Economic Analysis of Competing Crops with Special Reference to Cotton Production in Pakistan: The Case of Multan and Bahawalpur Regions

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Abstract

Cotton is an important and major cash crop in Pakistan. Keeping in view the tremendous importance of cotton crop, the study was conducted in core areas of cotton production i.e. Multan and Bahawalpur regions. The study was based on primary data using Policy Analysis Matrix (PAM) methodology to assess the comparative advantage of cotton crop over its competing crops i.e. rice and sugarcane in the study area. The comparative advantage of cotton over the other important crops i.e. rice and sugarcane which also compete for scarce domestic resources was calculated by applying DRC technique. The respective DRC values for cotton, sugarcane and rice (0.57, 1.14, and 0.65) indicated that the Multan and Bahawalpur regions had comparative advantage in producing cotton over sugarcane and rice crops and cotton crop can compete in national as well as in international markets. The divergence in private and social price revenue for cotton was Rs. 3150, where as the NPC and EPC were 0.89 and 0.83 respectively at export parity prices. This result showed that cotton crop was not protected by subsidy. It was concluded from the study that government may adopt the policies to reduce the cost of production / processing. Cotton yield would be increased by using quality inputs and by adopting better management practices. Water pricing and rational allocation of critical inputs, timely and standardized availability of inputs would increase marketing margins and efficiency of cotton in the study area.

Keywords: Cotton, Comparative Economic Advantage, PAM for Cotton, Rice and Sugarcane, Economic Analysis, Pakistan

I. Introduction

In Pakistan, agriculture is one of the largest sectors of economy contributing 21 percent to GDP and employing 44 percent of the workforce in Pakistan (Government of Pakistan, 2018).
Pakistan, Pakistan Economic Survey 2007-08). Major crops like cotton, wheat, sugarcane and rice account for 34 percent of agriculture and 7.1 percent of GDP. Approximately, 77 percent of total cotton crop is produced in the Punjab and remaining 23 percent in other provinces (Government of Pakistan, Pakistan Economic Survey 2005-06). Pakistan is the ancient home of cultivated cotton. The history of cotton has been traced back to Mohenjo Daro, a 5000 years old civilized city of the Indus Valley in Sindh, one of the four provinces of Pakistan. The unearthed cotton relics from the city reveal the proficiency of Indus civilization in the use of cotton as far back as 3000 BC (Ali Mehboob 2007). According to Afzal (1969) Alexandar the Great described the cotton plant of the Indus Valley as a plant from which the nations plucked the vegetable wool which they spun in to admirable clothing. Cotton provides lint for fabrics and seed for edible oil; it has contributed a very momentum role in agro-based industry of Pakistan. During late 50’s and 60’s there was a rapid expansion of cotton cultivation, the spreading progressively from Central Punjab to Southern Punjab (Afzal, 1970).

Pakistan is the fourth largest cotton producing country of the world after China, India and USA. Pakistan's share of total world cotton production in 2004/2005 remained 9.47 percent (Cotton Statistical Bulletin, 2006). Pakistan is 3rd largest consumer with 10 percent of world production, 3rd largest yarn producer with 9 percent, 2nd largest yarn exporter with 26 percent, 3rd largest cloth producer with 7 percent and 3rd largest cloth exporter with 14 percent of world cotton production (International Cotton Advisory Committee, 2005).

Cotton competitiveness depends on the domestic production, its domestic and international market price behavior. The performance of raw cotton in the country carries much importance as Punjab is the main cotton growing province of the country constituting around 81 percent of the total produce. Keeping in view the importance and productivity levels, the cotton growing zones of the Punjab have been categorized on the basis of area under crop and its production level as described in Table 1.

