



**The Impact of Irrigated area on Agriculture productivity in
Lower Sina Basin: A Geographical study**

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Abstract:

Agricultural productivity is a important aspect of agricultural geography. Agricultural productivity could be defined as the ratio of output to input in relation to land, capital and overall resources employed in agriculture. Irrigation is basic determinants of agriculture in arid and semi arid areas and where rainfall is inadequate. Irrigation means the supply of water to the land by means of channels, streams, and sprinklers in order to permit the growth of crops. Importance of irrigation has substantially increased after the enormous growth of population in developing and under developed countries. Irrigation is basic determinants of agriculture because its inadequacies are the most powerful constraints on increase of agricultural production. Therefore attempt is made here to assess the impact of irrigated area on agricultural productivity as irrigation is a determinants of agricultural productivity. The study is based on secondary data source. To examine the influence of irrigated area on agricultural productivity the Pearson's Coefficient of Correlation, Coefficient of determination and regression analysis technique has been utilized. The study reveals that the increase of one percent net irrigated area causes for increase of value of composite index of agricultural productivity of tahsils of lower Sina basin by 0.632 in study region.

Key words: Irrigated area, Productivity, Correlation, Coefficient of determination.

Introduction

Agriculture is basic and most important primary economic activity as most of the world's population depend on agriculture and allied activities for their livelihood. Agricultural productivity is a important aspect of agricultural geography. Agricultural productivity could be defined as the ratio of output to input in relation to land, capital and overall resources employed in agriculture (Noor Mohammad, 1995). Agriculture productivity is determined by number of factors such as physical, Social, economical and technical. Irrigation is a basic determinants of agriculture in arid and semi arid areas and where rainfall is inadequate and unpredictable. Irrigation is the watering of land by artificial means to foster plant growth (Merriam Webster's Collegiate Dictionary, 2004). Irrigation means the supply of water to the land by means of channels, streams, and sprinklers in order to permit the growth of crops (Susan Mayhew, 2004). Irrigation is identified as a decisive

factor in Indian agriculture due to high variability and inadequacy of rainfall. Irrigation is imperative for successful agriculture particularly in the arid, semi arid and sub-humid areas, which are prone to drought and famine conditions due to partial failure and delayed arrival or early withdrawal of monsoon (Reddy and Reddy, 1992). Importance of irrigation has substantially increased after the enormous growth of population in developing and under developed countries. Irrigation is basic determinants of agriculture because its inadequacies are the most powerful constraints on increase of agricultural production. It is observed that with the growth of irrigated area, the agricultural productivity is increases. Therefore attempt is made here to assess the impact of irrigated area on agricultural productivity as irrigation is one of the determinant of agricultural productivity.

The Study Area

The Study area is located in south central part of Maharashtra state. It is situated between $17^{\circ} 18'$ to $19^{\circ} 15'$ North Latitude and $74^{\circ} 30'$ to $76^{\circ} 15'$ East Longitude. It is a part of Deccan plateau. The average height of lower Sina basin is 748 meters above from mean sea level. Sina River was originated near Ahmadnagar city, it has two chief sources, one near Jamgaon about 20 kilometers West of the Town of Ahmadnagar and the another near Jeur about 16 kilometers to its North east. The study region is bounded to the North by upper Sina basin, to the East by Manjra sub

basin No 4, to the West by upper Bhima basin No 17 and 18 and to the South by Karnataka State. Its shape is roughly rectangular. Its East side covered by large area of the Balaghat Ranges and Uneven with patches of low-level plain. The total Geographical area of Sina Basin is 12742 Square kilometers and total length of river is 300 kilometers out of them 180 Kilometer is of lower basin. Lower Sina drains total seven tahsil of Maharashtra State, out of them six tahsil are of Solapur district i.e. Karmala, Barshi, Madha, Mohol, North Solapur, South Solapur and one tahsil of Osmanabad District i.e. Paranda.

