# **Geography Journal**

# AN INFLUENCE OF GROWTH OF IRRIGATED AREA ON AGRICULTURAL LAND USE: A CASE STUDY OF COMMAND AREA OF DUDHGANGA PROJECT IN KOLHAPUR DISTRICT

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# ABSTRACT

and is the basic resource of human society. Agricultural land-use is a proportion of area used to grow different crops during the agricultural year. Cropping or agricultural enterprise pattern are the extent to which the arable land under different agricultural activities can be put to use. Irrigation means the supply of water to the land by means of channels, streams, and sprinklers in order to permit the growth of crops. Agriculture land use is a function of number of factors including physical and non-physical factors. Rainfall is uncertain and unpredictable in India; therefore irrigation is identified as a decisive factor. Irrigation play most important role in agricultural land use. Therefore attempt is made here to examine the impact of growth of irrigated on agricultural land use in command area of Dudhganga project. The paper is mainly based on primary data. To examine the impact of growth of irrigated area on growth of area under cereal crops the Pearson's Coefficient of Correlation, Coefficient of determination and regression technique has been utilized. The study reveals that there is medium negative correlation between growth of irrigated area and growth of area under cereal crops in command area of Dudhganga project. It is found that increase of one per cent of irrigated area causes for decrease of area under cereal crops by 0.158 percent to total net sown area in study region.

**KEYWORDS** : Irrigated area, Area under cereal crops, Correlation, Regression.



### **INTRODUCTION**

Among the primary activity agriculture is most important as majority of population is depend on agriculture for their livelihood (Singh & Dhillon, 1984). Watson Longman English dictionary (1976) defines the word 'agriculture' as science or the art or the practice of large scale soil cultivation in order to produce crops.

Land is the basic resource of human society. Its utilization shows a reciprocal relationship between the prevailing ecological conditions of particular region and man. Land use is the surface utilization of all developed and vacant land on a specific point, at a given time and space (Patel Ganesh, 2014). This "Leads one back to the village farm and the farmer, the fields, gardens, pastures,

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fallow land, forests and to the isolated farmstead" (Freeman T.W., 1968). The idea of a land use hierarchy varies with the production and consumption factors. The production factors are land, transportation facilities and the stage of technological advancement. The consumption factor includes the number of people, consumption of goods per person and the gross exports. Any shift in the consumption of commodities may change the consumption of other commodities. Land use a function of four variables – Land, water, air and man. Each plays its own role in composing its life history. Land constitutes its body, water run though is veins life blood, Air give it Oxygen and man alts as the dynamic actor to reflect its types, pattern and distribution (Singh R. P., 1992). Land use is an important aspect of geographical studies particularly related to agricultural geography, as geography deals with the spatial relationship between these aspects and planning (Mandal R. B., 1990).

Agricultural land-use is a proportion of area used to grow different crops during the agricultural year. Cropping or agricultural enterprise pattern are the extent to which the arable land under different agricultural activities can be put to use (Singh and Dhillon, 1987). The demand for new uses of land may be inspired by a technological change or by a change in the size, composition and requirements of a community. Some changes are short-lived, where as others represent a more constant demand (Jackson J.N., 1963).

Irrigation is identified as a decisive factor in Indian agricultural land use due to high variability and inadequacy of rainfall. Irrigation is the watering of land by artificial means to foster plant growth (Merrium 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 basic determinants of agriculture because its inadequacies are the most powerful constraints to change agricultural land use. It is observed that with the growth of irrigated area, the area under cash crops are increased on the other hand area under cereals, pulses are decreased. So it is hypothesize that higher is the growth of irrigated area more is the decrease in area under cereal crops. Therefore attempt is made here to assess the impact of growth of irrigated area on growth of area under cereal crops.

#### **STUDY AREA**

Dudhganga Irrigation Project is located in Kolhapur District of south Maharashtra. Dudhganga Project is mainly irrigation project and its command area



#### Figure-1

lies between  $16^{\circ}26'15''$  north to  $16^{\circ}43'12''$  north latitude and  $74^{\circ}01'54''$  east to  $74^{\circ}39'22''$  east longitude (Fig. 1). It is a big irrigation project built on Dudhganga river having 27.43 TMC capacity. The gross command area of this multi-state project is 93,209 hectares of which 73,340 hectares lies in Maharashtra.

Dudhganga river which gets its origin in Western Ghats and flows eastwards and joins to Krishna river in the state of Karnataka. The command area covers the parts of six tahsils in Kolhapur district, namely, Radhanagari, Bhudargad, Kagal, Hatkanagle, Shirol and Karveer comprising 96 villages. It occupies an area of 63212 hectares with population of 267275 persons (2011). The region has varied topography with narrow basin in the west which gradually broadens in the east. The study region has monsoon climate dominates. The average maximum temperature of the region is 300c and minimum 140c. The region has varied type of rainfall which ranges from 5000 mm to west and 600 mm to the east. The western part of the command area is occupied by an alluvial and laterite soils and eastern part is covered with alluvial and black soils. The area is thickly populated and agriculture is the main source of livelihood of the people.