Table 1 Cotton Zones in the Punjab Province

<table>
<thead>
<tr>
<th>Area</th>
<th>Districts of Production Level (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core</td>
<td>Multan, Khanewal, Vehari, Lodhran, Bahawalnagar, Bahawalpur, D.G. Khan, Rajanpur, Muzafargarh, R.Y. Khan 91.0</td>
</tr>
<tr>
<td>Non-Core</td>
<td>Faisalabad, T.T. Singh, Jhang, Sahiwal, Okara, Pakpattan 8.50</td>
</tr>
<tr>
<td>Marginal</td>
<td>Bhakkar, Mianwali, Khushab, Sargodha, Gujrat, Sialkot, Jhelum, Qasur 0.78</td>
</tr>
</tbody>
</table>

Source: Pakistan Central Cotton Committee, Karachi 2006-07

Core areas contribute 91 percent in the total cotton production of the Punjab. While non-core areas contribute 8.5 percent with an average yield of 472 kg per hectare, whereas, the marginal areas contribute 0.78 percent in the total production of the province (Pakistan Central Cotton Committee, 2006).

II. Comparative Advantage of Cotton and Objectives of the Study

To determine the comparative advantage of cotton crop in Multan and Bahawalpur regions, the study was based on the following objectives:
i. To study the comparative economic advantage of cotton crop over the competing crops i.e. rice and sugarcane in the study area.

ii. To analyze the export parity price of cotton, sugarcane and rice focusing on value addition per acre inch of water.

iii. To suggest policy recommendations.

### III. Literature Review

There is a large body of literature on agriculture marketing problems and its impact on the production. Some significant studies are reviewed in this paper to make a hypothesis and theoretical background. (Appleyard, 1987) studied the comparative advantage in agriculture sector in Pakistan. Main commodities covered were wheat, cotton, basmati rice, coarse rice, sugar cane and maize. The data on cost of production estimates for the harvesting years i.e., 1982-83 and 1983-84 were utilized for analysis. The policy analysis matrix (PAM) approach was used to determine the competitiveness and policy effects. The coefficient for nominal protection and effective were calculated. Whereas the Domestic Resources Cost Ratio (DRC) was used to determine the comparative advantage.

Nelson and Panggabean (1991) explained that policy analysis have to present their research results to policy makers in an easy and comprehensible way. For this purpose they suggested that two types of summary measures have been developed. One strand focuses on private and social cost of public sector investment. While second strand of analysis focuses on price distorting policies and popular measure for this are NPC, EPC and DRC. According to authors, Indonesian sugar sector is a complex one and is an ideal candidate for PAM. They used the data for 1987 and separated sugar sector in three representative activities i.e. production, processing and marketing. Indonesian economy was relatively undistorted and determination of social prices was straightforward.

Fang and Beghin (1999) assessed the comparative advantage and protection of major agricultural crops using a modified Policy Analysis Matrix. Commodities covered were rice, wheat, maize, soybean, rapeseed, cotton, tobacco, sugarcane and a subset of fruits and vegetables. They stated that consistent with the institution of the simple Heckscher-Ohlin model, there was a comparative advantage in labour intensive crops and a disadvantage in land-intensive crops. Specifically grain (wheat, maize and sorghum) and oil seed crops (soybean and rapeseed) were less socially profitable than fruits and vegetables, tobacco, sugarcane, rice and cotton. Agricultural protection revealed systematic pattern of input subsidy and output taxation through exchange rate overvaluation effective protection patterns showed the high protection enjoyed by the rapeseed sector, and the effective taxation burdening tobacco and apples. The estimates of protection suggested that input policies unnecessarily induced deadweight loss to achieve self-sufficiency.

The existing literature on agricultural marketing in Pakistan is an inadequate guide to public policy that includes Mushtaq (1971); Qureshi (1974); Siddiqui, (1979). After 1980's only few studies were conducted which include the works of Akhtar (1985), Ali (1985), Khushk (1999) and Chaudhry (2004), the scope of these studies is limited and in-depth analysis has not been carried out. Most of them deal with only descriptive accounts of some aspects of the institutional arrangements, without analyzing such important issues as the regional and inter-temporal nature of prices or how the development process...
may have been influenced by them. Furthermore, the available research base in the agricultural marketing has focused on major crops and fruits, while the cash crop like cotton remained unaddressed.

