IMPACT OF INCREASE IN WHEAT SUPPORT PRICE ON THE ACREAGE AND INCOME OF THE FARMERS OF FAISALABAD, DIVISION

BY

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ABSTRACT
Linear Programming model was applied to calculate the acreage and income of the farmers due to increase in support price of wheat in Faisalabad division. The study was conducted on 2702 thousand acres of the irrigated areas from three districts of the division. Crops included in the model were wheat, Basmati rice, IRRI rice, cotton, sugar- cane, maize and potatoes. The result showed that wheat was the only crop, which gained acreage while main losers were Basmati rice, IRRI rice, Sugarcane and potatoes. Overall optimal crop acreage increased by 2.14% while, optimal income was increased by about 13.59% as compared to the existing levels.

KEYWORDS: Linear programming, cropping patterns, gross margin support price, wheat.

INTRODUCTION
Wheat is the staple food of people in Pakistan. It is grown on approximately 8.2 million hectares (m. ha) yielding 19.0 million tons (m. tons) annually. The Punjab province produces 15 m. tons wheat over an area of 6 m. ha. Its share in the national acreage is 84% and in production is about 80 per cent. Punjab is, therefore, the principal wheat-growing region in the country and caters to the food needs of the other provinces also (GOP, 2003).

Wheat has the largest acreage of any crop in Pakistan and is grown on 38 per cent of the total cultivated area. Its relative share in Punjab is even higher, where it occupies 51% of the cultivated area. All other cereals like rice, maize, sorghum, millets, and oats-combined are grown on approximately 2.5 million ha, less than half of the wheat area (GOP, 2003).

The Government has increased the support price of wheat by Rs.50 per 40 kg. How much acreage and income the support price will increase, is the subject matter of the study. The linear programming model was applied for the selection of optimum cropping pattern. The selection of optimum cropping patterns is a pre-requisite to efficient utilization of available resources of land, water and capital. Farmer’s profit cannot be maximized without optimum cropping patterns, which ensure efficient utilization of available resources.

OBJECTIVES
• To calculate the optimal cropping pattern with the recent increase in wheat price and its comparison with the existing situation.
• To calculate the income of the farmers with the increase in wheat price and its comparison with the existing situation.
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METHODOLOGY
The study was carried out in whole of the Faisalabad division. The study was conducted on 2702 thousands acres which roughly accounts for more than 75% of irrigated area of Faisalabad division. The data used in the study are the aggregate farm resources availability in the Faisalabad division, relative profitability and input-output, coefficients of various crop activities. Linear programming Model in the following form was used in the analysis.

MATHEMATICAL PRESENTATION OF THE MODEL
The objective of the model was to maximize total net income (gross margin). Algebraically the model is summarized below:

Basic Assumptions
- All producers in a division are having only the choice to produce certain product mixes.
- All producers in a division have identical input-output coefficients.
- Total production of various commodities is limited by the resources availability in the division.
- An acre of a crop can be substituted for an acre of other type of crop.
- The economic objective of the produces is to maximize profit, i.e. gross margin.
- The production period is agricultural calendar year i.e 2003-4.
- Crops covering upto 2% or above of the total cropped area would be included in the optimal solutions.
- Farm labor supply does not pose limitation on crop production than it is excluded from the model.
- Maximum and minimum area in optimal solution has been assumed not more than 1.1 and not less than 0.9 times respectively of the existing area under crops.

The model
Linear programming model of the following form was used as an analytical tool to explore the possibilities of optimizing farm returns. Objective function is to maximize profit, where:

\[ Y = \sum_i \sum_{j=1}^{m} C_{ij} X_{ij} \]

Subject to the following constraints

Kharif Land Availability:
\[ \sum_{j=1}^{n} a_{ij} X_{ij} \leq SL \text{ for all } i \]

Rabi Land Availability:
\[ \sum_{j=1}^{n} a_{ij} X_{ij} \leq WL \text{ for all } i \]

Water Availability:
\[ \sum_{j=1}^{n} w_{ijg} X_{ijg} \leq W \text{ for all } i \text{ and } g \]

Capital Availability:
\[ \sum_{j=1}^{n} k_{ij} X_{ij} \leq K \text{ for all } i \]

Maximum Acreage Constraint:
\[ \sum_{i=1}^{m} a_{ij} X_{ij} \leq \text{Max} \text{ for all } i \text{ and } J \]

Minimum Acreage Constraint:
\[ \sum_{i=1}^{m} a_{ij} X_{ij} \geq \text{Min} \text{ for all } i \text{ and } J \]

Non-negativity Constraints:
\[ X_{ij} \geq 0 \]
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Where \( Y = \text{Gross margin} \), i.e. gross income - variable cost
\( C_{ij} = \text{Gross margin from J-th activity in the i-th division.} \)