#### **OBJECTIVES:**

The main objectives of this paper are as following

To examine the influnce of growth of irrigated area on growth of area under cereal crops
To estimate the rate of change in area under cereal crops in relation to change in percentage of irrigated area.

#### DATA COLLECTION AND METHODOLOGY:

The present study is based on primary data source. In order to meet these objectives the relevant information and data regarding irrigated area, area under cereal crops, are collected through extensive field survey with the help of schedule, questionnaire, interview and discussion. During field survey 48 villages out of 96 are assessed for which The systematic sampling method is employed and every second village is considered for collection of data for the pre and post irrigation project period.

Collected rough data are processed. To determine growth of irrigated are and growth of area under cereal crops the percentage to net sown are is computed.

To examine the influence of irrigated area on area under cereal crops the Pearson's Coefficient of Correlation technique has been utilized. The degree of relationship by considering growth of irrigated area as an independent variable 'X' and growth of area under cereal crops 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.

#### **DISCUSSION:**

#### Impact of Growth of Irrigated area on Growth of Area Under Cereal crops:

The negative relationship between the growth of irrigated area (X) and growth of Area under Cereal crops (Y) has been observed in the command area of Dudhganga irrigation project. The coefficient of correlation in this regard is at r = -0.62126. It indicates that there is a good negative relation in between the variable 'X and 'Y'. The degree of linear association between these two variable obtained by using the coefficient of determination is found to be at 0.385964, which reveals that the independent variable (X) i.e. growth of irrigated area are explaining 38.59 per cent of the total variations in dependant variable (Y) i.e. growth of area under cereal crops in the study area. It is a good explanation because 3859 per cent of variation in 'Y' growth of Area under cereal crops to be influenced by the variable 'X' i.e. growth of irrigated area and about 61.64 percent of variation is left to be influenced by other variables. The functional form of linear relationship of 'Y' on 'X' found to be at y = -1.766+(-0.158x), the line of best fists shown in figure -2.

The regression coefficient indicates that increase of one per cent irrigated area causes for decrease of 0.158 percent area under cereal crops to total net sown area in study area. 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 6.31. It is observed that this calculated value is higher than the tabulated value of 't' (2.70) at the 46 degree of freedom (df = n - 2, where 'n' is 48) even at 1 per cent level of significance.

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Table 1: Growth of Irrigated area and growth area under cereal crops in Command area of								
Dudnganga project								
Name of	Growth of	Growth of	Name of Village	Growth of	Growth of			
village	irrigated area	area under		irrigated	area under			
	in %	cereal crops		area in %	cereal crops			
Donori	0.90		Komehali	29.40	21.20			
Panon	0.89	-0.51	Nempali	58.40	-21.59			
Bajawade	1.61	-11.3	Vnanali	61.//	-11.96			
Mallewadi	19.66	-1.21	Savarde Kh.	14.74	-7.55			
Solankur	8.12	-3.3	Gorambe	18.45	-5.19			
Mangewadi	31.81	-7.45	Shendur	13.73	-3.42			
Akanur	12.05	-3.67	Bamani	86.02	-15.74			
Kapileshwar	17.21	-6.7	Siddhanerli	47.36	-9.11			
Turambe	40.65	-6.75	Vhannur	16.13	-6.16			
Titawe	12.54	-3.04	Kagal (r)	37.5	-4.99			
Arjunwada	51.86	-2.76	Vandoor	80.82	-11.38			
Majagaon	32.9	-6.92	Sangaon Kasaba	25.82	-6.45			
Chandre	21.38	-5.84	Randivewadi	27.51	-3.67			
Sarvade	24.78	-2.93	Pimpalgaon Bk.	21.05	-4.02			
Savarde	3.25	7.74	Tikkewadi	11.01	-2.31			
Pandewadi	19.47	-6.89	Nadhavade	39.11	-7.47			
Aini	31.08	-0.94	Khaparewadi	19.73	-6			
Undarwadi	30.37	-3.06	Ispurli	59.46	-13.44			
Boravade	18.01	-1.08	Wadakashivale	32.31	-8.1			
Bidri	28.08	-4.45	Khebavade	56.88	-14.33			
Sonali	14.86	-3.97	Dindnevli	23.69	-8.31			
Kurni	23.64	-5.49	Talandage	34.59	-5.82			
Chaundal	28.92	-4.93	Yalgud	28.88	-10.41			
Pirachiwadi	39.78	-9.25	Takliwadi (n.v.)	38.71	-12.47			
Sake	16.71	-4.26	Dattawad	13.7	-4.64			
			Coefficient of Correlation		-0.62126			
			Coefficient of					
			Determination	0.385964				

