ISSN: 2278-4632
Vol-10 Issue-5 No. 16 May 2020

IMPACT OF INNOVATION ON PER HECTARE YIELD OF SUGARCANE: A CASE STUDY OF VILLAGE CHAVANWADI IN SOLAPUR DISTRICT (MS)

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Abstract

In developing country like India, agriculture is main and basic economic activity. It is base of industry, transport and trade. Agricultural productivity is an important aspect of agricultural study. Agriculture productivity is a function of number of factors. Technological innovation is one of these factors. Agricultural innovation may be defined as an introduction of new things and ideas in practice of cultivation of crops raising livestock, fish, pig farm, goat farm and poultry. In the present day drip irrigation is most essential technological factor due to shortage of water resources. Drip irrigation method is one of the important inputs, which is useful to increase area under irrigation and to save water resources as well as to increase crop yield. Therefore attempt is made here to examine the impact of drip irrigation as a innovation on per hectare yield of sugarcane in village Chavanwadi. The paper is mainly based on primary data. To examine the impact of drip irrigated area on per hectare yield of sugarcane the Pearson's Coefficient of Correlation, Coefficient of determination and regression technique has been utilized. The study reveals that there is high positive correlation between percentage of drip irrigated area and per hectare yield of sugarcane in the village Chavanwadi. It is found that increase of one per cent of irrigated area causes for an increase of 1.632 tons per hectare yield of sugarcane of farmers.

Keywords: Drip irrigated area, Per hectare yield, Correlation, Regression.

Introduction

Agriculture covers those productive efforts by which man settled on land, seeks to make use of resources and if possible, accelerate and improve upon the natural genetic or growth processes of plants and animal life, to the end that these processes will yield the vegetable and animal products needed and wanted by man (Roy P.K., 2004). In developing country like India, agriculture is main and basic economic activity. It is base of industries, transport and trade. Agricultural productivity is an important aspect of agricultural study.

Agriculture productivity could be defined as the ratio of output to input in relation to land, capital, over all resources employed in agriculture. (Noor Mohamad, 1992). Agriculture productivity is a function of number of factors including physical Socio-economical and technical organization (crop rotation, irrigation, use of fertilizer and mechanization (N. Mohammad, 1995). Technological innovation have made a significant impact on both agricultural pattern and productivity. Innovation means the introduction of new things, ideas or ways of doing something (Hornby A. S, 2015). Agricultural innovation may be defined as an introduction of new things and ideas in practice of cultivation of crops raising livestock, fish, pig farm, goat farm and poultry.

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

ISSN: 2278-4632
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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 & Reddy, 1992). Drip irrigation is designed to water the crop and not to the whole area on which the crop is planted. The lobour requirements for drip irrigation are low; the system is easily automated or could be operated manually with little effort with proper design. It promotes improved plant growth and productivity, larger yield, better crops are important benefits to the grower, whose livelihood depend on the irrigation system.

The Study Area

The village Chavanwadi is situated in the western part of Madha tahsil. It is 25 kilometers away west to tahsil head quarter. The absolute location of Chavanwadi village is 18^0 00' 47'' North latitudes and $75^0$20' 55''East longitude. It is located in the heart of drought prone area of Maharashtra and is a part of Deccan plateau. The village is bounded on the North and West by the village Tembhurni, on the East by village Venegoan and Akole and on the South by village Bembale. The average height of village is 511 meters from mean sea level and slope is from west to eastward. The village has hot and dry climate, with an average annual rainfall of 550 MM, rainfall is uncertain and unpredictable. Majority part of village is covered by medium soils. The total geographical area of village is 855.33 hectors out of them 825.82 hectares (96.54%) is under cultivation. The village has 95.91 percent irrigated area to total net sown area due to the Ujani left bank canal. Total population of village Chavanwadi (Te) is 1113 as per the censes of 2011. The village has 96 per cent agricultural workers, which indicates that agriculture is the main occupation of the village. The literacy rate of village is 79.24 percent which was lower than tahsil.

