FACTORS AFFECTING THE INCOME FROM MAJOR CROPS IN RICE-WHEAT ECOLOGICAL ZONE

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Agriculture is an important sector of our economy. About twenty-two percent of national income and 44.8 percent of total employment is generated by this sector. About 66 percent of country's population is living in rural areas and is directly or indirectly linked with agriculture for their livelihood. It also supplies raw materials to industry. The rice-wheat zone of Punjab covers 1.1 million hectare, 72% of wheat is grown in rotation with rice. The main purpose of this paper was to determine the effect of different factors on the productivity and ultimately on income from of major crops (wheat, rice and sugar-cane) in rice-wheat ecological zone. The results show that for wheat crop, land preparation, use of fertilizer and chemicals, for Sugarcane crop, area under cultivation, fertilizer and chemical costs and for rice crop, applications of chemicals, irrigation and land holding were the main determinants of productivity and crop income.

Keywords: Agriculture, economy, population, raw material, sugarcane, cultivation

INTRODUCTION

Agriculture is the mainstay of Pakistan's economy contributing nearly 22 percent of GDP while about 49 percent of the workforce is employed in agriculture sector. Whatever happens to agriculture is bound to affect not only the country's growth performance but to a large segment of the country's population as well (Government of Pakistan, 2006).

The rice-wheat zone of Punjab covers 1.1 million hectare in the district of Sialkot, Gujranwala, Sheikhupura, Lahore, Kasur, and Gujrat. In this area, 72% of wheat is grown in rotation with rice and wheat yield are low in comparison with those of the other cropping systems in Punjab (Hamid *et al.,* 1987). Major corps, accounting for 35.2 percent of value added in agriculture, registered a decline of 3.6 percent as production of two of the four major crops, namely cotton and sugarcane has been significantly less than last year for a variety of reasons including excessive rains at the time of sowing, high temperature at flowering stage, late harvesting of wheat crop, strong base effect (cotton) and incidence of frost, damaging sugarcane crop in the month of January, 2006. The production of third major crop, wheat remained more or less at last year's level at 21.7 million tons thereby registering a meager growth of 0.4 percent. The production of rice – the fourth major crop – has been the sole major crop, which registered an impressive growth of 10.4 percent but failed to turn the negative growth in major crops to a positive one (Government of Pakistan, 2006). During the five years i.e. from year 2001-02 to year 2005-06, wheat crop registered an increase of 19 percent increasing from 18226 thousand tons to 21700 thousand tons. Sugarcane crop

decreased by about 8 percent while rice crop registered an increase of about 43 percent during the same time period. Thus there was a wide variation in the income of the farmers due to uneven growth pattern of the major crops.

The main purpose of this paper was to determine the effect of different factors on the income of major crops (wheat, sugarcane, rice) in rice-wheat ecological zone. To achieve the objective of the study, a detailed and systematic procedure was adopted which has been discussed in the next section.

MATERIALS AND METHODS

Primary data was used for the study. Data was collected from the two districts of Punjab (Distt. Sheikhupura & Nankana Sahib) having irrigated agriculture system. The sample size for the study was 200 respondents i.e. 100 farmers from each district, 50 from each tehsil and 25 from each village.

Out of each district, two tehsils were selected and then from each tehsil, two villages were selected. Villages were selected on the basis of their distance from main road and main market i.e. one village near to the market and other away from market. In this way 4 villages, two district Nankana sahib and two from district Sheikhupura were selected using random and stratified random sampling techniques.

To measure the impact of different production operations and some other factors on the gross revenue from major crops i.e. wheat, sugarcane and rice in the study area, multiple regression models were used. In these regression models, gross income per acre of crops was taken as dependent variable. This gross income per was obtained by multiplying average

yield per acre by the median price (Chavas et al 2005) and cost of different production operation along with some other factors were taken as independent variables. Following regression model was used for this purpose based on earlier work (Raju 1976, Dubale, P, 2001 Ashfaq, *et al.* 2001: Ahearn, *et al.* 2002, Jess *et al.* 2004, and Shue 2004).

lgr $= b_0 + b_1$ llpcost $+ b_2$ lscost $+ b_3$ lfertcost $+ b_4$ lccost $+ b_5$ lirricost$+ b_6$lfexp $+ b_7$ larea $+ e$

Where,

Lgr = Log of per acre gross income of crop in (Rs)

llpcost = Log of land preparation operation cost in (Rs) per acre

lscost = Log of seed cost in (Rs) acre

lFert.cost = Log of cost of Fertilizer bags in (Rs) per acre

lccost = Log of chemical cost per acre (Rs)

lirricost = Log of irrigation cost (canal & tubewell) per acre (Rs)

lfexp = Log of farming experience of respondent (Years)

larea = Log of holding size of respondent (Acre)

b_0 = Intercept

b_1- b_7 = Coefficients to be estimated

e = Error term

In the above model, some inputs (Land preparation, seed, fertilizer, chemicals, irrigation) have been used in form of cost/expenditure incurred on these inputs while few inputs (Exp and area under crop) have been used in physical quantities. The same practice has also been used by Hajia (2006).

RESULTS AND DISCUSSION

The model was estimated using the data collected for major crops and results have been presented in the Table 2. The results were also consistent with other studies (Ashfaq, *et al.* 2001: Ahearn, *et al.* 2002, Jess *et al.* 2004).

