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Economics of Sugarcane Production in Pakistan: A Price Risk Analysis

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Abstract

The paper examined the economics of sugarcane production and its competitiveness in the up-and-coming open trade economy. The study also analyzed the extent of policy bend and agricultural safeguard. The data on cost of production series of sugar cane crop were collected from the Agricultural Prices Commission (APCom). Punjab and Sindh, the two major sugarcane producing provinces were the focus of the study The Policy Analysis Matrix (PAM) was selected as analytical framework. The crop budgets were constructed both in financial and economic prices. The time series data from 1990-2002 on world prices of sugar cane and fertilizers (DAP and Potash) were utilized to estimate the risk prices. These risk prices were later on utilized to estimate the economic risk prices. The Nominal Protection Coefficient for inputs (NPI) and output (NPC) and the Effective Protection Coefficient (EPC) was used to estimate the policy distortions. The Domestic resource Cost ratio (DRC) was applied to show comparative advantage. Sugarcane is an important cash crop and provide raw material to nearly 78 Sugar factories. The excess supply and demand of sugar was cyclical in nature. Therefore, analysis was performed keeping in view both import and export parity prices. The analysis lead us to conclude that Pakistan (Punjab and Sindh) has no comparative advantage in producing sugar at export parity prices (price risk scenario), however, crop can be grown as an import substitution crop to cater the needs of sugar industry.

Key words: Economics of sugarcane production
JEL Classification: F23, G15.

I. Introduction

The World Trade Organization's (WTO) Agreement on Agriculture (AOA) has set the stage for future world trade such as trade liberalization, non-intervention by government and elimination of trade

barriers. This would greatly improve world trade volumes and benefit the countries following free trade regimes. The trade liberalization is beneficial to those countries which have comparative advantage in a particular commodity and mutually advantageous to countries importing cheap raw material. The literature showed that Pakistan is likely to benefit more in producing commodities having comparative advantage than any developing country under full reform condition.

The WTO's Agreement on Agriculture specifically calls for major reduction in export subsidies, domestic support and import barriers on agriculture products and has set quantitative targets for cuts in these sectors (Chishti and Malik, 2001). Pakistan has signed the WTO agreements and therefore, has to phase out its protection and support to agriculture (Khan, 2000). Thus, there is a need make significant changes in economic and agricultural policies and trade regimes in the light of AOA. This entails profound implications for national economy. It is therefore, crucial for a country like Pakistan to exploit comparative advantage in the production and trade of agricultural commodities (Hassan 1999).

The rational allocation of scarce resources between competing crops warrants an efficient economic criterion. The international competitiveness and affects of policy intervention stands out to be the most critical. The use of comparative advantage analysis deals not only with on-farm production but incorporates downstream collection, processing and wholesaling activities. It thus, provides an analysis of entire commodity chain (Slinger, 1997).

The comparative advantage refers to a comparative cost advantage in producing commodities and explains observed trade patterns according to country differences in resource endowments, investment patterns, technology, human capital and managerial expertise, infrastructure and government policies. While, the term competitiveness encompasses not only relative prices and the ability to market but also quality differences, production and distribution costs, and production and distribution efficiency (Warr, 1994).

Of all the inputs, the irrigation water is a scarce and precious input that is dwindling day by day. Sugarcane is highly water consumptive crop that remains in the fields nearly 12 months or more. The sugarcane production, marketing and processing continue to be confronted with a host of problems. The growers are faced with increasing input prices, water shortages, along with uncertain output prices etc. As a result of recurring water shortage, element of risk, in farm production is increasing. The industry is facing increasing competition from cheap imports, idle capacity, and periodic fluctuations in the quantity and quality of raw material. The industry, due to its seasonal production cycle, has been periodically saddled with large stocks of unsold sugar in the recent past. The country often resorts to distress imports in stabilizing sugar prices. The sugar has assumed the status of "political good" like wheat.