Tariq (2003) describes that Pakistan, the world’s fourth largest cotton producer, ranks first in export of cotton and cotton based products by fetching over 60 percent foreign exchange. The cotton scientists, extension workers and growers had followed a fair weather technology. But they do not think about the rainy season which created risk for the cotton crop. Chaudhry (2004) in his study on constraints and opportunities in Citrus production and marketing in Pakistan concluded that the wholesale markets in the country are efficient. He further concluded that the price differentials across wholesale markets are due to transaction costs including transportation costs. Mustafa (2005) examined the performance of marketing institutions and delineate the deficiencies inherent in the agricultural marketing system of Pakistan. The author concludes that successful marketing strategy in Pakistan requires more than creation of marketing institutions both in Public and Private sector.

Most of the literature review was mainly concentrating on the production aspect of the commodities with a very less emphasis on marketing issues. In this study an effort will be made to focus the marketing aspect with special emphasis on its problems at each stakeholder’s level. The factors which attract or detract the marketing will also be highlighted.

IV. Data and Methodology

Under current international scenario, the study of comparative advantage of a particular agriculture crop is of paramount importance. Such analysis has become more important in the wake of World Trade Organization (WTO) scenario and globalization. The study areas i.e., Multan and Bahawalpur were highly agriculture-developed where cotton was major crop and wheat and rice were the crops over the time had gained popularity. This region was the core area for the cultivation of cotton crop. So cotton was the most prominent, prestigious and predominant crop. The study focused on small (60), medium (30) and larger (10) farmers of both Multan and Bahawalpur regions. In the present WTO era, sustainability of farmers and their food security was one of the biggest issues and needed institutional as well as non-institutional arrangements for assured supply of raw material for industry and food for the people.

Thus, the study of comparative advantage of different crops needs special attention for policy analysis. In comparative analysis, farm budgets for cotton, rice and sugarcane crops were estimated both in financial and economic prices. The per acre crops budgets included total costs with its components i.e. fixed and variable costs and gross margins and gross returns. Further, value addition was estimated to evaluate resource use per unit of inputs especially for water. The study was based on primary data collected from target area. The farmer selection was done by random sampling through the following three stages.

Stage-I: Total sample was allocated to the whole Multan and Bahawalpur regions. Since the existing statistics of growers were more or less similar to each other in both the districts of Multan and Bahawalpur. The equal sample between two districts was based upon the similar production techniques. Thus, fifty percent of the whole respondents of
the small, medium and large categories were taken from Multan district and fifty percent from Bahawalpur District. Therefore, 200 respondents were selected as sample from both the districts.

**Stage-II:** Ten villages from five union councils of two tehsils of each district were randomly selected. The number of sample farmers for each district was proportionately distributed among these selected villages based on the share of small, medium and large farmers.

**Stage-III:** The sample of selected three categories of growers, from the list of small farmers in those villages is described in the following Table-2.

<table>
<thead>
<tr>
<th>Farmer category</th>
<th>Multan (Nos.)</th>
<th>Bahawalpur (Nos.)</th>
<th>Total (Nos.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small (&lt;12.5 acres)</td>
<td>60</td>
<td>60</td>
<td>120</td>
</tr>
<tr>
<td>Medium (&gt;12.5&lt;25.0 acres)</td>
<td>25</td>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td>Large (&gt;25 acres)</td>
<td>15</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
<td><strong>100</strong></td>
<td><strong>200</strong></td>
</tr>
</tbody>
</table>

**Input Use Efficiency**

Policy Analysis Matrix (PAM) which is a computational framework developed by Monke and Pearson (1989) and augmented by Masters and Winter-Nelson (1995). PAM is used to measure input use efficiency in production, comparative advantage and the degree of government intervention. The basic format of PAM is a matrix of two way accounting identities, one set defining profitability and the other defining the difference between private and social values of a commodity system (Table 3). The Net Social Profit (NSP), Social Cost Benefit (SCB) and Domestic Resource Cost (DRC) are calculated to measure the competitive advantage of the cotton crop over sugarcane and rice. The basis of PAM is a set of profit and loss identities that are familiar to any businessmen (Nelson and Panggabean, 1991). It is based on estimation of budgets using market prices and social prices.