Wheat

The F-value 8.866 shows that model is overall significant. Value of R Square (R^2) for the model is 0.298, which shows that about 30 percent variation in dependent variable is being explained by independent variables, while the adjusted R Square value is 0.265. The results in Table 2 indicate that for 1 percent increase in land preparation cost, wheat gross income increases by .045 percent, and it is significant at 99 percent confidence level. The reason is that better preparation of seedbed improves the efficiency of seed to germinate and ultimately yield increases.

In case of wheat crop, seed cost is not a significant factor which is adding to the revenue from the crop. This result showed that farmers are almost applying same kind of seed across the area which is mostly home produced and it is not adding to the productivity significantly.

The results also show that fertilizer and chemicals are two important factors adding to the total revenue from the wheat crop. One percent increase in fertilizer cost can increase the wheat crop revenue by 0.29%. This result also showed that farmers of the area were not using the balance use of fertilizer and fertilizer is under utilized in the area. Same is the case of chemical cost for increase in revenue of wheat crop.

One percent increase in the chemical cost can increase the wheat crop revenue by .014 percent and it is highly significant. Irrigation cost is positively related with crop revenue but it is non significant. It shows that cost incurred for irrigation is not being properly utilized and irrigation is being under utilized by the farmers.

One unit increase in farming experience of the respondent decreases the wheat crop revenue by .018 percent and it is non significant. The reason is that farmers in older age cannot perform the farming operations properly which results in less yield.

One percent increase in holding size increase the wheat revenue by .012 percent and it is non significant. It means that large farmers have better yield than small farmers due to purchase and use of inputs at proper time and proper quantity.

Sugarcane

The F-value 4.965 shows that model is overall significant. The results in Table2 indicate that for 1 percent increase in land preparation operations cost, sugarcane crop income increases by almost 4 percent, and it is non significant.

It is evident from the results that 1 unit increase in seed cost increases the sugarcane crop income by 12 percent and was non significant.

The results show that 1 percent increase in fertilizer application cost increases the sugarcane crop income by 0.138 percent and it is significant at 90 percent confidence level. It depicts the importance of fertilizer utilization at proper time and in proper quantity for better yield.

One unit increase in the chemical cost increases the sugarcane gross income by 0.026 percent and it is significant at 90 percent confidence level. One percent increase in the irrigations application cost can increase the sugarcane crop income by 0.043 percent but it is non significant. It shows the positive relationship of irrigations for sugarcane crop.

One unit increase in farming experience of the respondent decreases the sugarcane gross income by about .004 percent and it is non significant. One percent increase in holding size increase the sugarcane yield by 0.13 percent and it is highly significant. It means that large farmers have better yield than small farmers due to purchase and use of inputs at proper time and proper quantity.

Rice

The F-value 22.63 indicates that model is overall significant. The results in Table 2 indicate that for 1 percent increase in land preparation operations rice gross income increases by 0.016 percent, and it is non significant. For 1 percent increase in seed cost, the rice income would increase by almost 0.50 percent and it is highly significant. This result is very well evident of the high price received by the superior rice varieties. This also showed that in rice crop high quality varieties fetch higher profits for the farmers.

Fertilizer cost has the positive relationship with the gross revenue but in case of rice it is statistically non-significant Whereas chemicals cost is highly significant in case of rice crop. One percent increase in the chemical cost increases the rice crop gross income almost .02 percent and it is significant at 99 percent confidence level. One percent increase in the cost of irrigations applied increases the rice crop income by almost 0.26 percent and it is highly significant. This result is again in conformity of the fact that irrigation plays an important role in the production of rice crop.

One unit increase in farming experience of the respondent decreases the rice crop income by 0.034 percent and it is non significant. The reason is that farmers in older age cannot perform the farming operations properly which results in less yield. One percent increase in holding size increases the rice income by 0.14 percent and it is significant at 99 percent confidence level. It means that large farmers have better yield than small farmers due to purchase and use of inputs at proper time and proper quantity.

Table 2. Coefficients of variables for crop production of farmers

Predictor	Wheat crop	Sugarcane crop	Rice Crop
(Constant)	6.551** (7.743)	8.021** (3.386)	4.833** (4.859)
Llpcost	0.045** (3.908)	0.041 0.575	.01622^{ns} (0.882)
Lscost	0.041^{ns} (0.386)	0.127^{ns} 0.456	0.500** 4.172
Lfertcost	0.296** (3.953)	0.138* 1.681	.0120^{ns} 0.406
Lccost	0.014** (4.078)	.026* (1.780)	.02105** 2.765
Lirricost	0.017^{ns} (0.507)	.043^{ns} (0.272)	0.259** 2.669
Lwarea	0.012^{ns} (0.697)	-0.004^{ns} (-0.086)	-.03479^{ns} -1.174
Lexp	-0.018^{ns} (-0.840)	.135** (3.648)	.148** 8.199
R^2	0.296	0.53	0.453
F-statistics	8.866**	4.965**	22.63**

**Significant at1percent probability
**Significant at 5 percent probability
^{ns} Non-significant at 5 percent or above

CONCLUSIONS

The major factors which were contributing significantly for wheat crop were land preparation, use of fertilizer and chemicals used. It means that through seed bed preparation, the use of good quality and proper amount of fertilizer along with timely application of chemicals could increase the yield significantly in the rice-wheat zone of Punjab. For Sugarcane crop, the fertilizer application was the major contributor along with the land holdings and for rice crop, the main determinants of productivity were good quality seed, applications of chemicals, irrigations applied and land holding. Results show that protecting of rice crop from insects and weed are very important. An economic size of land holding is also important for having good yield.

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