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Doha Round of WTO and the Rice Sector of Pakistan

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This study evaluates the impacts of the trade liberalization under Doha Round on basmati rice in Pakistan using a partial equilibrium model. Price integration analysis shows that there is a stable long-run relationship between farm gate price and wholesale price and between wholesale price and world price of basmati and non-basmati rice. Direction of influence is from world price to wholesale price and from wholesale price to farm gate price. The welfare analysis indicates a net welfare gain for the nation as a whole under the Doha Round agricultural trade liberalization.

1. Introduction

Rice is a highly valued cash crop that earns substantial foreign exchange for Pakistan. It is annually planted on an area of over 2.5 million hectares and accounts for 18 percent of the area under cereals and 10 percent of the total cropped area. The annual rice production averaging 5.0 million tons in recent years has constituted 18 percent of the overall output of cereals, and 17 percent of the value added by major crops (Pakistan, 2006-07). Rice has two distinct varieties namely non-basmati rice, which is a short duration variety and basmati rice, which is a long duration variety. Basmati rice accounts for nearly 63 percent while non-basmati rice for the remaining 37 percent of total rice area in Pakistan. The contribution of other varieties, in the total area and production of rice is almost negligible. Pakistan is one of the ten exporting countries that dominate world rice trade. The stable growth of rice production has helped Pakistan to not only meet increasing domestic demand but also have surplus for export.

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Basmati rice, a fine non-glutinous, long grain and aromatic variety, is a high value export crop. Pakistan has a comparative advantage in the production of basmati rice and is a major producer and exporter of this type of rice. The market for Pakistan's export of basmati rice is concentrated in a few importing countries such as Bahrain, Dubai, Iran, Kuwait, Mauritius, Omen, Qatar, Saudi Arabia, UK and Yemen etc.,which accounts for about 90 percent of the total export of basmati rice. The major competitor of Pakistan in the international market for this type of rice is India.

Pakistan has been actively engaged in the Doha Round of trade talks that were launched in the Qatari capital in November 2001under the umbrella of World Trade Organization (WTO). Aptly named the "Doha Development Agenda" (DDA), this round of trade talks has been focusing on removing distortions in the world agriculture markets and attaining enhanced market access for both products and service providers from Pakistan. Since 2001, there have two more ministerial conferences in Cancun in 2003 and Hong Kong in 2005 respectively. There have been many ups and downs in the road to a successful conclusion to the Doha Round that takes into account the myriad interests of the developing membership. There was a breakdown of talks in the summer of 2006, which led many observers to be skeptical of the entire process. However, sustained efforts by the membership led to a partial resumption of the talks in November 2006 and full resumption since January 2007 after the annual meeting of the World economic forum at Davos.

Many studies have been conducted for the estimation of likely impacts of trade liberalization on world and domestic agricultural markets both in developed and developing countries (see, for example, Dawe (2002), Fabiosa et al (2003), Gulati and Narayanan (2003), Wailes (2004), Achterbosch et al. (2005), Aksoy (2005), Bouet et al (2005) and Anderson et al (2006), Hertel and Winters (2005), Kwa, A. et al. (2007)). However, in case of Pakistan, the research literature on the issue of impacts of trade liberalization under WTO regime on agricultural sector and especially on rice sub-sector is quite scarce. Akhtar (1999) is the only one important move in this direction. This study estimates the impact of trade liberalization on wheat, rice (both basmati and non-basmati rice) and maize by conducting welfare analysis

for these commodities. In case of rice, net gain to Pakistan is calculated Rs. 3232.76 million during 1997-98. However, a major limitation of this study is that it has conducted the price transmission analysis from the world markets to domestic markets for the selected agricultural commodities without using any suitable econometric technique. Domestic prices are supposed to be the function of world prices under price a linkage equation system, which creates a scope for exactly estimating the price transmission elasticities by using some suitable econometric technique.

