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IMPACT OF IRRIGATION ON AGRICULTURE PRODUCTION AND CROPPING PATTERN IN DROUGHT PRONE AREA (A CASE STUDY OF VILLAGE HINGANI IN SOLAPUR DISTRICT)

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Abstract:

Agriculture production is a function of number of factors including physical and non-physical factors. In drought prone region where rainfall is uncertain and unpredictable, therefore irrigation play important role in agriculture development. For the assure agriculture production irrigation is most important. Therefore attempt is made here to examine the impact of irrigation on per hectare agriculture production and cropping pattern in village Hingani. This paper is mainly based on primary data. To examine the impact of irrigated area the Pearson's Coefficient of Correlation, Coefficient of determination and regression technique has been utilized. This study reveals that there is high positive correlation between percentage of irrigated area and per hectare production and cropping pattern in the village Hingani. It is found that increase of one per cent of irrigated area causes for an increase of 0.627 tons per hectare production of the farmers.

Keywords: Irrigated area, per hectare Production, Correlation, Regression.

Introduction

Agriculture can contribute significantly to overall development as it provides increased food surplus to the growing population, help to extend the secondary and tertiary sectors, increases rural incomes and improves the welfare of the rural population of the region. Finally agriculture development also brings about social and cultural development as increased per capita income in rural areas in variably results in increased literacy and level of education which are conductive for social transformation. (Noor Mohmmad,1995)

Agriculture production is a function of number of factors including physical and non-physical. Technological variables have made a significant impact on both agricultural pattern and production. Agricultural production is high in irrigated area in the study region. The variability water due to medium irrigation project at Hingani village in Barshi tahsil turn the farmers towards cash crop cultivation i.e. grapes and sugarcane.

Irrigation is identified as a decisive factor in Indian agriculture development. Due to high variability and inadequacy of rainfall irrigation is essential for successful

agriculture particularly in the drought prone area, where rainfall is inadequate uncertain, and unpredictable. These areas are prone to drought and famine condition due to partial failure and delayed arrival or early withdrawal of monsoon. Irrigation is basic determinants of agriculture because its inadequacies are the most powerful constraints on increase of agricultural production.

Study Region:

The Village Hingani lies in Eastern part of Barshi Tahshil of Solapur District. Which is a part of drought prone area of Maharashtra. Absolute location of village is 18^0 9' 30''North latitude and 75^0 54' 56'' East longitudes. The geographical area of village is 1178.59 hectors, out of that 94.98 per cent is under cultivation. The share of cultivators and agricultural labours are 89.21 per cent respectively in the working population, indicates that the agriculture is the main occupation of people in the village. The village has hot and dry climate, with an average annual rainfall of 665.84 mm. The village has surface irrigation facility from Hingni medium project in Hingain village. Due to the impact of this irrigation project farmers push towards cash crop cultivation. Out of the total farmers in the village 61% farmers are cultivated cash crops.

Objectives:

The main objective of this paper is

1) To examine the impact of irrigation on agriculture production and cropping pattern.

2) To estimate the rate of change in per hectare production in relation to change in percentage of irrigated area.

Data collection and Methodology:

In order to meet these objectives the relevant information and data regarding irrigated area and per hectare agriculture production collected from Primary sources. For which special questionnaire is designed and field survey has been made to obtain primary data. During the field survey, 32 farmers were surveyed, out of 320 farmers those have irrigation facility. Which constituted about 10 per cent to total farmers. Systematic sampling method is applied, every 10^{th} farmer who have irrigation facility is considered in the village. Information also collected from Talathi office.

Collected rough data are processed. To examine the impact of irrigated area on per hectare agriculture production 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 per hectare yield 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.