**Table 3  Policy Analysis Matrix (PAM)**

<table>
<thead>
<tr>
<th>Description</th>
<th>Revenues</th>
<th>Tradable Inputs</th>
<th>Costs</th>
<th>Domestic Factors</th>
<th>Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private Prices</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td>Social Prices</td>
<td>E</td>
<td>F</td>
<td>G</td>
<td>H</td>
<td></td>
</tr>
<tr>
<td>Policy Transfer</td>
<td>I</td>
<td>J</td>
<td>K</td>
<td>L</td>
<td></td>
</tr>
</tbody>
</table>


The calculations are based on the following expressions:

(i) Private Profitability \( D = A - (B+C) \)
(ii) Social Profitability \( H = E - (F+G) \)
(iii) Output Transfers \( I = A - E \)
(iv) Input Transfers \( J = B - F \)
(v) Factor transfer \( K = C-G \)
(vi) Net Policy Transfers \( L = D-H \)
D is the measure of profitability, defined as the difference between observed revenue (A) and costs (B+C). The private profitability demonstrates the competitiveness of the agricultural system, given current technologies, prices for input and output or policy. The H calculates the social profit that reflects social opportunity costs. Social profits provide a measure of efficiency. A positive social profit indicates that the country uses scarce resources efficiently and has a static comparative advantage in the production of that commodity at the margin. Similarly, negative social profits suggest that the sector is not utilizing resources efficiently, which could have been utilized more efficiently in another sector of economy. In other words, the cost of domestic production exceeds the cost of imports suggesting that the sector cannot survive without government support at the margin. The third row of the matrix estimates the difference between first and second rows. The differences between private and social valuations of revenues, costs and profit can be explained by the effects of policy interventions.

The PAM framework has been used to calculate important indicators for policy analysis. The following are indicators which have been calculated to achieve desired objectives:

**a) Nominal Protection Coefficient (NPC)**

Nominal Protection Coefficient (NPC), a simplest indicator of policy effects, is the ratio of domestic price of commodity to its border price. The border price is the price in the international market converted into local currency using prevailing exchange rate. The simple forms of these ratios are:

Nominal Protection Coefficient tradable outputs (NPCP) = \( \frac{A}{E} \)

Nominal Protection Coefficient tradable inputs (NPCI) = \( \frac{B}{F} \)

**b) Effective Protection Coefficient (EPC)**

The Effective Protection Coefficient (EPC) is the ratio of distorted tradable value added at market prices to its un-distorted value at border prices.

\[ \text{EPC} = \frac{A-B}{E-F} \]

EPC >1, implies price protection and positive incentives to the domestic producers of that commodity while the opposite is true when the EPC is positive but <1 which shows that the producer / growers are not protected through any policy interventions.

**c) Domestic Resource Cost (DRC)**

Competitiveness in domestic production of a commodity is measured by the Domestic Resource Cost (DRC). This is a measure of relative efficiency of domestic production by comparing the opportunity cost of domestic production to the value generated by the product (Tsakok, 1990).

\[ \text{DRC} = \frac{G}{E-F} \]

The DRC indicates whether the use of domestic factor is socially profitable (DRC<1) or not (DRC>1). The commodities can be ranked according to the DRC values and the ranking is used as an indication of comparative advantage or disadvantage of the particular crop in the area.
Modeling Assumptions

The Policy Analysis Matrix requires a comprehensive set of data. For present study, data on various variables were collected from field surveys. The collection of the needed data and its manipulation was done by different approaches. Difficulties were faced while collecting the required information/data.

a) Input / Output technical coefficients and market price

Input technical coefficients are the physical quantities of inputs, which are used in producing the agricultural products. Output technical coefficients are also the physical quantities. It is essential that data on physical output and inputs be compiled on per unit basis of land, thus the data are analyzed on per acre basis.