The present study has been conducted to fill this vacuum. The main objective of this study is to determine the impact of trade liberalization on domestic prices, production and consumption of basmati rice in Pakistan. For this purpose, the long-run stable relationship between wholesale price and world price and between farm gate price and wholesale price of basmati rice has been estimated. If there is no stable relationship between the above prices, then the implementation of agricultural trade liberalization under the Doha Round has no important implications in case of basmati rice trade for Pakistan. Finally the welfare analysis has been conducted by estimating the domestic demand and supply functions and by using the concepts of consumer and producer surpluses.

The rest of the paper is organized as follows. Section 2 provides analytical framework and data description. Empirical findings are given in section 3. The final section concludes the study with some policy implications.

2. Method of Analysis

The present study has used a partial equilibrium model in order to quantify the gains and losses to Pakistan after trade liberalization in case of basmati rice. We make use of partial equilibrium trade models as they focus on international markets for a selected set of traded goods, such as agricultural goods. Partial equilibrium trade models have primarily been constructed to provide insight into the implications for domestic and international agricultural markets of existing and alternative agricultural policies. The models generate information on the effects of such policies on domestic supply, demand, prices, the volume of international trade

and "world market" prices. This information is often used to compute partial equilibrium welfare measures such as producers' and consumers' surpluses.

2.1 Price Integration Model

Cointegration methodology developed by Engle and Granger (1987) has been used in this study in order to examine whether there exists a stable long-run relationship between farm gate price and wholesale price and between wholesale price and world price of basmati rice for Pakistan. Furthermore, Granger causality tests have been applied to decide on the leading price for basmati rice. The objective of this exercise is to explore the possibility of trade liberalization in terms of relationship between world and domestic prices of basmati rice.

2.2 Domestic Demand Function

The representative consumer maximizes utility, given a fixed income. The demand schedule is derived by maximizing utility. This study assumes that the per capita demand for basmati rice is a linear function of its own price, prices of substitutes and complementary goods and per capita income i.e.

$$Q_d = f(P_m, P_s, I). \qquad (1)$$

Where Q_d is per capita quantity demanded of basmati rice; P_m is domestic market or wholesale price of basmati rice, P_s is price of other (substitute) commodity and I is Per capita income.
Own-price elasticity of demand:

$$(E_m) = (\%\Delta Q_d) / (\%\Delta P_m) \qquad (2)$$

Cross-price elasticity of demand:

$$(E_s) = (\%\Delta Q_d) / (\%\Delta P_s) \qquad (3)$$

2.3 Domestic Supply Function

Agriculture production is affected by many and varying factors according to the nature of the crop. The supply response of rice can be assumed to be a function of own output price, prices of all the other relevant crops and prices of inputs and technology (Ali, 1990). Therefore, the supply for function basmati rice estimated in this study is specified as:

$$Q_s = f(P_f, P_c, P_n, T). \quad (4)$$

Where Q_s is total quantity supplied of basmati rice; P_f, P_c and P_n are price of basmati rice at farm level, price of competing crops and price of inputs respectively and T is trend variable used as a proxy for technology.

Own-price elasticity of supply:

$$E_f = (\%\Delta Q_s)/(\%\Delta P_f) \quad (5)$$

Cross-price elasticities of supply:

$$E_c = (\%\Delta Q_s)/(\%\Delta P_c) \quad (6)$$

$$E_n = (\%\Delta Q_s)/(\%\Delta P_n) \quad (7)$$

Price transmission elasticity estimates (α_1 and β_1) have been computed using method of cointegration. Following Thompson and Bohl (1999), we define:

$$P_m = \alpha_0 + \alpha_1 Pw + u_1 \quad (8)$$

$$P_f = \beta_0 + \beta_1 P_m + v_1 \quad (9)$$

α_1 as the percentage change in the domestic market or wholesale price (P_m) in response to a one percent change in the world price (P_w) i.e. $\alpha_1 = (\% \Delta P_m) / (\%\Delta P_w)$ and β_1 as the percentage change in the farm level price (P_f) in response to a one percent change in the wholesale price (P_m) i.e. $\beta_1 = (\% \Delta P_f)/ (\% \Delta P_m)$. Normally α_1 and β_1 range from 0 to 1, where high

price transmission elasticity signifies a high degree of co-movement of the prices of the above two sets of markets of a given commodity. For example, $\alpha_1 = 1$ means that a one percent change in the world price of a commodity is precisely reflected in a one percent change in the local price of that commodity, so a high value for α_1 can be taken as a measure of well integrated markets.

