Cropping Intensity and Farm Size – A Case Study of Chashma Right Bank Canal (CRBC), in D.I.Khan

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Abstract

The basic objective of this paper is to examine the farm size and cropping intensity relationship in the command area of CRBC. Stage I and Stage II of CRBC are taken for the study. A traditional inverse relationship lies in both the stages of CRBC. The cropping intensity is highest in small farms while lowest in large farms. Cropping intensity also differ in two stages of CRBC. Cropping intensity is high in Stage I due to canal irrigation (Paharpur Canal) and tube wells in the area.

Keywords: Chashma Right Bank Canal (CRBC), Cropping, D.I.Khan, Pakistan

Introduction

Agriculture in Pakistan not only provides food and fiber it is also a greater source of direct and indirect employment. The economy heavily relies on the agriculture sector. In an agrarian society like Pakistan, irrigation is good source of employment and adds to capital formation. A major objective of agricultural development is to increase agricultural productivity which in turns increases farm incomes and lessen the incidence of poverty. The increase in agricultural productivity may be largely due to increased use of HYV seeds, fertilizer and irrigation. It is therefore imperative that the future of Pakistan agriculture lies in the direction of increasing multiple cropping.

Chashma Right Bank Irrigation Project (CRBIP) has a major role in the agriculture sector not only in Khyber Pakhtun Khaw (KPK) but also in Punjab province. The major reason of this large capital investment in the area is to increase the production of major crops and improve farm incomes. Farm size has a major bearing on many aspect of crop production and depends on many conditions. Farm sizes in CRBC are in transition from a Rod Kohi (Flood / spate irrigation system from

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hill torrents) system of irrigation to canal irrigated system. The subject has been examined intensively in Pakistan.

Cropping intensity (CI) is an index of single or double cropping. Cropping intensity is defined as the seasonal area cropped divided by the command area. If for example the 75,000 acres is the cropped area during Rabi out of total command area of 100,000 acres, then CI for Rabi is 75 % and if 50,000 acres is the cropped area during Kharif out of same total command area the CI is 50% for the Kharif. But the yearly total CI would be the summation of two CI's that is 75 + 50 = 125 %. For perennial crops such as sugarcane or orchards the CI is counted on a yearly basis not seasonal. If the cropped area is 10 % then CI is a total of 10 %, not 10% for Rabi and 10 % for Kharif. (Sheladia Associates 2001)

Objectives

The present study has following objectives

1. To examine the farm size – cropping intensity relationship after the CRBIP in the command area of Stage I and Stage II
2. To compare the farm size – cropping intensity relationship between Stage I and Stage II of CRBC.

Literature Review

The subject has been examined intensively in Pakistan. Available literature shows a negative relationship between farm size and cropping intensity. It has also been observed in many underdeveloped economies of the world with widely different climatic, land holdings and cropping pattern that an inverse relationship exists between farm size and CI. Bharadwaj 1974, Griffin 1974, Berry and Cline 1976, Routmasset 1976 and Khan 1979.

The same inverse relationship was also seen in the European agriculture before the First World War (Lenin [1961]) and in China also in 1930 (Buck [1973]).

Sau (1978)remarked that large farms has low CI as compared to big farms and says that there is an inverse relationship between farm size and CI in few Indian states.

Sen (1964, 1966) argued that small farms being family enterprises had a lower cost of labor when compared to large farms. So small farms are cultivated more intensively and produce a higher level of output.

Jehangir et al (1999) analyzed the Rechna Doab in the province of Punjab and states that their prevails an inverse relationship between farm size and the CI.

No such study is available which shows the relationship between Farm Size and CI in the command area of CRBC.

Methodology

Out of three stages of CRBC only two stages namely Stage I and Stage II are selected for the study. Stage I and II lies in the province of Khyber Pakhtunkhwa while Stage III mostly irrigates the Punjab province. The primary sampling units are the distributaries. Six distributaries are selected in both the stages. In Stage I (Kot Hafiz, Additional and D-4) and in Stage II (D-5, D-7 and D-13) are selected. On each distributary 15 farmers – irrigators were selected for interview; it means that for 6 distributaries 90 farmers were selected. A detailed questionnaire was prepared and also a secondary data was used from the Chashma Right Bank Irrigation Project (CRBIP) office in D.I.Khan. The data is collected in both the stages in Dec. 2009.

For data analysis along with tables a log-linear form is used to study the relationship between farm size and the CI in the two stages. The model is

$$\text{Log CI (Stage)} = \text{Log } a + b \log x \text{ (Stage)}$$

Where CI = Cropping Intensity
X = Average size of the Farm
a= A constant
b = The estimated parameter for the explanatory variable x

The above equation explain the relationship between farm size and CI for the two stages, but other explanatory variables can also be included as farm size, tube well, tractor, fertilizer, HYV, water logging and salinity, cropping pattern etc.

Data Analysis

For the analysis of the data, let us explain the relationship with the help of tables. For comparison farms are divided into four categories. That is small, medium, large and very large farms. The explanation is given in the following tables.

