

FACTORS AFFECTING WHEAT YIELD: A CASE STUDY OF MIXED CROPPING ZONE OF PUNJAB

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ABSTRACT

A study was carried out at Adaptive Research Farm, Sargodha, Punjab, Pakistan during 2006-07. The objective was to determine the most important factors affecting wheat production in mixed cropping zone of Punjab province. A sample of 200 wheat growing respondents was randomly selected from five villages of four districts. i.e. Sargodha, Jhang, Faisalabad and Toba Tek Singh. Cobb Douglas type production function was employed to assess the effect of sowing time, seed rate, education, fertilizers application, irrigation, etc. on wheat yield. Sowing time, rotavator use, education, seed rate, weedicide cost and use of nitrogenous fertilizer were found as contributing factors towards higher wheat yield on sampled respondents farms with co-efficient values of -0.083 , 0.07 , 0.03 , 0.418 , 0.081 and 0.092 , respectively. So, there is a need to educate the farmers on priority basis for adopting recommended practices. The extension staff can play a pivotal role in this regard.

KEYWORDS: *Triticum aestivum*; farmers; production factors; yields; Punjab, Pakistan.

INTRODUCTION

Out of 121 wheat growing countries, Pakistan ranks 8th in terms of area and production but 29th in terms of yield per unit area (3). Wheat is a leading food grain of Pakistan and occupies a central position in agricultural policies of the country. It contributes 13.8 percent to value added in agriculture and 3.2 percent to GDP. In 2006-2007 wheat was cultivated on an area of about 8.5 thousand hectares with 23 million tons of production (5). This period is typically peculiar in itself. There is visibly no increase in wheat supplies, improved seeds, etc. but still good harvest is coming forth. This according to experts, has been facilitated by favourable weather i.e. sufficient rains and cool temperature at ear setting, grain formation and grain maturity. Any shift of weather from its normal pattern could

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easily wipe out 2-3 million tons of wheat as was witnessed in 2002. Favourable weather may prove as temporary and unreliable source of additional wheat production. So more permanent sources would have to be identified for sustained wheat production.

Hassan (7) estimated the technical efficiency of wheat farmers in mixed farming system of Punjab, using stochastic frontier production function. He found that increasing the weedicide use, number of cultivations, fertilizer use, timely sowing, increasing the education of farmers, providing credit to the farmers and drill sowing are responsible for increased wheat production.

Muhammad and Khan (8) used production model to estimate the productivity of wheat growers in Peshawar Valley. It was found that an increase in nitrogen and phosphorus and decrease in the use of tillage and irrigation enhanced the wheat productivity.

There are many physiological, agronomic, socio-economic, political and management factors responsible for low yields in Pakistan. Poor management is more conspicuous of all the factors. In particular, it lacks in seed rate, fertilization dose, weedicide use and irrigation water delta. Since managerial skill and access to resources vary from region to region, productivity also varies widely across the farming regions.

Moreover, there is wide yield gap between progressive and common farmers which may be attributed to many factors like poor seed rate, weed infestation, inadequate irrigation water, improper dosage of chemical fertilizers and cultural practices, etc. The knowledge of optimum dose of various inputs, and their marginal productivity is vital for making management decisions. Yield difference under similar conditions necessitates analysis of factors, which may help reveal the type and magnitude of variation in causative factors.

The present study was designed to identify factors affecting the wheat yield in mixed cropping zone of Punjab province.

MATERIALS AND METHODS

Primary data for this study were collected through a comprehensive questionnaire from 200 wheat growers of Faisalabd, Sargodha, Jhang and Toba Tek Singh districts. Wheat growers were selected randomly from five villages of each district. From each village ten farmers were interviewed for collecting detailed information.

A regression equation was estimated assuming a modified Cobb Douglas type production function (1, 2, 6). It estimates real contribution of each and every factor affecting yield. Important factors affecting yield i.e. land preparation, sowing time, seed rate, use of rotavator, education, fertilizer application, weedicide cost, irrigation and farm size were incorporated in the analysis. Many factors were left out to keep study within manageable limits.