Source: Compiled by author on the basis of field survey



Figure -2

Table -2: Residuals from Regression of area under cereal crops in Command area of								
Dudhganga project								
Name of Village	yi	Yi-yi	Name of Village	yi	Yi-yi			
Panori	-1.91	1.40	Kembali	-7.84	-13.55			
Bajawade	-2.02	-9.28	Vhanali	-11.53	-0.43			
Mallewadi	-4.87	3.66	Savarde Kh.	-4.09	-3.46			
Solankur	-3.05	-0.25	Gorambe	-4.68	-0.51			
Mangewadi	-6.79	-0.66	Shendur	-3.94	0.52			
Akanur	-3.67	0.00	Bamani	-15.36	-0.38			
Kapileshwar	-4.49	-2.21	Siddhanerli	-9.25	0.14			
Turambe	-8.19	1.44	Vhannur	-4.31	-1.85			
Titawe	-3.75	0.71	Kagal (r)	-7.69	2.70			
Arjunwada	-9.96	7.20	Vandoor	-14.54	3.16			
Majagaon	-6.96	0.04	Sangaon Kasaba	-5.85	-0.60			
Chandre	-5.14	-0.70	Randivewadi	-6.11	2.44			
Sarvade	-5.68	2.75	Pimpalgaon Bk.	-5.09	1.07			
Savarde	-2.28	10.02	Tikkewadi	-3.51	1.20			
Pandewadi	-4.84	-2.05	Nadhavade	-7.95	0.48			
Aini	-6.68	5.74	Khaparewadi	-4.88	-1.12			
Undarwadi	-6.56	3.50	Ispurli	-11.16	-2.28			
Boravade	-4.61	3.53	Wada kashiva le	-6.87	-1.23			
Bidri	-6.20	1.75	Khebavade	-10.75	-3.58			
Sonali	-4.11	0.14	Dindnevli	-5.51	-2.80			
Kurni	-5.50	0.01	Talandage	-7.23	1.41			
Chaundal	-6.34	1.41	Yalgud	-6.33	-4.08			
Pirachiwadi	-8.05	-1.20	Takliwadi (n.v.)	-7.88	-4.59			
Sake	-4.41	0.15	Dattawad	-3.93	-0.71			

Source: Compiled by author on the basis of field survey

The confidence intervals of the predicted values are worked out at  $Y \pm SE(Y)$  (The SE(Y) for the present exercise is 2.88 and SY is the 4.68). 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  $t = (b-\beta) n(-2) X(-X^{-})^{2} \div ((i-yi)^{2})^{2}$ 

In this context it has been observed that the predicted values (given in table-2) of 37 out of 48 Villages in the present study lie within the range of  $\pm$  SE and 9 within  $\pm$  SE to  $\pm$  2 SE and 2 >  $\pm$  2 SE. Now the obvious inference is that the 77.08 per cent of the total number of observation (n is 48) the regression is a good indicator meaning thereby that the variations in decrease of area under cereal crops of villages in command area of Dudhganga project is the function of the variations in irrigated area. In the case of other villages 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 villages whom the influence of variables other than the independent one. The variations in decrease of area under cereal crops of villages in the latter case may be due to the variation in rainfall and soil, variation in use of fertilizer and variation in capital of farmers

# **CONCLUSIONS**

This study reveals that there is medium negative correlation between growth of irrigated area and growth of area under cereal crops in villages of command area of Dudhganga project in Kolhapur

district. The coefficient of correlation in this regard is -0.62126. The degree of linear association between these two variable obtained by using the coefficient of determination (r2) is found to be at 0.385964, which reveals that the independent variable (X) i.e. growth of irrigated area are explaining 38.59 per cent of the total variations in dependant variable (Y) i.e. area under cereal crops in villages of of command area of Dudhganga project. The percentage of irrigated area is found to be more effective than the other variables considering decrease of area under cereal crops. The functional form of linear relationship of 'Y' on 'X' found to be at y = -1.766 + (-0.158x). The regression coefficient indicates that increase of one percent irrigated area causes for decrease of area under cereal crops by 0.158 percent in study region. The confidence intervals of the predicted values states that variations in decrease of area under cereal crops by 0.158 percent in study region. The confidence intervals of the predicted values states that variations in decrease of area under cereal crops by 0.158 percent in study region. The confidence intervals of the predicted values states that variations in decrease of area under cereal crops by 0.158 percent in study region. The confidence intervals of the predicted values states that variations in decrease of area under cereal crops of villages in command area of Dudhganga project is the function of the variations in irrigated area. Therefore it is to be stated that the increase in percentage of irrigated area is helpful to increase area under cash crops such as sugarcane as it is water consuming crop. Public awareness should made regarding to cultivate cereal crops to save water and to increase irrigated area in turn to increase agricultural productivity.

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