Rational of the study

Innovation in agriculture is very important due to the increasing demand for agricultural commodity to fulfill the need of rapidly increasing population. An innovation leads the agricultural productivity and save natural resources, time and money. Drip irrigation is an important innovation in agriculture which conserve and manage water resource in turn lead agricultural productivity. In the present day, drip irrigation is most essential technological factor due to inadequate water resources. The drip irrigation method save water, fertilizer by allowing water to drip slowly to the roots of plants, either into the soil surface or directly on the root zone, through the network of valves, pipes, tubing and emitter. In the study area the rainfall is irregular, uncertain and variation in annual rainfall from year to year is fairly large. Here agriculture is gamble with monsoon. If rainfall is scare it results into crop failure. Sugarcane is water consuming crop. To increase irrigated area and increase production of sugarcane, drip irrigation is most important innovation. Therefore attempt is made here to examine the impact of drip irrigation as a innovation in agriculture on per hectare yield of sugarcane in village Chavanwadi.

Hypothesis

The per hectare yield of sugarcane increases with the increase of drip irrigated area.

Objectives

The main objectives of this paper are as following.

1) To examine the impact of drip irrigated area on per hectare yield of sugarcane

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

Data collection and Methodology

In order to meet these objectives the relevant information and data regarding drip irrigated area and per hectare yield of sugarcane collected and used for the year of 2018-19 are based on the primary sources. For which special questionnaire were designed and field survey has been made to obtain primary data in Octomber2018. During the field survey, 25 farmers were surveyed out of 51 farmers those have drip-irrigation facility, which constitutes 50 percent of drip-irrigated farmers, every 2nd farmer is assessed. It has been helped to understand drip irrigated area and per hectare yield of sugarcane. Information also collected from Talathi office.

Collected rough data are processed. On the basis of field survey average per hectare yield of each farmer is determined. To examine the impact of drip irrigated area on per hectare yield of sugarcane the Pearson's Coefficient of Correlation technique has been utilized. The degree of relationship by considering percentage of drip 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. Analysis of the study has been made with help of the statistical techniques and on the basis of this results and conclusions are drawn.

Result and Discussion

Percentage of drip irrigated area and Per hectare yield of sugarcane:

The table-1 indicates that on an average the village as a whole has 47 per cent drip irrigated area out of total irrigated area under Sugarcane in the year of 2017. The table also indicates that drip irrigated area under sugarcane of farmers is ranging in between 16.67 percent and 100 percent of total irrigated area. In Chavanwadi village there is 8 percent farmers those have more than 67 per cent drip irrigated area to total irrigated, while 24 per cent farmers have less than 33.33 per cent of drip irrigated area to total irrigated area under Sugarcane.

Table-1:

Drip Irrigated area and per hectare yield of sugarcane in Village Chavanwadi (2018-19)

Sr. No. of farmers	Irrigated area under Sugarcane in acre	Drip Irrigated area under Sugarcane in acre	% of Drip irrigated area	P. H. Yield of sugarcane in tons
1	7	2.5	35.71	110.71
2	4	2	50.00	132.50
3	7	3	42.86	115.00
4	4	2.5	62.50	147.50
5	3.5	1	28.57	139.29
6	7	4	57.14	200.00
7	8	5	62.50	123.75

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8	5	1	20.00	91.50
9	7.5	3	40.00	50.00
10	11	7	63.64	180.00
11	3	1.5	50.00	112.50
12	6	3.5	58.33	250.00
13	3	3	100.00	200.00
14	2	2	100.00	230.00
15	15	8.5	56.67	108.33
16	9.5	2	21.05	105.26
17	4	2	50.00	106.25
18	6.5	2.5	38.46	100.00
19	3	2	66.67	144.17
20	4	1.5	37.50	90.63
21	5	1	20.00	100.00
22	4	1.5	37.50	125.00
23	2	1	50.00	112.50
24	3	1	33.33	120.83
25	6	1	16.67	57.00
			r =	0.722095
			r^2 =	0.521421