b) Input Categories

Inputs are classified into two categories:

i. Tradable/purchased Inputs: The purchase inputs include seeds, fertilizers, manure, chemicals, and machinery etc.

ii. Non-tradable inputs/Domestic ressources. The domestic resources include labor, land and irrigation water.

c) Input and Output World Prices

Economic prices are estimated on basis of export parity prices depending upon the commodity. The export parity prices are used to calculate the economic prices of the crops that are exported in previous years and vice versa. World prices are the prices for tradable commodities, which were traded at different markets in different countries.

d) Classification/ Decomposition of Input Cost Items

The cost of production is separated into tradable and non-tradable components; every item is divided into two parts. Some items had greater proportion of tradable element than others.

e) Social Valuation of Tradable Inputs and Outputs

The social valuation of tradable outputs and inputs is a major segment in the building process of the PAM. Social prices in the PAM are also referred to as efficiency prices or economic prices.

f) Shadow Exchange Rate

A foreign exchange rate is the ratio of the number of domestic currency units to one unit of an internationally traded currency (usually US $). A shadow exchange rate that reflects the opportunity cost of the foreign currency instead is used. Shadow exchange rate (SER) is estimated from the official exchange rate (OER) using a social conversion factor (SCF) as following:

\[
\text{SER} = \frac{\text{OER}}{\text{SCF}}
\]

\[
\text{SCF} = \frac{\text{M} + \text{X} (1 - \text{TM}) + \text{X} (1 - \text{Tx})}{\text{M} + \text{X} (1 - \text{TM})}
\]

Where

- \( \text{M} \) = CIF value of imports;
- \( \text{X} \) = FOB value of exports
- \( \text{TM} \) = Average tax rate on imports
- \( \text{Tx} \) = Average tax rate on exports
Imports and Exports Parity Prices of Tradable Outputs and Inputs

At the border the import and export parity prices are the Cost Insurance Freight (CIF), Free on Board (FOB) prices. These prices are used as reference prices, since they represent what a commodity can earn as an export or cost as an import commodity. When these prices are converted into domestic currency with the shadow exchange rate, they became the social border prices. For correctly comparing two different prices, the following two conditions are considered:

i) The commodities are exactly comparable in physical terms;
ii) The commodities are compared at the same location.

To fulfill the second condition a precise accounting of transport, handling and marketing costs is made. Following is the equation for the calculation of export parity price (EPP).

\[
\text{Export Parity Price} = (\text{FOB} \times \text{SER}) - (\text{HCB}) - (\text{TCBM} + \text{MCBM}) - (\text{TCMF} + \text{MCMF})
\]

- FOB = Free on board price at border;
- CIF = Cost insurance freight
- SER = Shadow exchange rate;
- HCB = Handling costs at border
- TCBM = Transport costs from border to market;
- MCBM = Marketing cost from border to market;
- TCMF = Transport costs from market to farm;
- MCMF = Marketing cost from market to farm.

V. Results and Discussion

Study of comparative advantage of a particular agriculture crop in the current international economy is important. Multan and Bahawalpur are sound agricultural regions where cotton is major crop and sugarcane and rice are the substituted crops.

**PAM for Cotton Crop**

The study area was the core area for the cultivation of cotton crop. Farm budgets for cotton, rice and sugarcane were estimated both in financial and economic prices. The farm budgets included total costs with its component for cotton.

Cotton is an important non-food cash crop and a significant source of foreign exchange earnings. Cotton accounts for 7.5 percent of the value added in agriculture and about 1.6 percent to GDP. The crop was sown on the area of 3054 thousand hectares and production was estimated at 11.7 million bales for 2007-08 less by 9.3 percent over 2006-07 production of 12.9 million bales (Government of Pakistan, Pakistan Economic Survey 2007-08). Several factors were responsible for the lower production of cotton in 2007-08 i.e. shifting of area to sugarcane and rice, heavy rainfall, poor germination and cotton leaf curl virus infection. PAM results for the cotton crop are depicted in Table 4.
Table 4 PAM for cotton in the Multan and Bahawalpur region based on export parity prices.