Cobb Douglas type production function was fitted, which is described as below:-

$$LN\ YLD = b_0 + b_1\ LNPARCEL + b_2\ Dummy\ Education + b_3\ LN\ Rotavator + b_4\ LNPREP + b_5\ LN\ Time\ of\ sowing + b_6\ LNSEED + b_7\ LNIRRI + b_8\ LNNITROG + b_9\ LNPHOSPH + b_{10}\ LNWEDCST + b_{11}\ LNFARMSZ + U$$

Where

LN YLD	=	Natural logarithm of yield per acre in maunds
b_0	=	Constant
LNPARCEL	=	Natural logarithm of parcel of land
Dummy Education	=	Dummy for Education
LN Rotavator	=	Natural logarithm of rotavator
LNPREP	=	Natural logarithm of land preparation
LN Time of sowing	=	Natural logarithm of time of sowing
LNSEED	=	Natural logarithm of land seed rate (kg/acre)
LNIRRI	=	Natural logarithm of irrigation (Number).
LNNITROG	=	Natural logarithm of nitrogenous fertilizer
LNPHOSPH	=	Natural logarithm of phosphatic fertilizer
LNWEDCST	=	Natural logarithm of weedicide cost
LNFARMSZ	=	Natural logarithm of farm size
U	=	Random error term independently and identically distributed with zero mean and constant variance.

b_1 to b_{11} are coefficient.

RESULTS AND DISCUSSION

The effects of all factors studied were investigated through multiple regression analysis. The Cobb Douglas type production function was estimated using the ordinary least square (OLS) method. The R^2 value of 0.55 can be regarded as quite a good fit in view of cross sectional data involved in this study, since it implies that about 55 percent variation in yield explained by independent

variables included in the study. The influence of independent variables on wheat yield is discussed as under:-

Parcel of land

The value of coefficient was found as -2.932 . It indicates that one percent increase in pieces of farm holding decreases the yield by 2.932 percent (Table).

Education

Education plays a vital role in adoption of improved technology and attaining higher productivity level. The educated farmers could manage various farm practices in a better way. The result of the study indicated that coefficient of education was positive (0.030) and was statistically significant. It was found that one percent increase in education could enhance wheat yield by 0.030 percent.

Rotavator use

The coefficient of rotavator (0.070) was statistically highly significant. It shows that one percent increase in the use of rotavator increased the wheat yield by 0.070 percent.

Table . Regression results

Model	Unstandardized coefficients	Sig.
Constant	.365	.000
LNPARCEL	-2.932	.084
Education	0.030	.122
LN Rotavator	0.070	.000
LNPREP	0.0009	.634
LN Time of sowing	-0.083	.000
LNSEED	0.418	.000
LNIRRI	0.016	.675
LNNITROG	0.092	.000
LNPHOSPH	0.004	.428
LNWEDCST	0.081	.000
LN FARMSZ	-0.004	.546
R ²	0.55	
F value	58.236	
No. of observations	200	

Dependent variable: LNYLD

Land preparation

Regression analysis showed a positive sign. The value of coefficient (0.0009) indicated that one percent increase in tractor hours for land preparation increased wheat yield by 0.0009 percent (Table).

Sowing time

The coefficient of sowing time was negative -0.083 and it was highly significant (Table). It indicates that one percent delay in sowing time decreased yield by 0.083 percent.

Seed rate

Coefficient of seed rate was also highly significant (0.418). This means that one percent increase in seed rate increased yield by 0.418 percent.

Irrigation

The coefficient of irrigation was negative and non-significant. It was due to more rains during wheat-growing season.

Fertilizer use

The coefficient of nitrogenous fertilizer was also highly significant (0.092). This indicates that one percent increase in use of nitrogenous fertilizers increased yield by 0.092 percent. The coefficient of phosphate fertilizer was 0.004 which was positive but non-significant.

Weedicide cost

Coefficient of weedicide cost was 0.081 and it is highly significant indicating that one percent increase in weedicide cost increased yield by 0.081 percent.

Farm size

The coefficient of farm size was -0.004 and non-significant.

CONCLUSION AND SUGGESTIONS

Most of the factors studied were found positively contributing towards higher wheat yield. However, effects of education, sowing time, rotavator use, seed rate, weedicide cost and use of nitrogenous fertilizer were highly significant.

Extension system should emphasize to educate the farmers about weeds control, use of proper seed rate and nitrogenous fertilizer. Field visits and demonstration by extension staff could be right steps in this direction.

Late sowing of wheat decreased wheat productivity to a great extent. In mixed cropping zone wheat is mostly sown after harvesting of sugarcane and cotton crops. As far as timely sowing of wheat is concerned, short duration and early maturing cotton varieties need to be evolved. Early harvesting of sugarcane may also help in right direction. For this purpose sugar mills may be asked to commission their mills by early October.

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