The study of comparative advantage and competitiveness of sugar cane crop under future risk price it seems imperative to determine its future potential of sugar cane production and sugar trade. Furthermore identify bottlenecks in marketing mechanism that discourage competitiveness and rational allocation of the scarce resources, at import and export parity prices.

II. Materials and Methods

The study was based on secondary data and the time series cost of production (COP) data were obtained from Agriculture Price Commission (APCom); the policy organ of the Ministry of Food, Agriculture and Livestock, Pakistan. The COP data were collected for three harvesting years i.e. 2000-01 to 2002-03 for the two provinces Punjab and Sindh. The Policy Analysis Matrix (PAM) was selected as analytical framework The PAM is based on estimation of budgets using market prices and social prices. The measurement of policy distortions in agriculture was developed through various approaches i.e. Nominal Protection Co-efficient for output (NPC), Nominal Protection Co-efficient for input (NPI) and Effective Protection Co-efficient (EPC). Domestic Resource cost (DRC) was used to measure comparative advantage that has been extensively used in policy analysis, IFPRI (Gonzales et al. 1993), OECD (Alpine and Pickett 1993), CIMMYT (Morris 1990), FAO (Appleyard 1987) and the World Bank (Ward, Deren and D' silva. 1991). Many studies in the near past have utilized PAM to evaluate the comparative advantage and policy effects in Pakistan (Appleyard (1987) Longmire (1992).

The modified PAM was developed in the study by incorporating revenues and costs, taken from private and social budgets of sugarcane crop. The social budgets were prepared using parity prices of sugar cane and fertilizers based on respective risk prices. The parity price of sugarcane was indirectly estimated from f.o.b. (London) risk price of white sugar. The import parity prices of only fertilizers (DAP and potash) were estimated and all the other tradable inputs i.e. pesticides and machinery were weighted by premium (1.138). The premium reflects the ratio of shadow exchange rate to the country's official exchange rate. All non-tradable inputs (land, labor etc.) were valued at their relevant market prices. These risk prices were generated through Normal Distribution of time series world prices of sugar, DAP and Potash. The data were then analyzed for assessing competitiveness and comparative advantage at production level for the future five years under free trade i.e. 2004-05 to 2008-09.The economic revenue and tradable cost generated for the 2004-05 were taken as base and respective risk error resulted from Best Fit normal distribution was added in both of these to make the projections in the next year. The projections for the further years were made following the same procedure.

III. Analytical Results

The construction of PAM requires estimation of crop budget at financial and economic prices both. In the study economic prices were estimated based on the risk prices of sugar cane and fertilizers i.e. DAP and Potash. The risk price of urea was not considered, as urea was not imported in bulk during the study years. The time series price data of DAP from 1990 to 2002 was used in "Best Fit" to find the best probability distribution.

The program estimated the Risk normal distribution as best-selected probability distribution (Fig 1) and gave the risk price as US $ 174.84±SD 24.38 per ton over the past 12 years. This risk price estimate was truncated to define the boundaries for resultant value. For this further two attributes i.e. minimum, maximum values set around the mean were added. The mean price obtained through Tnormal function was US $ 176.89. The mean risk price of potash estimated in the same way was US $198.5 per ton (Fig2). The economic tradable costs were generated as final results through hyper cube Monte Carlo simulations.

