RESEARCH FRONT

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Impact of Drip irrgation On Sugarcane Productivity In Drought Prone Area (A case study of Barshi Tahsil in Solapur District)

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Abstract

Agriculture productivity is a function of number of factors including physical and non-physical factors. Rainfall is uncertain and unpredictable in drought prone area, therefore drip-irrgation is identified as a decisive factor. For the assure agriculture production and to save water drip irrgation is most important factor. There fore attempt is made here to examine the impact of drip-irrigation on per hectare yield of sugarcane in Barshi tahsil. The paper is mainly based on primary data. To examine the impact of 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 Barshi tahsil. It is found that increase of one per cent of irrigated area causes for an increase of 0.705 ton per hectare yield of sugarcane of farmers.

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

Introduction

Etymologically agriculture geography deals with the arts and science of domestication of plants and animals (M. Husain, 2002). In modern sense the Agriculture consist of practice of cultivation of crops raising livestock, fish, pig farm, goat farm and poultry. Directly and indirectly, the Indian economy is depending on agriculture. The agriculture provides livelihood to about 65 per cent of total labour force. Agriculture is base of trade, transport and trade. In Maharashtra state about 65 per cent of the total workers depend on agriculture and allied activities.

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 variables have made a significant impact on both agricultural pattern and productivity.

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 & Reddy, 1992). 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 agricultural production. It is irrigation methods, which save water, fertilizer by allowing water to drip

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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. 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.

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. To increase irrigated area and assure agriculture production drip irrigation is most important factor. On this basis it can be hypothesized, that the higher is the percentage of irrigated area, the more is the per hectare yield of sugarcane. There fore attempt is made here to examine the impact of drip irrigation on per hectare yield of sugarcane in Barshi tahsil.

The Study Area

The Barshi tahsil lies in North-Eastern part of Solapur District, which is a part of drought prone area of Maharashtra. Absolute location of tahsil is 17^0 8’ 3’’ to 18^0 8’ 11’’North latitude and 75^0 30’ 10’’ to 76^0 6’ East longitudes. The North southern length of the Tahsil is 45.5 Km and East-West width is 39 Km. The adjoining tahsils are Madha to it’s South-West, Mohol and North Solapur to it’s South, Paranda Bhoom and Washi of Osmanbad district to it’s North-West and East respectively The geographical area of tahsil is 152200 hectors, it cosititute 10.22 per cent of total area of district. out of total geographical area 91.69 per cent is under cultivation. The high share of cultivators and agricultural labours in the working population, indicates that the agriculture is the main occupation of people in the tahsil. The tahsil has hot and dry climate, with an average annual rainfall of 660 mm. The tahsil is deprived from major irrigation project.

Objectives

The main objective of this paper are as following.

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

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 2011-12 are based on the Primary sources. For which special questionnaire were designed and field survey has been made to obtain primary data. During the field survey, 250 farmers were surveyed. It has been helped to understand drip irrigated area and per hectare yield of sugarcane. Stratified sampling method is applied, in first phase all137 villages are divided into 10 strata i.e. revenue circles. In the second phase one village from each circle is selected

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by random method. In the third phase 250 drip irrigated farmers (25 from each village) of these 10 villages are selected by random sampling technique. Information also collected from Talathi office.

Collected rough data are processed. On the basis of field survey average per hectare yield of each village 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 conclusion are drawn.

Percentage of drip irrigated area and Per hectare yield of sugarcane

The table-1 indicates that on an average the tahsil as a whole has 47.55 per cent drip irrigated area out of total irrigated area during the period of investigation. The table also indicates that drip irrigated area of villages is ranging in between 31.85 percent and 84.09 percent of total irrigated area. In Barshi tahsil there is 10 percent villages those have more than 71 percent drip irrigated area to total irrigated, while 80 per cent villages have less than 54 per cent of drip irrigated area to total irrigated area.

The average per hectare yield of sugarcane is 119.12 ton in the Study area during the period of investigation but it is varies from village to village. Per hectare yield of sugarcane is ranging from 97 ton to 125 ton during the period of investigation. On an average per hectare yield of sugarcane are high of those farmers who have high drip irrigated area. But there are some exceptions that have high percentage of irrigated area but per hectare yield is low.