Table-1 Irrigated area and Per hectare yield of cereal crops in village Hingni:

No of Farmers	irrigated	Per Hectare Production (Tons)
1	1	6.00
2	2	60.00
3	2	5.00
4	2	15.10
5	3	26.73
6	10	16.05
7	0	0.00
8	8	5.11
9	3	26.87
10	3	26.87
11	1	10.00
12	0	0.00
13	1.5	46.67

14	1.25	8.00
15	1.5	33.33
16	2	5.00
17	2	7.75
18	2	32.50
19	3	4.27
20	0	0.00
21	2	3.05
22	5	32.00
23	2	0.13
24	10	30.05
25	4	7.53
26	7	26.43
27	1	20.30
28	3	4.03
29	1	0.15
30	2	0.13
31	0	0.00
32	0	0.00
Average	2.66	14.34

Source: field work on dated-11/12/2014

Percentage of irrigated area and per hectare yield of cereal crops

The table-1 indicates that on an average the village as a whole has 87.09 per cent irrigated area out of total cultivated area during the period of investigation. In village Hingni there is 89.21 percent populations are cultivatiors and agriculture labours. Due to the location of Hingni medium irrigation

project in the village, 55.34 percent cultivated land is surface irrigated while remaining 31.75 percent land is ground water irrigation.

The average per hectare production is 18.38 tons in the Study area during the period of investigation but it is varies from farmer to farmer. On an average per hectare agriculture production is high of those farmers who have high-irrigated area. Due to the high development of surface irrigation through Hingni project the agriculture land is intensively used and farmers are cultivated cash crops, therefore sugarcane and grapes cultivation is leading crops in Hingni village.

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

1) The positive relationship between the percentage of irrigated area (X) and per hectare production (Y) has been observed in the village Hingni. The coefficient of correlation in this regard is at r = + 0 .7918. It indicates that there is a good positive relationship between the variables 'X' and 'Y'. The degree of linear association between these two variables obtained by using the coefficient of determination (r^2) is found to be at 0.6270, which reveals that the independent variable (X) i.e, the percentage of irrigated area are explaining 62.70 per cent of the total variations in dependent variable (Y) i.e. the per hectare agriculture production in the village Hingni. It is a good explanation because 62.70 per cent of the variations in (Y) per hectare production to be influenced by the variable (X) i.e. percentage of irrigated area and about 37.30 per cent of the 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 = 6.282 + 20.74x. The line of best fit is shown in the Figure-1. The regression coefficient indicates that increase of one per cent in irrigated area causes for an increase of 20.74 tons per hectare production of farmers per year. By testing the significance of regression coefficient (a test of significance), the validity of this causal relationship has been confirmed,

The equation used $t = (b-\beta)\sqrt{(n-2)\Sigma(Xi-\bar{X})^2 \div \Sigma (Yi-yi)^2}$

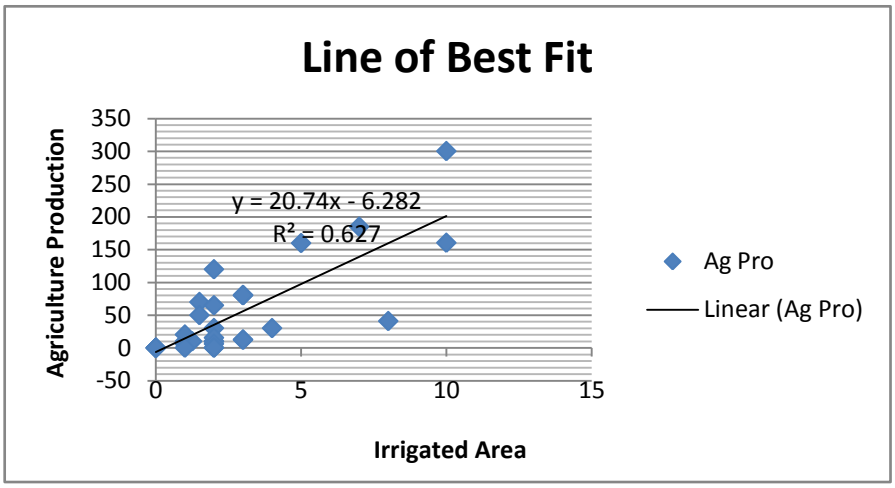

Figure-1

Table -2 Residuals from regression of per hectare yield of cereal crops.