Fig 1: Normal Distribution of Time Series World Price of DAP Fertilizer

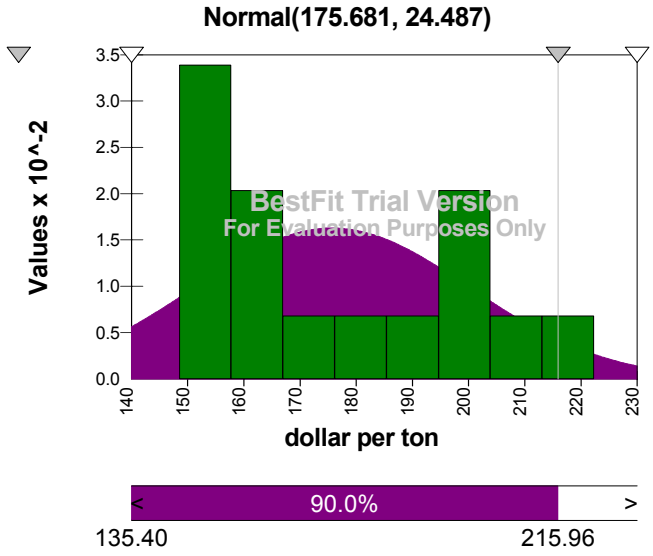


Fig 2: Normal Distribution of Time Series World Price of Potash Fertilizer

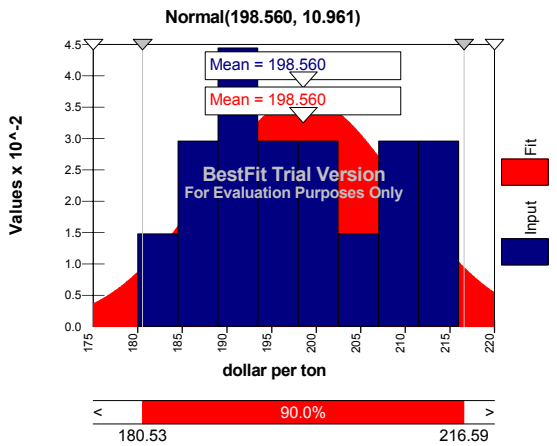
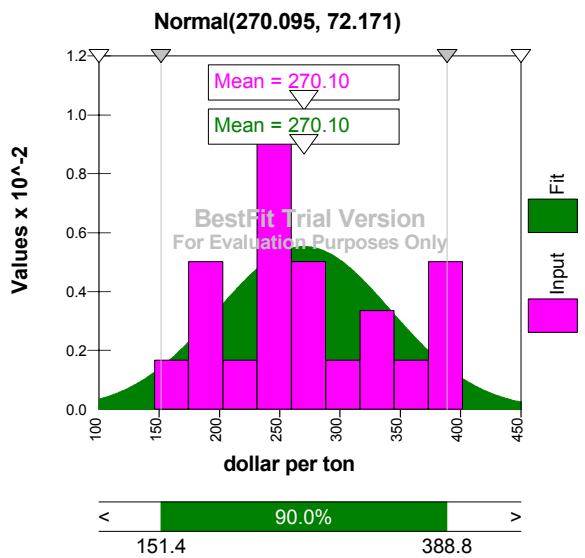


Fig 3: Normal Distribution of Time Series World Price of White Sugar



The Policy Analysis Matrix (PAM) was required to include IPP (Import Parity Price) of each fertilizer. Therefore, PAM was modified to include economic tradable costs based on IPP of DAP and potash separately. Economic costs of tradable inputs were further projected for the next four years. In the projection process, the final results generated through simulation were taken as the base value. The respective function estimate of Risk Tnormal for DAP and Potash was further added to the final results as error term to obtain the projected value of tradable cost for the next five years. The values of coefficients indicating policy distortion and comparative advantage generated through these PAMs were almost similar thus discussed jointly.

The results in Table 1 and Table 2 showed that NPI for first year was 0.86 for Punjab, Sindh and Pakistan and there after decreased for the projected years. This showed lower prices for inputs in domestic market than open market. There was an indirect subsidy on irrigation water even in looming large water scarcity. The analysis further showed that the prices of imported fertilizers would increase in free trade regime. This will increase the gap between domestic and world market prices, provided prices of fertilizers are not increased in the domestic market.

The NPC was 0.76, 0.86 and 0.81 for Punjab, Sindh and Pakistan respectively at the first stage and showed a slightly decreasing trend. This showed under pricing of sugarcane crop in the country compared with world market, during the study period. The price gap was more in Punjab than Sindh.