Table-1

Irrigated area and Per hectare yield of sugarcane in Barshi tahsil (20011-12)

Sr. No.	Name of village	drip irrigated area (acre)	Irrigated area (acre)	% of drip irrigated area to total irrigated area	Per hectare Yield (ton)
1	Pimpari (pa)	84.5	217.5	38.85	114.5
2	Javalgaon	78	207	37.38	100
3	Gulpoli	105.25	198	53.16	125
4	Boregaon	63.5	125	50.80	130
5	Dadshinge	58.5	101.5	57.64	117.5
6	Sasure	185	220	84.09	140
7	Pimpalgaon	43	135	31.85	116.23
8	Wanewadi	14	27	51.85	137
9	Turk pimpari	75	171.5	43.73	114
10	Kategaon	80.1	251.1	31.90	97
	Tahsil	786.85	1653.6	47.58	119.12

Source: Field Survey (March 2012)

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In the context of objective following findings have 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 Barshi tahsil. The coefficient of correlation in this regard is at r = + 0 .77. 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 0.59, which reveals that the independent variable (X) i.e, the percentage of drip irrigated area are explaining 59 per cent of the total variations in dependent variable (Y) i.e. the per hectare yield of sugarcane in the Barshi tahsil. It is a good explanation because 59 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 41 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 = 85.17 + 0.705x. 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 0.705 ton per hectare yield of farmers per year.

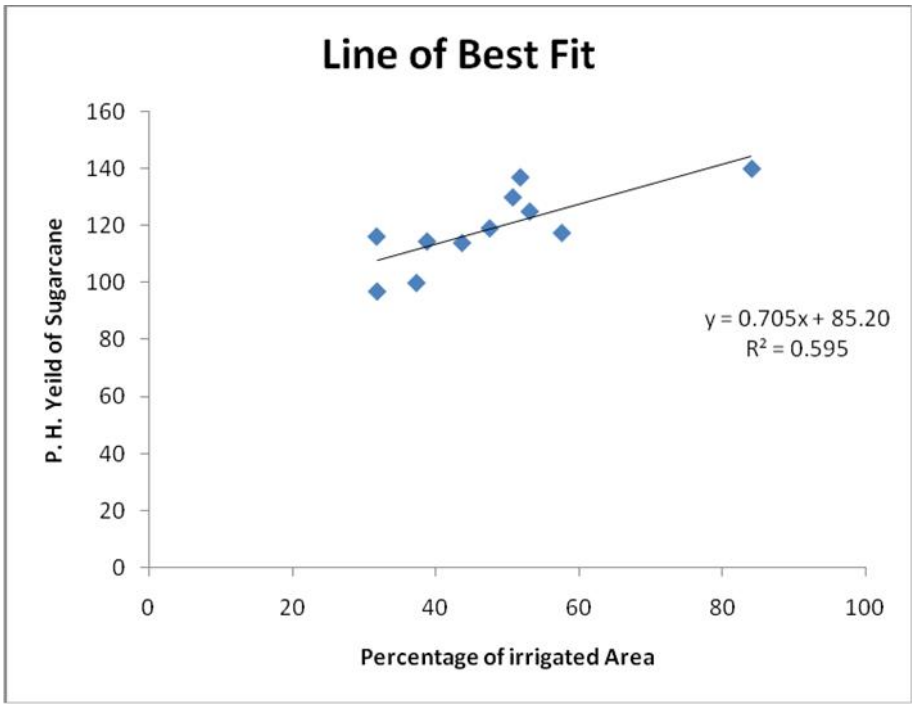

Figure-1

By testing the significance of regression coefficient (a test of significance), the validity of this causal relationship has been confirmed,

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

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The calculated value of 't' in this exercise is found at 3.42. It is observed that this calculated value is higher than the tabulated value of 't' (3.17) at the 08 degree of freedom (df = n –2, where 'n' is 10) 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 villages of Barshi tahshil 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 9.05 and SY is the 14.22). 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 7 villages out of 10 villages in the present study lie within the range of ± SE, 03 within ± SE to ± 2 SE. Now the obvious inference is that the 70 per cent of the total number of observation (n is 10) the regression is a good indicator meaning thereby that the variations of per hectare yield of Sugarcane is the function of the variations of percentage of drip irrigated area.

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

Sr. No. Of Farmers	Y	y	Y-y
1	114.5	112.55	1.95
2	100	111.51	-11.51
3	125	122.64	2.36
4	130	120.97	9.03
5	117.5	125.80	-8.30
6	140	144.44	-4.44
7	116.23	107.61	8.62
8	137	121.71	15.29
9	114	115.99	-1.99
10	97	107.65	-10.65

Source: Complied by Researcher on the basis of field survey

In the case of other villages 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 villages whom the influence of variables other than the independent one. The variations of per hectare yield of sugarcane of villages in the latter case may be due to the variation in soil type variation in fertilizer, Variation in pesticides, Variation in farmer's cauciousness.

Conclusions

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

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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 0.705ton per hectare yield of sugarcane of farmers. Therefore it is to be stated that the increase in percentage of drip irrigated area is helpful to improve per hectare yield, where rainfall is inadequate and unpredictable. Public awareness should made regarding water conservation, drip irrgation and proper utilization of water in the farmers to increase irrigated area in turn to increase per hectare yield.

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