent), high developed (7.21 percent) and very high developed (4.13 percent) category. In other words, more than 60 percent villages are developed two times more in the year 2011 than the year 1981. Similarly 11 percent villages are agriculturally developed more than three times.

Table No. 2 : Village level difference in Development Index

Index value ➡	Above 400		300 to 400		200 to 300		Below 200		Total	
Category ➡	Very High developed		High developed		Medium Developed		Less Developed			
Tahsil ⬇	No. of villages	Percentage to total villages	No. of villages	Percentage to total villages	No. of villages	Percentage to total villages	No. of villages	Percentage to total villages	No.of villages	Percentage to total villages
Radhanagari	03	8.57	03	8.57	24	68.57	05	14.29	35	100
Kagal	01	2.70	04	10.81	31	83.79	01	2.70	37	100
Bhudargad	00	00	00	00	01	14.29	06	85.71	07	100
Karveer	00	00	00	00	03	25	09	75	12	100
Hatkangale	00	00	00	00	00	00	02	100	02	100
Shirol	00	00	00	00	01	25	03	75	04	100
Doodhganga command area	04	4.13	07	7.21	60	61.86	26	26.80	97	100

Source: Compiled by the Authors

1. Very high development of agriculture:

This zone consists of 04 villages comprising 03 villages in Radhanagari tahasil and one village in Kagal tahasil where more than four time development is observed during the period 1981-2011. It is mainly because of the increase in net sown area, number of credit societies, regulated markets and tractors. No village in this category is recorded in other tahasils of the command area.

2. high development of agriculture:

In this category 07 villages are consisted of which includes 03 villages from Radhanagari tahasil, 04 villages from Kagal tahasil where more than three time development is observed during the period 1981-2011. In this zone of development no single village is recorded from other tahasils.

The villages in the upper two zones had no irrigation development in the pre - irrigation project and they were deprived of modern amenities of agricultural development. But after the irrigation project the situation in the agricultural sector totally changed indicating high development index.

3. Medium development of agriculture:

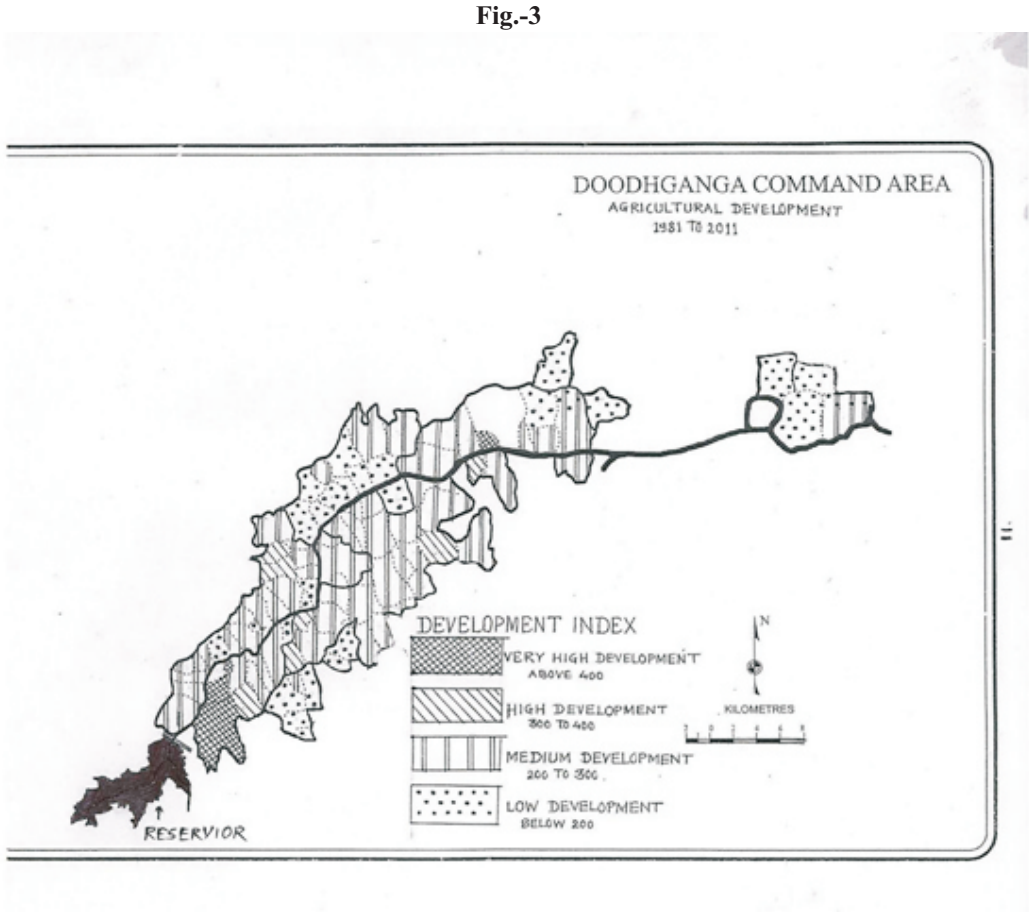
60 villages are consisted of this category and 55 villages are found in only two tahasils i.e. Radhanagari and Kagal. This zone indicates more than two time development where all the indicators of the agricultural development are changed positively.

4. Low Development of Agriculture:

It consists of 26 villages where less than two time development has taken place. The villages in this category are found in all the tahasils of the command area, but the proportion is high in the villages of Hatkanagale (100 percent), Bhudargad(85.71 percent) and Shirol and Karveer(75 percents each).

It is to note that the village Talandge and Yelgud in Hatkanagale tahasil show Development Index value less than 100, as these villages have been benefited already from lift irrigation of Panchganga river.

Fig.-3



CONCLUSION:

The foregoing analysis revels that command area of the Doodhganga Irrigation Project has achieved a good agricultural development where irrigation has a profound impact. The indicator, chosen to measure the agricultural development and the disparity in the development are very much inter-linked with each other and are the result of the irrigation development. The spatio-temporal development of agriculture in the command area is thus clearly observed. It will be very interesting to know the benefits of agricultural development achieved among all the families in the villages of the command area.

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