<table>
<thead>
<tr>
<th></th>
<th>Revenue</th>
<th>Production Costs</th>
<th>Profit</th>
<th>Ratios</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tradable</td>
<td>Non Tradable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private prices</td>
<td>25091.17</td>
<td>8705.24</td>
<td>9476.06</td>
<td>6909.87</td>
</tr>
<tr>
<td>Social Prices</td>
<td>28241.27</td>
<td>8531.63</td>
<td>11176.32</td>
<td>8533.32</td>
</tr>
<tr>
<td>Divergence</td>
<td>-3150.10</td>
<td>173.62</td>
<td>-1700.26</td>
<td>-1623.45</td>
</tr>
<tr>
<td>Value added</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Value added per</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>inch of water</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Authors’ Estimation.

The value for Domestic Resource Cost (DRC) given in Table 4 showed that export parity prices was 0.57 and the value added per acre inch of water was Rs.1383.01. EPC and NPC were 0.83 and 0.89 respectively. The PAM results also indicated that the net social profitability of cotton was Rs. 8533.32 per acre. This revealed that the farmer was earning higher profit for his output in study area. However, NPC was less than unity (0.89) meaning thereby that cotton was not protected by any subsidy / support in Multan and Bahawalpur region. The EPC value was 0.83 being less than unity implies that cotton production was receiving a negative incentive. The input and output policies had no positive incentive for producer / growers indicating free trade and the resources were allocated efficiently for this crop. Value added was calculated by summation of social profit and cost of domestic resource which explained that how much worth was added to total output with one unit investment of input resource. The value added per acre inch of water was Rs. 1383.13. The DRC value (0.57) indicated a strong comparative advantage of cotton crop in the study area.

**PAM for Sugarcane Crop**

Sugarcane is an important cash crop in Pakistan and in many countries of the world also. Pakistan occupies an important position in cane producing countries of the world. It ranks at the fifth position in cane acreage and production and 15th position in sugar production (FAO, Production Year Book 1998). The ideal condition for cultivation of sugarcane is abundant sunshine with day temperature around 30 ºC, plenty of water and cool dry weather. The climatic condition in the study area generally was providing growing season of eight to ten months for sugarcane. The sugarcane production, marketing and processing continued to be confronted with a host of problems like increasing input prices, water shortage and with uncertain output prices. The PAM was applied for sugarcane in the study area. The results are shown in Table 5.
Table 5  PAM for sugarcane in the Multan and Bahawalpur region based on export parity prices.

<table>
<thead>
<tr>
<th>Revenue</th>
<th>Production Costs</th>
<th>Profit</th>
<th>Ratios</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tradable</td>
<td>Non Tradable</td>
<td></td>
</tr>
<tr>
<td>Private prices</td>
<td>15380.89</td>
<td>7520.23</td>
<td>11002.89</td>
</tr>
<tr>
<td>Social Prices</td>
<td>17450.22</td>
<td>7228.1</td>
<td>11672.2</td>
</tr>
<tr>
<td>Divergence</td>
<td>-2069.33</td>
<td>292.13</td>
<td>-669.31</td>
</tr>
<tr>
<td>Value added</td>
<td>10222.1</td>
<td>723.94</td>
<td></td>
</tr>
</tbody>
</table>

Source: Authors’ Estimation.

The private revenue was less than the social revenue by Rs. 2069.33 on per acre basis. The value added / acre inch of water was Rs. 723.94 as per the result of PAM. NPC, EPC and DRC are 0.88, 0.77 and 1.44 respectively. DRC value for sugarcane showed obvious comparative disadvantage of this crop over the competing crop i.e. cotton in Multan and Bahawalpur region. The reason being resource cost of producing sugarcane was greater than its export cost. The value added for sugarcane was estimated Rs. 10222.10. The value added for application of one acre inch of water costing Rs. 723.94. The NPC was 0.88 that showed sugarcane had not been provided any subsidy or support while negative divergence of Rs. -2069.33 explains that the grower was under-priced in the study area. The EPC value of 0.77 reinforces the result that the sugarcane was not provided any type of input or output subsidy.