2.4 Welfare Analysis

The magnitude of the net welfare effect depends on the magnitude of the price changes, on the initial price and quantity and the consumers' and producers' sensitivity to price changes. If consumers exhibit a high elasticity of demand, then they will greatly decrease their consumption when faced with a price increase. This flexibility allows them to escape the new high price, which basically softens the effect. On the other hand, if consumers have inelastic demand, changes in the price bring only a small response from consumers. In this case, price increases have a more harmful effect on consumers' welfare, as they do not escape the higher price by decreasing their consumption of the commodity. The welfare effect also depends on the producers' sensitivity to price changes. If producers have elastic supply, then they will greatly increase production at the higher price. However, in Pakistan like other developing countries, there are many other factors that can decrease the elasticity of supply. These include poor transportation infrastructure and limited ability to increase productivity due to a lack of access to credit etc.

To measure the net welfare change, we combine the change in producer surplus with the change in consumer surplus. Following equations have been estimated to measure the changes in consumer surplus and producer surplus for basmati rice:

$$Change\,in\ ConsumerSurplus = \left[(P_b - P_t)\{D' + (D - D')^* 0.5\}\right], \quad (10)$$

$$Change\,in\ \Pr oducerSurplus = \left[(P_t - P_b)\{S + (S' - S)^* 0.5\}\right] \quad (11)$$

Net welfare effect = Change in Producer Surplus +Change in Consumer Surplus.

Where, P_b is the price of basmati rice in the base year i.e 2005; P_t is the price of basmati rice after trade liberalization; D is the quantity demanded of basmati rice in the base year i.e 2005; D' is the quantity demanded of basmati rice after trade liberalization; S is the quantity supplied of basmati rice in the base year i.e 2005 and S' is the quantity supplied of basmati rice after trade liberalization;

2.5 Data Sources

The study has used annual observations for the period 1975 to 2005.Ideally data should be from a single source to maintain consistency. However, there is no single source that can provide all relevant data. Therefore, different secondary sources have been used to take the required data. The data have been taken from Agricultural Statistics of Pakistan (various issues), Economic Survey of Pakistan (various issues), Agriculture Prices Commission, Islamabad, Pakistan, Federal Bureau of Statistics, Islamabad, Pakistan and Food & Agriculture Organization of United Nations (FAO), Rome, Italy.

3. Results and Discussions

Using Fabiosa et al. study on "Agricultural Markets Liberalization and the Doha Round ", 2003, it is assumed that the price of rice would increase by 10.3 percent at the world level. Different price elasticity coefficients have then been used to estimate this projected increase in price on basmati rice market at national level.

3.1 Price Integration of Tests

First, we have checked whether the each price series (LWPB, LIPB, LFPB, LWPNB, LIPNB and LFPNB)[1] is satisfied with the first-order

[1] LWPB=Natural log of Wholesale/Market Price of basmati rice
LIPB= Natural log of International Price of basmati rice
LFPB= Natural log of Farm gate Price of basmati rice
LWPNB=Natural log of Wholesale/Market Price of non-basmati rice
LIPNB= Natural log of International Price of non-basmati rice
LFPNB= Natural log of Farm gate Price of non-basmati rice

condition for cointegration analysis. Augmented Dickey Fuller (ADF) tests of the individual price series (in levels and first differences) have indicated that each series is *I*(1), or integrated of order one as shown in table 1.