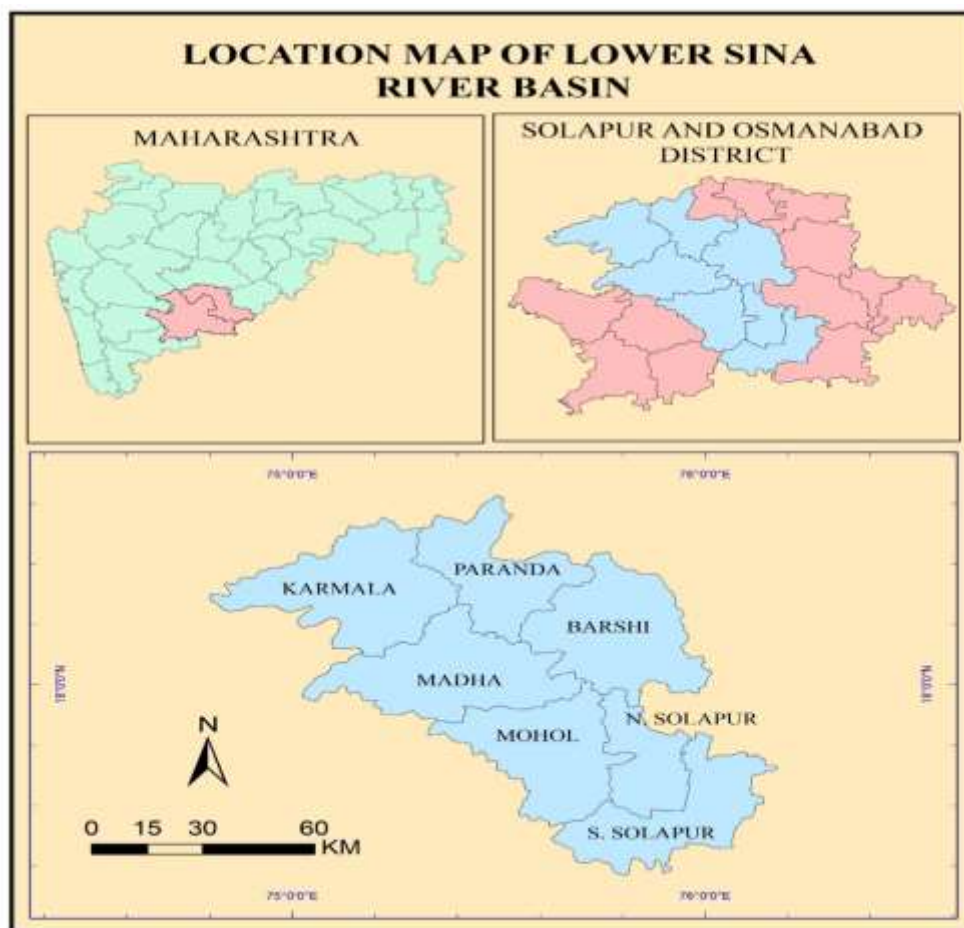


Figure -1

Hypothesis

The higher is the percentage of irrigated area the more is the agricultural productivity.

Objectives

The main objectives of this paper are as following

- 1) To examine the impact of irrigated area on agricultural productivity.
- 2) To estimate the rate of change in agricultural productivity in relation to change in percentage of irrigated area.

Data collection and Methodology

The present study is based on secondary data source. In order to meet these objectives the relevant information and data regarding irrigated area, production of crops are collected from Socio economic Review and district Statistical Abstract of Solapur & Osmanabad Districts 2011-12 to 2015-16, Chief Statistical Office of Agriculture Maharashtra state, pune.

Collected rough data are processed. To examine the influence of irrigated area on

agricultural productivity the Pearson's Coefficient of Correlation technique has been utilized. The degree of relationship by considering percentage of irrigated area as an independent variable 'X' and composite index of agricultural productivity as dependent variable 'Y' is measured. The functional form of linear relationship has been measured by using regression equation Y on X i.e. $y = a + bx$. The rate of change in dependent variable has been estimated with the help of 'b' coefficient, which is the line of best fit. The 't' test is used with the view to understand the confidence level. Analysis of the study has been made with help of the statistical techniques and on the basis of this results and conclusion are drawn.

Result and Discussion

In the context of objective the following findings have come to light.

1. The high positive correlation is observed in between percentage of net irrigated area and agricultural productivity of tahsils in the lower Sina Basin. The coefficient of correlation in this regard is +0.730789. The degree of linear association between these two variable is obtained by using the coefficient of determination (r^2) is found to be at 0.534048, which reveals that

the independent variable (X) i.e. percentage of net irrigated area are explaining 53.40 per cent of the total variations in dependant variable (Y) i.e. agricultural productivity of tahsils of lower Sina basin. It is good explanation because 53.40 per cent of variation in 'Y' composite index of agricultural productivity of tahsils of lower Sina basin to be influenced by the variable 'X' i.e. percentage of net irrigated area and about 46.60 percent of variation is left to be influenced by other variables.

2) The functional form of linear relationship of 'Y' on 'X' found to be at $y = 45.59 + 0.632x$. The line of best fit is shown in figure 2. The regression coefficient indicates that increase of one percent net irrigated area causes for increase of value of composite index of agricultural productivity of tahsils by 0.632 in study region. By testing the significance of regression coefficient (a test of significance), the validity of this causal relationship has been confirmed.

The calculated value of 't' in this exercise is found at 2.39121. It is observed that this calculated value is higher than the tabulated value of 't' (2.02) at the 5 degree of freedom ($df = n - 2$, where 'n' is 7) at 10 per cent level of significance.

Table 1: Percentage of net irrigated area and composite index of agricultural productivity- 2011-12 to 2015-16

Sr. No	Tahsils	X (% of Net irrigated area to net area sown)	Y (Composite index of agricultural productivity)
1	Karmala	25.66	66.58
2	Barshi	16.42	58.09
3	Madha	29.87	68.35
4	Mohol	32.34	62.88
5	N. Solapur	27.26	61.04
6	S.Solapur	21.57	54.29
7	Paranda	16.94	55.50
Coefficient of correlation			0.730786
Coefficient of determination			0.534048

Source: Compiled by researcher on the basis of Socio economic Review and District Statistical Abstract of Solapur & Osmanabad Districts 2011-12 to 2015-16, Chief Statistical Office of Agriculture Maharashtra state, pune.