The wide variation between domestic prices and import price of sugar cane showed an implicit tax to the farming community.

Table 1: Values of Coefficients for Risk Analysis of Sugarcane with Risk Price of DAP

NPI			NPC			EPC			DRC		
Punjab	**Sindh**	**Pakistan**	**Punjab**	**Sindh**	**Pakistan**	**Punjab**	**Sindh**	**Pakistan**	**Punjab**	**Sindh**	**Pakistan**
0.86	0.86	0.86	0.76	0.86	0.81	0.71	0.85	0.79	0.59	0.52	0.57
0.84	0.85	0.84	0.75	0.85	0.80	0.71	0.85	0.78	0.58	0.52	0.56
0.82	0.83	0.83	0.74	0.84	0.79	0.70	0.85	0.78	0.58	0.52	0.56
0.81	0.82	0.81	0.74	0.84	0.79	0.70	0.84	0.78	0.58	0.52	0.56
0.79	0.80	0.79	0.73	0.83	0.78	0.70	0.84	0.77	0.58	0.52	0.56

Table 2: Values of Coefficients for Risk Analysis of Sugar Cane with Risk Price of Potash

NPI			NPC			EPC			DRC		
Punjab	**Sindh**	**Pakistan**	**Punjab**	**Sindh**	**Pakistan**	**Punjab**	**Sindh**	**Pakistan**	**Punjab**	**Sindh**	**Pakistan**
0.86	0.86	0.86	0.76	0.86	0.81	0.72	0.85	0.79	0.59	0.52	0.57
0.84	0.84	0.84	0.75	0.85	0.80	0.71	0.85	0.78	0.59	0.52	0.57
0.82	0.83	0.82	0.74	0.84	0.79	0.71	0.85	0.78	0.58	0.52	0.56
0.80	0.81	0.80	0.73	0.84	0.79	0.71	0.85	0.78	0.58	0.52	0.56
0.78	0.79	0.78	0.73	0.83	0.78	0.71	0.84	0.78	0.58	0.52	0.56

The EPC was 0.71, 0.85 and 0.79 for Punjab, Sindh and Pakistan respectively. This indicates that in the next coming years, if domestic sugarcane price is not improved, farmers will curtail sugarcane production. The DRC was 0.59, 0.52 and 0.57 for Punjab, Sindh and Pakistan respectively and remained almost same up to fifth year. Thus, Pakistan will have comparative advantage in sugar cane production at import parity prices as an import substitution crop in the future.

The export parity price (EPP) of sugar cane was also indirectly estimated from EPP of sugar based on the risk price of sugar. The risk price of sugar was also generated through "Best Fit" program that plotted the Normal distribution of time series for world price of sugar .The results showed that NPI for the first year was 0.86 for Punjab, Sindh and Pakistan. This showed that prices of fertilizers are likely to increase in free trade regime. That in turn will increase the gap between domestic and world market prices, at the given prices of fertilizers in the domestic market. The NPC was 1.21, 1.38 and 1.31 in Punjab, Sindh and Pakistan respectively and decreased for the projected years. This showed that domestic sugarcane prices were greater than border prices. In order to maintain the private profitability level, sugarcane grower needs protection from world market in future years.

The EPC was 1.24, 1.79 and 1.65 for Punjab, Sindh and Pakistan respectively in the initial year of analysis, which showed protection to sugar cane crop. The DRC was 1.51, 1.10 and 1.19 for Punjab, Sindh and Pakistan respectively. This showed that in the future, Punjab would have no comparative advantage in sugar cane production at export parity prices.