Table.1: Farm Size (Acres) and Number of Farms

Farm Size Category wise (Acres)	Farms %	Area %
Small < 6	45	11
Medium 6 – 20	39	35
Large 20- 50	11	29
Very Large > 50	5	25
Total	100 %	100 %

Source: Survey 2009

Farm sizes in the command area of CRBC shows a transition from Rod Kohi to the Canal irrigation and have not reached the optimum sizes based on best mix of crops. Categories of farm sizes are taken after a careful review of the data and the break points are taken as 6, 20 and 50 acres. In most of the above mentioned studies these breaks up are given and used for the analysis of the data. The category of 6 acres or less is according to the definition of government of a subsistence farmer. Table No. I compare the total number of farms with their area. Analysis shows that 84 % of the farmers in small and medium farms control 46 % of the land, while the large and very large farmers 16 % control 54 % of the land and only 5 % controls 25 % of the area.

Table 2.Cropping Pattern by Farm Size and Stage For the Rabbi Season of 2009- 10 and Kharif 2009

	Small			Medium			Large			Very Large		
	I	II	Total	I	II	Total	I	II	Total	I	II	Total
Wheat %	62.5	77.5	70.0	54.6	52.3	53.5	43.5	57.6	50.5	35.0	34.6	34.8
Gram %	5.7	4.0	4.9	4.4	7.4	5.9	6.3	7.8	7.0	7.0	1.8	4.4
Fodder Rabi %	7.4	11.2	8.3	4.5	3.1	3.9	2.3	4.0	2.9	2.3	0.7	1.3
Other Rabi %	6.8	1.6	5.6	4.7	0.5	3.0	1.9	0.7	1.5	0.5	0.1	0.2
Rabi CI	82.4	94.3	88.8	68.2	63.3	66.3	54.0	70.1	61.9	45.8	37.2	40.7
Fodder Kharif %	4.6	7.7	5.5	2.7	2.3	2.5	1.9	1.3	2.0	1.7	0.7	0.9
Rice %	17.0	21.2	18.0	13.9	19.0	19.2	15.5	15.3	15.3	10.0	16.0	14.0
Other Crops Kharif %	7.2	4.5	6.3	5.2	0.6	3.2	2.6	0.5	2.8	1.4	0.0	0.5
Kharif CI	28.8	33.4	29.8	21.8	21.9	24.9	20.0	17.1	20.1	13.1	16.7	15.4
Sugarcane %	17.4	4.3	14.1	17.0	11.7	15.1	22.7	11.2	19.0	15.1	17.0	16.3
Perennial CI	17.4	4.3	14.1	17.0	11.7	15.1	22.7	11.2	19.0	15.1	17.0	16.3
Total CI %	128.6	132.0	132.7	107.0	96.9	106.3	96.7	98.4	101.0	74.0	70.9	72.4

Note. Other crops Kharif also include Maize and cotton

Table No 2 explains the cropping intensity by farm size. Keeping in view the situation and conditions of CRBC it gives a different perspective when we compare the intensities at the farm size level. An inverse relationship prevails that highest CI is seen in small farms while lowest CI is seen in large and very large farms. In both the stages that is I and II the same inverse relationship between CI and farm size prevails.

As explained earlier the log linear form of the model is also applied to know the relationship between CI and farm size. The estimated parameters and related statistics are given below.

Table 3- Estimated values of the coefficient on determinant of CI in Stage I and II

Dependent Variable = Cropping Intensity (CI)

Stage	Constant	X= Average Size of Farm	Standard Error	R^2	F Stat
Stage I	4.936	- 0.1192* (-10. 5455)	0.011	0.91	110.65
Stage II	5.11	- 0.0612* (- 7.312)	0.0082	0.89	52.24

*Note. * shows significant at 1 % level*
Figures in the parentheses shows t – ratios

The negative values of b in the model clearly indicates the negative relationship between CI and farm size in both the stages of CRBC Stage I and Stage II. The coefficient of the CI is significant at 1 % level and the explanatory power of the equation is satisfactory and the R^2 is reasonably high.

The reason for this traditional negative relationship may be due to more intensive use of land, HYV, higher labor input and greater area for irrigation for the small farmers as compared to large farmers. The main reason may also be that during rabi small farmers grow twice as much wheat as the large farms and during Kharif large farms grow more sugarcane. The cropping intensity is high in Stage I as compared to Stage II. The reason is that stage I has a longer experience of canal irrigation (Paharpur Canal) and a facility of tube well irrigation before CRBIP.

Conclusion

The analyses in this study suggest following main points. Firstly it examines the farm size and the CI relationship. The basic objective in this study is to explain the size – cropping intensity relationship after the CRBIP. The analyses of the data show an inverse relationship. The main reason for this inverse relationship is that a newer farm technology has not thrown the small farmers from traditional position of high cropping intensity. Secondly already mentioned that is high labor use, greater irrigated area and more intensive use of land. There are also differences in the cropping intensity between stage I and stage II.

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