Table 1. Augmented Dickey Fuller (ADF) Unit Root Tests

Variables	Level	First Difference	Mackinnon Critical Values for Rejection of Hypothesis of a Unit Root			Decision	Order of Integration
			1 %	5 %	10 %		
LWPB	2.44	-6.39	-2.64	-1.95	-1.62	Nonstationary at level but stationary at first difference	*I* (1)
LIPB	2.85	-3.43	-2.64	-1.95	-1.62	Nonstationary at level but stationary at first difference	*I* (1)
LFPB	3.84	-3.95	-2.64	-1.95	-1.62	Nonstationary at level but stationary at first difference	*I* (1)
LWPNB	3.30	-4.73	-2.64	-1.95	-1.62	Nonstationary at level but stationary at first difference	*I* (1)
LIPNB	2.51	-5.16	-2.64	-1.95	-1.62	Nonstationary at level but stationary at first difference	*I* (1)
LFPNB	1.41	-6.67	-2.64	-1.95	-1.62	Nonstationary at level but stationary at first difference	*I* (1)

Now we can proceed for cointegration analysis between price series of basmati rice and non-basmati rice in each pair. The estimated long-run relationship between the price series in each pair will reveal whether the prices are cointegrated or not. The estimated coefficients give the

relationship between the above prices in the form of the following price linkage equations:

$$LWPB = \underset{(0.81)}{1.875} + \underset{(3.43)^{***}}{0.98}*LIPB \quad (3.1a)$$

$R^2 = 0.95$ D.W = 2.06

$$LFPB = \underset{(-3.46)^{**}}{-1.778} + \underset{(19.95)^{***}}{1.12}*LWPB \quad (3.1b)$$

$R^2 = 0.97$ D.W = 2.03

$$LWPNB = \underset{(-2.68)^{**}}{-2.356} + \underset{(12.23)^{***}}{1.26}*LIPNB \quad (3.1c)$$

$R^2 = 0.94$ D.W = 1.91

$$LFPNB = \underset{(2.84)^{*}}{1.823} + \underset{(9.38)^{***}}{0.82}*LWPNB \quad (3.1d)$$

$R^2 = 0.88$ D.W = 1.96

Each of the price series is non-stationary and transformation into the first difference is required to obtain a stationary series. The linear combination of the two price series in each pair gives the residuals which are stationary I(0) and this gives the basis for condition that two price series are indeed cointegrated in each pair. The corresponding cointegration tests are reported in table 2.

In order to check stability between price series in each group, error-correction models have been estimated. The results are filed in table 3. The results indicate that there exists a stable long-run relationship between price series in all five groups. The adjustment parameter (π) i.e. the error correction term appears with negative value and lies between 0.5 and 1.

Table 2. Augmented Dickey-Fuller Tests on the Level of Residuals

Estimated Residuals	Level	Mackinnon Critical Values for Rejection of Hypothesis of a Unit Root			Decision	Order of Integration
		1 %	5 %	10 %		
LWPB	-5.29	-2.64	-1.95	-1.62	Stationary at level	*I* (0)
LFPB	-5.42	-2.64	-1.95	-1.62	Stationary at level	*I* (0)
LWPNB	-5.17	-2.64	-1.95	-1.62	Stationary at level	*I* (0)
LFPNB	-6.09	-2.64	-1.95	-1.62	Stationary at level	*I* (0)

Table 3. Empirical Findings of Error-Correction Model

Variables	ΔLWPB	ΔLFPB	ΔLWPNB	ΔLFPNB
Constant	0.02 (0.65)	0.05 (2.24)*	0.09 (5.29)***	0.05 (0.99)
ΔLIPB	0.68 (3.11)**			
ΔLWPB		0.47 (4.96)**		
ΔLIPNB			0.06 (0.37)	
ΔLWPNB				0.07 (0.23)
π (Error Correction Term)	-0.66 (-6.79)***	-0.85 (-4.30)**	-0.51 (-3.52)**	-0.79 (-2.86)**
AR(2)	-0.38 (-3.84)***			
MA(1)			-0.36 (-2.9)**	
MA(2)	1.43 (6.15)***			
R^2	0.68	0.35	0.36	0.39
R	0.64	0.34	0.35	0.38
DW	1.90	2.08	1.98	2.02
F-Stat	26.71	20.93	12.58	17.47
Prob(F-Stat)	0.00	0.00	0.00	0.00

t-values given in parenthesis with, ***, **, *,indicate significance at 1 pertcent,5 percent and 10 percent probability level respectively.