Source: compiled by researcher on the basis of field Survey (Oct 2018)

The table 1 also exhibits that the average per hectare yield of sugarcane is 130.11 tons in the study area in the year of 2018-19. But it is varies from farmer to farmer. Per hectare yield of sugarcane is ranging from 57 tons to 250 tons during the period of investigation. On an average per hectare yield of sugarcane are high of those farmers who have high percentage of drip irrigated area. But there are some exceptions that have high percentage of irrigated area but per hectare yield is low.

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

1) The positive relationship between the percentage of drip irrigated area (X) and per hectare yield of sugarcane (Y) has been observed in the village Chavanwadi. The coefficient of correlation in this regard is at r = + 0 .722095. 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 0.521421, which reveals that the independent variable (X) i.e, the percentage of drip irrigated area are explaining 52.14 per cent of the total variations in dependent variable (Y) i.e. the per hectare yield of sugarcane in the village Chavanwadi. It is a good explanation because more than 50 per cent of the variations in (Y) per hectare yield of sugarcane to be influenced by the variable (X) i.e. percentage of drip irrigated area and about 47.86 per cent of the variation is left to be influenced by other variables.

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2) The functional form of linear relationship of Y on X found to be at Y = 51.80 + 1.632x. 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 1.632 tons per hectare yield 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 is $t = (b-\beta) \sqrt{(n-2)\Sigma(Xi-X^-)^2 \div \Sigma (Yi-yi)^2}$ (Dr. Singh Sukhminder, et. all, (1986)

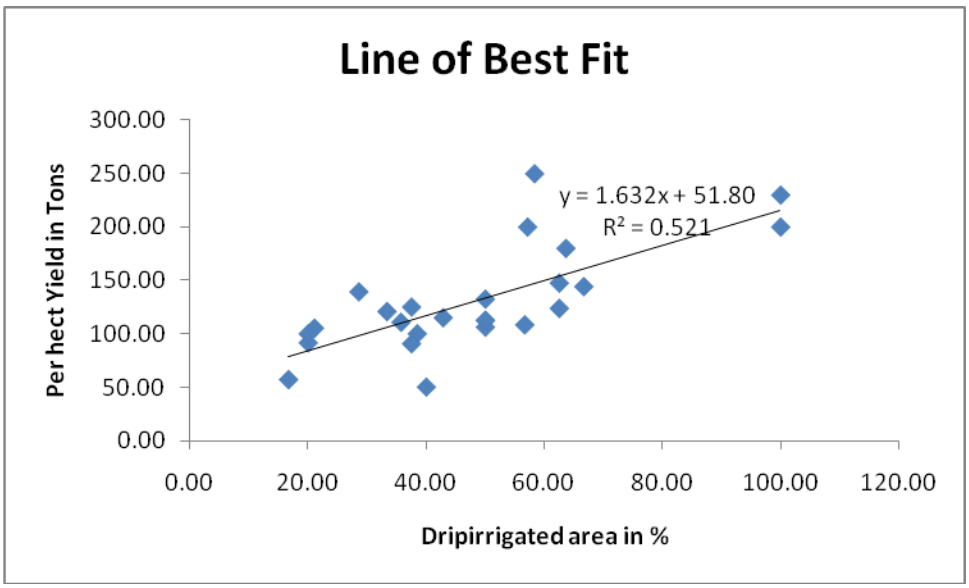

Figure-1

The calculated value of 't' in this exercise is found at 5. It is observed that this calculated value is higher than the tabulated value of 't' (2.81) at the 23 degree of freedom (df = n –2, where 'n' is 25) even at 1 per cent level of significance.

