FACTORS AFFECTING AGRICULTURAL PRODUCTION OF PUNJAB (PAKISTAN)

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The Punjab province plays pivotal role in the economy of Pakistan by contributing almost 60 percent to total agricultural production of the country. This contribution can further be enhanced by identifying the factors that affect agricultural production in the province. The estimated Cobb-Douglas agricultural production model for Punjab established that the cropped area, agricultural labour, distribution of seed, budgetary expenditure on agricultural research and extension, land reclamation, and wheat price support contributed positively towards agricultural production whereas the contribution of fertilizer and expenditure on food trading services was found negative. The provincial government should accord high priority to these factors to boost agricultural production in the province.
Keywords: Punjab, agricultural production, Cobb-Douglas Production Function.

INTRODUCTION

The Punjab province once known as the granary of the East is the lifeline of Pakistan's economy. The major sectors of the economy of Punjab are agriculture, industry and services. According to Punjab Economic Report 2005 of Asian Development Bank, agriculture constitutes a slightly larger share of the Punjab's economy than of Pakistan as a whole. Between 1991-92 and 2002-03, the provincial GDP of the Punjab increased in real terms at about 4.5 percent a year, faster than the 3.7 percent annual growth recorded in the rest of the country.

The economy of Punjab is mainly agriculture based, although industry makes a substantial contribution. Despite its dry climate, extensive irrigation makes it a rich agricultural region. The province is playing a leading role in agricultural production. It contributes about 63740.4 thousand tonnes which is about 59.85 percent towards total agricultural production in the country. Commodity wise Punjab is contributing 74.12 percent cereals, 81.75 percent pulses, 55.45 percent cash crops, 9.39 percent edible oils, 59.95 percent fruits and 77.54 percent vegetables of the total production of these commodities at national level. Total agricultural production of Punjab over the years has increased considerably. In the year 2003-04, Punjab produced 63740.4 thousand tonnes of agricultural produce almost 62.21 percent higher than the agricultural production of 1990-91 i.e. 39655.3 thousand tonnes (Govt. of Pakistan, 2004-05).

Majority of the farmers in the Punjab are small with land holdings up to 5 hectares and owners of such farms are practicing subsistence farming under deficit as their yield of major crops is far less than the progressive farms. Besides this, there are many factors that affect overall agricultural production of the province. The paper in hand attempts to figure out the factors that affect agricultural production in the province of Punjab.

MATERIALS AND METHODS

The empirical approach used in this study is based on an aggregate Cobb-Douglas production function. In its general form, the relationship between output and the two inputs is nonlinear. However, the log-transform of this model is used to make it linear. Hence it is called log-log, double log or log linear model. The general form of the model is specified as under.

$$\ln Y_i = \beta_0 + \beta_i \ln X_i + \mu_i$$

Where ln = Natural logarithm
Y_i = Dependent variable
X_i = Independent variables
β_i = Elasticities of Production
μ = stochastic disturbance term

The empirical model for the study in hand was estimated for the period from 1981 to 2004. This specified time period was taken to capture the effect of policies towards agriculture sector so as to draw meaningful lessons from the experience of past two and half decades. During the estimation process, various variables were tried and following type of model was observed.

$Ln\ (TLAGRPRD) = Ln\ \beta_1 + \beta_2\ Ln\ (CRPAREA) + \beta_3\ Ln\ (AGLABOUR) + \beta_4\ Ln\ (FERTCONS) + \beta_5\ Ln\ (SEEDDIST) + \beta_6\ Ln\ (ARSEXTEX) + \beta_7\ Ln\ (LNDRCLEX) + \beta_8\ Ln\ (FODTRDEX) + \beta_9\ Ln\ (WTSUPRICE)$

Dependent Variable (TLAGRPRD)

The dependant variable used in the production model was agricultural production (thousand tons) in the province of Punjab. Agricultural production was obtained by summing the yearly production of cereals (wheat, rice, maize, bajra, jowar, and barley), pulses (gram, mung, mash, and masoor), cash crops (sugarcane, cotton, jute, tobacco, and guarseed), edible oils (rapeseed & mustard, sesamum, groundnut, and sunflower) and all fruits and vegetables.

Independent Variables

The independent variables include:
(CRPAREA)   Cropped Area of Punjab (thousand hectares)
(AGRLABOUR) Agricultural Labour of Punjab measured by the economically active population in agriculture (thousand units)
(FERTCONS)   Fertilizer Consumption i.e. the sum of Nitrogen (N), Phosphorus (P) and Potash (K) of fertilizer (metric tons of plant nutrients)
(SEEDDIST)   Distribution of Improved Seed in Punjab (thousand tons)
(ARSEXTEX)   Provincial Expenditure on Agri. Research & Extension (million rupees)
(LNDRCLEX)   Provincial Expenditure on Land Reclamation (million rupees)
(FODTRDEX)   Expenditure on Food Trading Services in Punjab in (million rupees)
(WTSUPRICE) Wheat support price (Rs./40 Kg)

The data used for this model were obtained from secondary sources of information. These data sources included official publications of various offices of Govt. of Pakistan and Govt. of Punjab. Some of these included Federal Bureau of Statistics, Islamabad, Ministry of Finance, Islamabad, Ministry of Food, Agriculture and Livestock, Islamabad, Planning and Development Department and Bureau of Statistics, Govt. of Punjab, Lahore.