PAM for Rice Crop

Besides being an important food crop, rice also serves as a major source of foreign earning. After calculating financial and economic prices, PAM was applied on rice crop for Multan and Bahawalpur region as shown in Table 6.

Table 6  PAM for rice in the Multan and Bahawalpur region based on export parity prices.

<table>
<thead>
<tr>
<th>Revenue</th>
<th>Production Costs</th>
<th>Profit</th>
<th>Ratios</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tradable</td>
<td>Non Tradable</td>
<td></td>
</tr>
<tr>
<td>Private prices</td>
<td>14872.78</td>
<td>5072.25</td>
<td>8234.56</td>
</tr>
<tr>
<td>Social Prices</td>
<td>17620.28</td>
<td>5012.12</td>
<td>8142.18</td>
</tr>
<tr>
<td>Divergence</td>
<td>-2747.50</td>
<td>60.13</td>
<td>92.38</td>
</tr>
<tr>
<td>Value added</td>
<td>12608.2</td>
<td>892.92</td>
<td></td>
</tr>
</tbody>
</table>

Source: Authors’ Estimations

The divergence in private and social revenue was Rs. 2747.50. The value added / acre inch of water was Rs. 892.92. As per the PAM result, NPC, EPC and DRC were 0.84, 0.78 and 0.65 respectively. DRC value of the rice showed obvious comparative disadvantage of this crop over the competing crop i.e. cotton in the study area. The summary of PAM results for all three crops in the study area are shown in Table 7.
Table 7  Summary of PAM results for cotton, sugarcane and rice in Multan & Bahawalpur regions

<table>
<thead>
<tr>
<th>Ratios</th>
<th>Cotton</th>
<th>Sugarcane</th>
<th>Rice</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPC</td>
<td>0.89</td>
<td>0.88</td>
<td>0.84</td>
</tr>
<tr>
<td>EPC</td>
<td>0.83</td>
<td>0.77</td>
<td>0.78</td>
</tr>
<tr>
<td>DRC</td>
<td>0.57</td>
<td>1.14</td>
<td>0.65</td>
</tr>
</tbody>
</table>

Source: Authors’ Estimations

DRC estimates the comparative advantage of different crops. It measures that how much domestic resources are being used to either save or earn one unit of foreign exchange. PAM and associated coefficient showed that cotton had comparative advantage over the competing crops i.e. rice and sugarcane in Multan and Bahawalpur region and can very well compete in the international market on export parity prices.

VI. Conclusion and Policy Implications

The study was an application of policy analysis matrix for cotton and its competing crops i.e. rice and sugarcane in Multan and Bahawalpur regions of Punjab province. It is obvious from the PAM indicators that cotton was efficiently produced in the study area while sugarcane was the least efficiently produced crop. The results were consistent with the government policies of providing raw material to the textile industry of the country for earning better profits for growers and foreign exchange for the country. Following are some significant policy implications.

General Policy Implications

a) Availability of critical inputs is the major concern of every grower in the study area. Sale of adulterated pesticides and sub-standard fertilizer require strict monitoring. Moreover, timely availability of above mentioned inputs is of prime importance.

b) The grading and standardization of cotton in line with the international standards must be ensured.

c) The production of any crop heavily depends upon quality seed. The provision of good quality and variety of seed must be ensured.

d) For improving marketing margins and efficiency, development of infrastructure such as roads, storage facility and availability of transport must be improved.

Specific Policy Implications

a) Since cotton showed comparative advantage in the study area, the entire stakeholders in the chain of cotton marketing should improve the quality of raw cotton and lint in order to achieve better prices in international market.

b) The government may get more advantage out of comparative advantage of cotton crop by reducing the cost of production / processing in the core areas of cotton belt.

c) Cotton yield should be increased using quality inputs and by adopting better management practices.

d) Since the vital importance of water is evident from the value added per acre inch of water, Government may emphasize on the water pricing and rationale allocation of this critical input in Pakistan.
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