3) In order to understand the degree of fit of regression equation and the accuracy level of predicted values (y) for the farmers Chavanwadi 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 confidence interval of the predicted values are worked out at Y = Y ± SE (Y) (The SE (Y) for the present exercise is 33.67 and SY is the 48.67). 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 20 farmers out of 25 farmers in the present study lie within the range of zero ± SE, 04 and within ± SE to ± 2 SE and 1 > 2SE.

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Table -2: Residuals from regression of per hectare yield of Sugarcane of farmers.

Sr. No. Of Farmers	Y	yi	Yi-yi
1	112.50	110.09	0.63
2	120.83	133.40	-0.90
3	57.00	121.74	-6.74
4	112.50	153.80	-6.30
5	120.83	98.43	40.86
6	57.00	145.06	54.94
7	112.50	153.80	-30.05
8	120.83	84.44	7.06
9	57.00	117.08	-67.08
10	112.50	155.65	24.35
11	120.83	133.40	-20.90
12	57.00	147.00	103.00
13	112.50	215.00	-15.00
14	120.83	215.00	15.00
15	57.00	144.28	-35.95
16	112.50	86.16	19.11
17	120.83	133.40	-27.15
18	57.00	114.57	-14.57
19	112.50	160.60	-16.43
20	120.83	113.00	-22.38
21	57.00	84.44	15.56
22	112.50	113.00	12.00
23	120.83	133.40	-20.90
24	57.00	106.20	14.63

Source: Compiled by researcher on the basis of field survey (Oct. 2018)

Now the obvious inference is that the 80 per cent of the total number of observation (n is 25) the regression is a good indicator meaning thereby that the variations in per hectare yield of Sugarcane is the function of the variations in percentage of drip irrigated area. In the case of other farmers with residuals between > ± SE to ± 3 SE, the situation is different because here the regression is a poor indicator. It clearly indicates that these are the farmer whom the influence of variables other than the independent one. The variations in per hectare yield of sugarcane of farmers in the latter case may be due to the variation in soil type, variation in use of fertilizer, variation in variety of seeds, variation in farmer's cautious.

Conclusions

This study reveals that there is high positive correlation between percentage of drip irrigated area and per hectare yield of sugarcane in the village Chavanwadi. The percentage

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of drip irrigated area is found to be more effective than the other variables considering per hectare yield of sugarcane. It is found that increase of one per cent of drip irrigated area causes for an increase of 1.632 tons per hectare yield of sugarcane of farmers. The study also indicate that the 80 per cent of the total number of observation (n is 25) the regression is a good indicator meaning thereby that the variations in per hectare yield of Sugarcane is the function of the variations in percentage of drip irrigated area. It means that the use of innovations in agriculture is more useful to increase the crop yield and save the resources and money.

Recommendations

It is found that the increase in percentage of drip irrigated area is helpful to improve per hectare yield , so it is recommended that public awareness should made regarding water conservation, application of drip irrigation and proper utilization of water in the farmers to increase irrigated area in turn to increase per hectare yield.

References

1. Dr. Singh Sukhminder, Dr. SinghT.P.,Dr. Bansal M.L.And Dr.Rakesh Kumar (1986): Statistical Methods for Research Workers, Central publishers , Mahraj Nagar, Ludhiana.pp197-234,284-233
2. Noor Mohammad (1992): Anthropogenic Correlation and determinant of Agriculture Productivity, New Dimension in Agriculture Geography Vol 8P. 140
3. Noor Mohammad & A. Majeed (1995): Determinants of Agricultural Prductivity In Arid Region, New Dimensions In Agricultural Geography Vol.-8, Pp103
4. Hornby A. S. (2015): Oxford Advanced Learner's Dictionary, Oxford University Press, great Clarendon Street, Oxford ox 26Dp, UK, Pp811
5. Roy Prithwish (2004): 'Economic Geography'- A Study of Resources. New Central Book Agency, Kolkata-West Bengol.Pp-147-148.
6. Reddy M. V. & Reddy B. K. (1992): Changing Pattern of IrrigationIn Andhra Pradesh, New Dimensions In Agricultural Geography Vol.-3, Pp. 239