RESULTS AND DISCUSSION

To study the impact of various factors on agricultural production of Punjab, Cobb-Douglas production model was employed. The Table 1 shows the results of fitting a multiple linear regression model to describe the relationship between TLAGRPRD and eight independent variables. The equation of the fitted model is:

Ln *(TLAGRPRD)*   =   *– 0.0982884 + 0.644066*
Ln *(CRPAREA)*   =   *+ 0.601639*
Ln *(AGLABOUR)**   =   *– 0.592693*
Ln *(FERTCONS**)*   =   *+ 0.140295*
Ln *(SEEDDIST**   =   *+ 0.00886817*
Ln *(ARSEXTEX)*   =   *+ 0.192647*
Ln *(LNDRCLEX)*   =   *– 0.0343348*
Ln *(FODTRDEX)*   =   *+ 0.238742*
Ln *(WTSUPRICE*)*

The empirical results indicate that cropped area in the province of Punjab has a positive impact on total agricultural production. Although the elasticity coefficient is non signifcant, the model explains that one

percent increase in cropped area in Punjab province leads to an increase of 0.64 percent in agricultural production.

The elasticity coefficient for agricultural labour is positive 0.60 and is significant at 9 percent level. This reveals that increase in agricultural labour over the years has positively contributed in enhancing agricultural production despite the fact that the agricultural labour mostly in Punjab is not equipped with modern methods of agricultural production and are illiterate. The results are also supported by the fact that most of agricultural practices in Punjab are still labour intensive. So any improvement in quantity and quality of agriculture would boost up agricultural production. This necessitates that necessary domestic support should be extended in Punjab for capacity building of the farmers.

The value of elasticity coefficient of fertilizer (nutrients) consumption is 0.59 and has negative sign. The coefficient is highly significant at 2.5 percent level. The elasticity coefficient implies that increase in fertilizer consumption results in decline of agricultural production. This is probably due to the fact that in Punjab majority of the farmers are illiterate and are not properly trained in the application of fertilizers in terms of nutrients usage. This may lead to over dosage of one nutrient at the cost of other essential nutrients and hence negatively affect the agricultural production.

The distribution of improved seed in Punjab has played a significant role in boosting agricultural production in the province. The elasticity coefficient has a positive value of 0.14 and is significant at 9 percent significance level. The results imply that one percent increase in the distribution of improved seed brings about a surge of 0.14 percent in agricultural production. This indirectly highlights the importance of agricultural research and shows that improved seed contributes significantly towards agricultural production.

Table 1. Multiple Regression Analysis

Parameter	Coefficients	Std. Error	T-Statistic	P-Value
CONSTANT	– 0.0982884	8.08599	– 0.0121554	0.9905
Ln (CRPAREA)	0.644066	0.950677	0.677481	0.5084
Ln (AGLABOUR)	0.601639	0.33722	1.78411	0.0946
Ln (FERTCONS)	– 0.592693	0.239461	– 2.47511	0.0257
Ln (SEEDDIST)	0.140295	0.0776367	1.80707	0.0908
Ln (ARSEXTEX)	0.00886817	0.0197185	0.44974	0.6593
Ln (LNDRCLEX)	0.192647	0.175557	1.09735	0.2898
Ln (FODTRDEX)	– 0.0343348	0.0280717	– 1.22311	0.2402
Ln (WTSUPRICE)	0.238742	0.129042	1.85011	0.0841

R-squared = 93.98 percent
R-squared (adjusted for d.f.) = 90.7693 percent
Standard Error of Est. = 0.061901
Durbin-Watson statistic = 1.90864

The value of coefficient of agricultural research and extension is almost near to zero and is 0.008. This is even not significant. This meager contribution of agricultural research and extension is due to low priority given to this sector in budgetary allocation in the past. Expenditure incurred on agricultural research and extension is insufficient to meet the requirements of modern agriculture and to make Punjab's agriculture internationally competitive. Even operational agricultural research and extension expenditure as percentage of total allocation is quite less and therefore coefficient of this variable is quite low.

The coefficient for land reclamation expenditure is 0.19 and is non significant. The results indicate that one percent increase in land reclamation expenditure results 0.19 percent increase in agricultural production.

Expenditure incurred on food trading services provided by the Punjab govt. has a non significant elasticity coefficient with a negative value of 0.034. This points out that food trading services by govt. negatively

affect agricultural production as these cause misallocation of resources i.e. allocation of resource for the crops which receive this support is at the cost of other crops.