No of Farmers	Y	y	Y-y
1	6.00	14.458	-8.46
2	60.00	35.198	24.80
3	5.00	35.198	-30.20
4	15.10	35.198	-20.10
5	26.73	55.938	-29.20
6	16.05	201.118	-185.07
7	0.00	-6.282	6.28
8	5.11	159.638	-154.53
9	26.87	55.938	-29.07
10	26.87	55.938	-29.07
11	10.00	14.458	-4.46
12	0.00	-6.282	6.28

13	46.67	24.828	21.84
14	8.00	19.643	-11.64
15	33.33	24.828	8.51
16	5.00	35.198	-30.20
17	7.75	35.198	-27.45
18	32.50	35.198	-2.70
19	4.27	55.938	-51.67
20	0.00	-6.282	6.28
21	3.05	35.198	-32.15
22	32.00	97.418	-65.42
23	0.13	35.198	-35.07
24	30.05	201.118	-171.07
25	7.53	76.678	-69.15
26	26.43	138.898	-112.47
27	20.30	14.458	5.84
28	4.03	55.938	-51.90
29	0.15	14.458	-14.31
30	0.13	35.198	-35.07
31	0.00	-6.282	6.28
32	0.00	-6.282	6.28
stdev	15.53195	54.99301	
	r	0.791845	
	r2	0.627018	

Source: Compiled by Researcher on the basis of table1

3) In order to understand the degree of fit of regression equation and the accuracy level of predicted values (y) for the farmer of village Hingni the standard error (SE) of estimate is being done with the equation SE (Y) = SY √1-r2, where SE (Y) is the standard deviation of residuals (Y-y); and 'SY' is the standard deviation of 'Y'.

The calculated value of't' in this exercise is found at 5.43. It is observed that this calculated value is higher than the tabulated value of 't' (2.77) at the 30 degree of freedom (df = n –2, where 'n' is 32) even at 1 per cent level of significance.

The confidence interval of the predicted values are worked out at Y = Y ± SE (Y) (The SE (Y) for the present exercise is 45.51 and SY is the 54.99). Thus it is assumed that if the values of 'Y' (Y-y) lie within the range of Zero to ± 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.

In this context it has been observed that the predicted values (given in table- 2) of 25 farmers out of 25 farmers in the present study lie within the range of ± SE, 1 within ± SE to ± 2 SE and 4 >± 2 SE. Now the obvious inference is that the 80.50 per cent of the total number of observation (n is 30) the regression is a good indicator meaning thereby that the variations of per hectare agriculture production of farmers in village Hingni is the function of the variations of irrigated area. In the case of other years with residuals between > ± SE to ± 2 SE the situation is different because here the regression is a poor indicator. It clearly indicates that these are the farmers whom the influence of variables other than the independent one. The variations of per hectare agriculture production in the latter case may be due to the variation in cautiousness of farmers, Variation in the seeds, Variation in use of fertilizers and climatic hazards.

Conclusions

This study reveals that there is high positive correlation (0.7918) between percentage of irrigated area and per hectare agriculture production in the village Hingni. The percentage of irrigated area is found to be more effective than the other variables considering per agriculture production. It is found that increase of one per cent of irrigated area causes for an increase of 0.627 tons per hectare agriculture production of farmers.

Not only Hingni medium irrigation project is effect on per hectare agriculture production but it also on cropping pattern of the village. Out of the total cultivated area 32 percent area is under sugarcane cultivation, 29 percent area is under grapes production in Hingni village. It indicates that irrigation facilities Leeds farmers towards cash crops cultivation in Hangni village. Due to inadequate and unpredictable rainfall Hingni Medium Irrigation project play important role in agriculture and overall rural development at Hingni village. 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 per hectare production.

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