3) In order to understand the degree of fit of regression equation and the accuracy level of predicted values (y) agricultural productivity of tahsils in lower Sina basin the standard error (SE) of estimate is being done with the equation $SE(Y) = SY \sqrt{1-r^2}$, where SE (Y) is the standard deviation of residuals (Y-y); and 'SY' is the standard deviation of 'Y'.

The confidence intervals of the predicted values are worked out at $Y \pm SE(Y)$

(The SE (Y) for the present exercise is 3.66 and SY is the 5.36). Thus it is assumed that if the values of 'Y' (Y-y) lie within the range of Zero to $\pm SE$, the prediction could be expected to be accurate. In other words, the role of independent variables in explaining the change in dependent variable can be accepted as correct.

The equation used $t = (b-b) \sqrt{(n-2) \sum (X_i - \bar{X})^2 \div \sum (Y_i - y_i)^2}$ (Dr. Singh et.all, 1986)

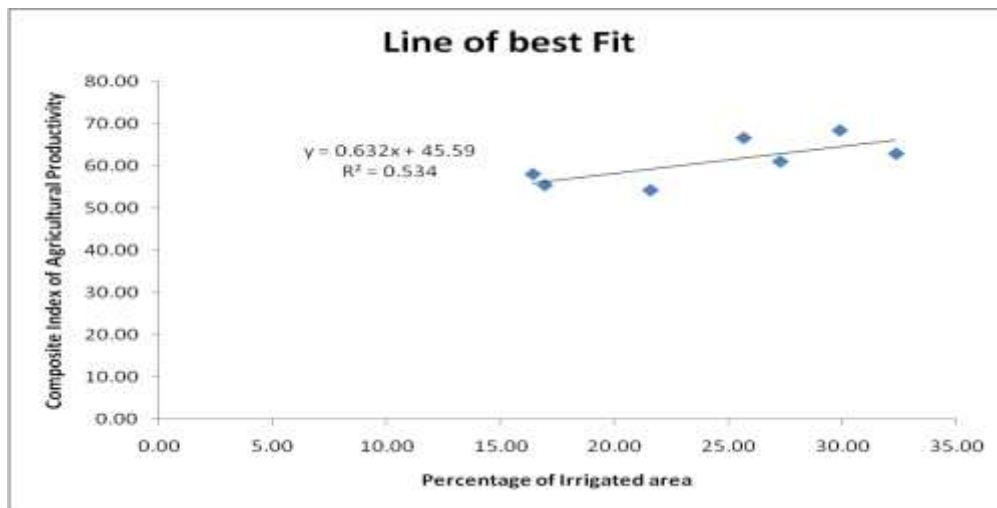


Figure 2

Table 2:Residuals from Regression of Composite Index of Agricultural Productivity

Sr. No,	Tahsils	Yi	Yi-yi
1	Karmala	61.81	4.78
2	Barshi	55.97	2.12
3	Madha	64.47	3.88
4	Mohol	66.03	-3.15
5	N. Solapur	62.82	-1.77
6	S.Solapur	59.22	-4.93
7	Paranda	56.30	-0.79

Source: Compiled by Researcher on the basis of Socio economic Review and District Statistical Abstract of Solapur & Osmanabad Districts 2011-12 to 2015-16, Chief Statistical Office of Agriculture Maharashtra state, pune.

In this context it has been observed that the predicted values (given in table 2) of 4 out of 7 districts in the present study lie within the range of \pm SE and 3 within \pm SE to \pm 2 SE. Now the obvious inference is that the 57.14 per cent of the total number of observation (n is 7) the regression is a good indicator meaning thereby that the variations in agricultural productivity of tahsils in lower Sina basin is the function of the variations in net irrigated area. In the case of other tahsils with residuals between $>$ \pm SE to \pm 2 SE the situation is different because here the regression is a poor indicator. It clearly indicates that these are the tahsils whom the influence of variables other than the independent one. The variations in agricultural productivity of districts in the latter case may be due to the variation in soil, variation in seeds, variation in use of fertilizer and variation in consciousness of farmers.

Conclusions

This study reveals that there is high positive correlation between percentage of net irrigated area and agricultural productivity in the lower Sna basin. The percentage of net irrigated area is found to be

more effective than the other variables considering composite index agricultural productivity. It is found that increase of one percent net irrigated area causes for an increase of value of composite index of agricultural productivity of tahsils by 0.632 in study region. The study also indicate that the 57.14 per cent of the total number of observation (n is 7) the regression is a good indicator meaning thereby that the variations in agricultural productivity of tahsils in lower Sina basin is the function of the variations in net irrigated area. The analysis reveals that the increase in percentage of irrigated area is helpful to improve agricultural productivity, it means that irrigation is a basic determinants of agricultural productivity, where rainfall is inadequate and unpredictable. Therefore it is recommended that Public awareness should made regarding water conservation, drip irrigation and proper utilization of water in the farmers to increase irrigated area in turn to increase agricultural productivity

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