Table 3: Values of Coefficients for Risk Analysis of Sugarcane with Risk Price of DAP

NPI			NPC			EPC			DRC		
Punjab	**Sindh**	**Pakistan**	**Punjab**	**Sindh**	**Pakistan**	**Punjab**	**Sindh**	**Pakistan**	**Punjab**	**Sindh**	**Pakistan**
0.86	0.86	0.86	1.21	1.38	1.30	1.24	1.79	1.65	1.51	1.10	1.19
0.84	0.85	0.84	1.20	1.36	1.28	1.23	1.78	1.63	1.50	1.09	1.18
0.82	0.83	0.83	1.18	1.34	1.26	1.22	1.76	1.62	1.48	1.08	1.17
0.81	0.82	0.81	1.16	1.33	1.24	1.21	1.75	1.61	1.47	1.07	1.16
0.79	0.80	0.79	1.14	1.31	1.23	1.20	1.74	1.59	1.46	1.07	1.15

Table 4: Values of Coefficients for Risk Analysis of Sugarcane with Risk Price of Potash

NPI			NPC			EPC			DRC		
Punjab	**Sindh**	**Pakistan**	**Punjab**	**Sindh**	**Pakistan**	**Punjab**	**Sindh**	**Pakistan**	**Punjab**	**Sindh**	**Pakistan**
0.86	0.86	0.86	1.21	1.38	1.30	1.52	1.80	1.65	1.25	1.10	1.19
0.84	0.84	0.84	1.20	1.36	1.28	1.50	1.78	1.64	1.24	1.10	1.18
0.82	0.83	0.82	1.18	1.34	1.26	1.49	1.77	1.63	1.23	1.09	1.17
0.80	0.81	0.80	1.16	1.33	1.24	1.48	1.76	1.62	1.22	1.08	1.17
0.78	0.79	0.78	1.14	1.31	1.23	1.47	1.75	1.61	1.21	1.08	1.16

IV. Conclusions and Recommendations:

Sugar cane crop is an important cash crop of Pakistan and is grown on area of more than on million hectares. It provides raw material to 77 sugar factories besides indigenous "brown Sugar" cottage industry (APcom, 2003). The sugarcane crop is beset with many problems: one abysmally low yield leading to yearly fluctuation in production, and secondly monopolistic exploitation of sugar cane growers by the powerful sugar syndicate. The sugar cane highly water consumptive crop, thus losing comparative advantage id water scarce scenario. Therefore, it is important to look at the economics of sugar cane production in the WTO regimes.

The DRC (at import parity prices) was 0.59, 0.52 and 0.57 for Punjab, Sindh and Pakistan respectively and remained almost same up to fifth year. Thus, Pakistan will have comparative advantage in sugar cane production as an import substitution crop (import parity prices) in the future.

The DRC (at export parity prices was 1.51, 1.10 and 1.19 for Punjab, Sindh and Pakistan respectively. This showed that in the future, Punjab would have no comparative advantage in sugar cane production at export parity prices.

In conclusion, Pakistan sholud grow sugarcane only to maintain self sufficiency level as it will be cheaper in domestic market than to invest on import of sugar cane. It will not be feasible for country to grow for export purposes. On the other hand, the country should increase sugar cane productivity per unit of resource use especially scarce irrigation water.

Recommendations

The sugar industry must spearhead the research and development efforts so as to meet its raw material requirements. The specific recommendations are:

1. The marketing of the produce, raw material as well as end product, has emerged a key issue requiring serious attention of the government. The market imperfections must be removed through marketing efficiency and institutionalization of market intelligence.
2. The recurring water shortage is posing a serious challenge to the large scale cultivation of sugarcane being highly water consumptive crop. It is in the interest of industry and farmers to curtail its area but promote the cultivation of improved varieties with rational use of inputs and improved crop management. The sugarcane is highly water consumptive crop.

The present flat rate system is allocatively neutral leading to misallocation of this scarce resource. Therefore, the water pricing of is imperative for its rational use.

3. The vertical integration rather than horizontal expansion of the sugar industry is the need of the hour. The value added products e.g. spirits, yeast, acetic acid, citric acid, glucose etc., must be produced .The development of these products would help reduce the cost of sugar which remains the principal produce.

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