\( i = 1, \text{ Faisalabad district} \)
\( i = 2, \text{ T.T Singh district} \)
\( i = 3, \text{ Jhang district} \)
\( J = 1, \text{ wheat} \)
\( J = 2, \text{ Basmati Rice} \)
\( J = 3, \text{ Irri Rice} \)
\( J = 4, \text{ Cotton} \)
\( J = 5, \text{ Sugarcane} \)
\( J = 6, \text{ Maize} \)
\( J = 7, \text{ Potatos} \)

\( j = \text{Level of J-th activity in the i-th division} \)
\( X_{ij} = \text{Level of J-th activity in the I-th district} \)
\( a_{ij} = \text{Amount of land needed per unit of J-th activity in the i-th division} \)
\( SL_i = \text{Amount of land available during the kharif season in the i-th division} \)
\( WL_i = \text{Amount of land available during the Rabi season in the i-th division} \)
\( w_{ijg} = \text{Quantity of water required per unit of j-th activity in the i-th division during the g-th month} \)

\( g = 1, \text{ January} \)
\( g = 2, \text{ February} \)
\( g = 3, \text{ March} \)
\( g = 4, \text{ April} \)
\( g = 5, \text{ May} \)
\( g = 6, \text{ June} \)
\( g = 7, \text{ July} \)
\( g = 8, \text{ August} \)
\( g = 9, \text{ September} \)
\( g = 10, \text{ October} \)
\( g = 11, \text{ November} \)
\( g = 12, \text{ December} \)
\( X_{ijg} = \text{Level of J-th activity in the i-th division during the g-th month} \)
\( W_{ig} = \text{Total amount of water available in the i-th division during the g-th month.} \)
\( k_{ij} = \text{Amount of capital required for the J-th activity in the i-th division} \)
\( K_i = \text{Total amount of capital available in the i-th division} \)
\( X_j = \text{Level of j-th activity} \)
\( \text{Max}_j = \text{Maximum level of j-th activity} \)
\( \text{Min}_i = \text{Minimum level of j-th activity} \)

RESULT AND DISCUSSION

Optimal Solutions

Optimal cropping patterns resulting from the application of LP model in comparison to the existing cropping patterns for Faisalabad division are presented in Table 1.

<table>
<thead>
<tr>
<th>Crops</th>
<th>Existing (000 Acres)</th>
<th>Optimal Solution (000 Acres)</th>
<th>% Of Existing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>1600</td>
<td>1729</td>
<td>108.06</td>
</tr>
<tr>
<td>Basmati Rice</td>
<td>208</td>
<td>187</td>
<td>89.90</td>
</tr>
<tr>
<td>IRRI rice</td>
<td>20</td>
<td>18</td>
<td>90.0</td>
</tr>
<tr>
<td>Cotton</td>
<td>321</td>
<td>321</td>
<td>100.0</td>
</tr>
<tr>
<td>Sugarcane</td>
<td>462</td>
<td>416</td>
<td>90.0</td>
</tr>
<tr>
<td>Maize</td>
<td>71</td>
<td>71</td>
<td>100.0</td>
</tr>
<tr>
<td>Potatoes</td>
<td>20</td>
<td>18</td>
<td>90.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2702</strong></td>
<td><strong>2760</strong></td>
<td><strong>2.14</strong></td>
</tr>
</tbody>
</table>
Hassan, et al. (2008). Impact of support price on wheat

Wheat gained acreage over 8%, while cotton and maize maintained their actual positions. All other crops such as Basmati rice, IRRI rice, sugarcane and potatoes lost acreage by about 10% each. Overall optimal cropped acreage increased by 2.14% as compared to the existing situation. So with the increase of wheat price by Rs. 50 per 40 kg, the farmers of the Faisalabad division will get Rs. 1.215 billion additional income. Optimal income increased from existing level of Rs. 8.973 billions to Rs. 10.192 billion showing an improvement of almost 13.59 percent. The optimal income level as compared to the existing one is presented in table 2.

Table 2: Comparison of Income Level under Optimal Solutions with Existing Condition.

<table>
<thead>
<tr>
<th>Existing income Rs. Billion</th>
<th>Optimal solutions Rs Billion</th>
<th>% Of Existing</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.973</td>
<td>10.192</td>
<td>13.59</td>
</tr>
</tbody>
</table>

The results, therefore, plead that the LP model is an objective tool and assess effects on acreage and farm income. The results of this study are in line with the results of the studies conducted by Saini, (1975), Radhakrishnan and Sivandharam. (1975), Bajwa, (1978), Jolayemi and Olaomi,(1995), Neto et al. (1997) and Carvalho et al. (2000). They found that optimal solution increased the income.

CONCLUSION

As a result of optimal cropping pattern farmer’s income increased by 13.59 percent. The optimal solution suggested significantly change in the cropping pattern. It suggests over 8% increase in wheat acreage; on the other hand it suggested reduction in the acreage of Basmati rice, IRRI rice sugarcane and potatoes by about 10% each. Cotton and maize remained unchanged.

REFERENCES


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