Wheat support price was used as proxy variable for price support programme of the Govt. The elasticity coefficient for wheat support price is 0.23 and is significant at 8 percent significance level. The estimate shows positive contribution of this variable and implies that one percent increase in wheat support price pushes up agricultural production by 0.23 percent. The results justify the continuation of price support programme in Punjab particularly to wheat sector without contravening the provisions of Agreement on Agriculture of WTO.

CONCLUSION AND RECOMMENDATIONS

Agriculture sector has a key role in the economy of province of Punjab. In spite of its major role, overall agricultural production of the province is not in consonance with the potential of the province and there are many factors that contribute to this shortfall. The agriculture sector in the recent past has initiated its journey towards commercialization but this sector has not yet become fully self supportive. Farming community lacks proper knowledge and is not properly equipped to meet the challenges of modern agriculture and the World Trade Organization (WTO). Majority of the farmers are illiterate and are unable to make rational decisions on their own and need institutional support. Moreover market mechanism is not well established and not capable enough to provide proper economic signals to all the stakeholders. In the following, various recommendations have been extended to further boost agriculture sector of the Punjab province.

1. The results of the study indicate that wheat price support have contributed significantly in increasing agricultural output of the Punjab province. Wheat crop is very important from food security point of view; the price support programme for wheat should be continued. This support can be extended under the WTO because current total AMS of Pakistan is negative and there are as such no reduction commitments in this regard.

2. In the province of Punjab the contribution of food trading services towards agricultural output is not positive according to the findings of the study. Therefore, government should gradually disengage itself from food trading services and enable the private sector to extend these types of services by themselves.

3. In the WTO regime, agricultural producers of Punjab are confronted with many challenges that call for an increased investment in rural public domain such as agricultural research to further improve agricultural technology and to provide producers with better production conditions that are comparable with their foreign competitors. The results of the study report negligible contribution of investment in research in Punjab which is because of meager budgetary allocation for operational research. In this direction, Govt. of Punjab should (a) accord high priority to agricultural research and investment spending on agricultural research should be increased manifolds immediately, (b) ensure that major proportion of budget of the various research organizations is incurred on the operational research (c) bring drastic institutional changes in the provincial research organizations in order to stem the current outflow of competent agricultural researchers. (d) fill all the vacant positions in the research organizations of the province. Fresh recruitment, promotions and appointment against various administrative posts should be on merit and should be tied up with performance, (e) ensure agricultural research be problem solving and target oriented.

4. The results of the study establish a significant relationship between the distribution of improved seed and agricultural output in the province of Punjab. Therefore, efforts should be made to further enhance the distribution of seed in the province. In this regard, the cost of transporting seeds can be subsidized in the province with the objective of ensuring universal and timely access to this vital input. Seeds should also be made available in case of natural calamity and seed storage infrastructure should be developed. Grants should be provided to both public and private seed corporations for maintenance of certified and foundation seeds. The core poor should be given improved seed at cheaper rates and in small packs.

5. Fertilizer constitutes a major component of cost of production of the crops. Government should ensure timely and proper availability of all types of nitrogenous, phosphate and potash fertilizers at

affordable rates to farming community. Government is already giving gas subsidy to fertilizer sector which should be continued and additionally government should give subsidy on the import of fertilizers. Besides this, technical and advisory services to the farming community should be arranged so that farmers can effectively utilize the fertilizers.

6. Infrastructural development should be accorded high priority in the budgetary allocations of the Punjab government. Public expenditure on the irrigation, and land reclamation should be further enhanced and spendings on canal lining and laying down of water courses for overcoming water losses during conveyance of water to the tail end farms should be increased. In water deficient areas, water conservation techniques should be introduced and promoted among the farmers. Where installation of tube wells is feasible, farmers should be provided incentives and technical expertise for tube well installation. In this connection, electricity should be provided at subsidized rates to the agriculture sector. In our neighbouring country India, power to agriculture is offered at a very low price; in a few cases it is even free. Like many Indian states, the government of Punjab can also adopt policy of irrigation subsidies to facilitate its resource poor farmers.

7. Agricultural marketing in the past in Pakistan and province of Punjab has largely remained ignored but disposal of occasional surpluses of some of agricultural commodities; emergence of agribusiness sector and challenges posed to agrarian economy by WTO has increased its importance. The farmers of Punjab in general and small farmers in particular lack modern marketing techniques that result in high post-harvest losses. Although separate Ministry of Agricultural Marketing has been established but there is need to make it vibrant and functionally working for the provision of various marketing related services to the farmers. Farmers should be facilitated in the product preparation, handling, storage, bargaining, grading, standardization, packing and disposal of their produce. Market information system should be strengthened in order to provide information to all stake holders and bring coordination in agricultural markets.

8. The findings of the study indicate that contribution of agriculture labour in increasing agricultural production of the province of Punjab has been quite significant in spite of the fact that labour in our country is not equipped with modern techniques used in Agriculture sector. It is therefore, urgent need of the time to arrange training programmes for not only the farmers but other stakeholders as well. Govt. in this regard should chalk out comprehensive training programmes. Various programmes and projects should be initiated in collaboration with various research and training institutes and agricultural universities.

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