To examine the causal relationship between the variables I have applied the Granger-causality tests using lag length up to one period only. The selection of lag length is based on Schwarz criterion. The results in table 4 show that world price of rice (both basmati rice and non-basmati rice) cause wholesale price of rice in Pakistan and causality of prices is only in one direction. These results are in accordance with the expectations as Pakistan is, no doubt, an important producer and exporter of rice, behaves as a price taker in the world market. Therefore, the international price of the rice influences the domestic rice price formation in Pakistan. Further the results show that wholesale price of rice cause farm gate price of rice in Pakistan and causality of prices runs in only one direction.

Table 4. Price Causality Results

Lagged Periods	Null Hypothesis	Decision
1	No causality from LWPB to LIPB	Accepted
	No causality from LIPB to LWPB	Rejected
1	No causality from LFPB to LWPB	Accepted
	No causality from LWPB to LFPB	Rejected
1	No causality from LWPNB to LIPNB	Accepted
	No causality from LIPNB to LWPNB	Rejected
1	No causality from LFPNB to LWPNB	Rejected
	No causality from LWPNB to LFPNB	Accepted

3.2 Impact of Trade Liberalization on Basmati Rice at National Level

The effect of trade liberalization has two dimensions. One, the effect due to liberalization in the domestic economy and two, the effect due to liberalization in the rest of the world. The effect of the latter again depends to a large extent on the former. The actual impact of trade liberalization would be reflected through changes in prices, which further would lead to bring changes in production, consumption and quantity of exports. That is why in order to asses the impact of trade liberalization under the Doha Round on basmati rice at national level in Pakistan, I, first of all, have estimated price linkage equations as given above i.e. from 4.1a to 4.1d. The equations fit the data reasonably well with summary statistics such as R^2 and D.W etc. These equations actually represent the price transmission mechanism from the world

level to the farm gate level for basmati and non-basmati rice. Through this mechanism the degree of integration of our domestic markets for both types of rice with the world markets has been determined. The results from the price linkage equations, then, have been used to estimate demand and supply equations of basmati rice in Pakistan for conducting welfare analysis. To get more reliable estimates, all the equations have been corrected for autocorrelation.

3.2.1 Impact on Domestic Prices of Basmati Rice

Table 5 lists the estimated price transmission elasticities of basmati rice and non-basmati rice in Pakistan. The elasticity of price transmission of wholesale price of basmati rice at the Lahore market with respect to the Pakistani export price of basmati rice is estimated as 0.98. This means that a 1 percent increase in the Pakistani export price of basmati rice would increase the Lahore wholesale price of basmati rice by 0.98 percent. Therefore, the increase in export price of basmati rice by 10.3 (as estimated by Fabiosa et al., (2003)) would cause an increase in wholesale price of basmati rice by 10.09 percent in Pakistan due to trade liberalization. Thus Rs. 22829.37/ton wholesale price of basmati rice in 2005, which has been taken as a base year, would become Rs. 25132.85/ton after the trade liberalization at current market price.

The price elasticity of transmission of basmati rice price received by farmers with respect to the wholesale price of basmati rice is 1.12. It means that a 1 percent change in wholesale price will result in a 1.12 percent change to farm level prices. Since wholesale price is expected to increase by 10.09 percent under total trade liberalization, farm gate price to be received by farmers is expected to increase by11.3 percent i.e. from Rs. 14859.73/ton to 16538.88/ton after trade liberalization.

Similarly, the elasticity of price transmission of wholesale price of non-basmati rice at the Lahore market with respect to the Pakistani export price of non- basmati rice is 1.26 as presented in table 5. This means that a 1 percent increase in the Pakistani export price of non- basmati rice would increase the Lahore wholesale price of non-basmati rice by 1.26 percent. Therefore, the increase in export price of non- basmati rice by 10.3 percent would cause an increase in wholesale price of non- basmati rice by 12.98 percent in Pakistan due to trade liberalization. Table 5 shows that elasticity of price transmission of non- basmati rice price received by farmers with respect to the wholesale price of non- basmati rice is 0.82. It means that a 1 percent change in wholesale price will result in a 0.82 percent change to farm level prices. Since wholesale price is expected to increase by 12.98 percent under total trade

liberalization, farm gate price to be received by farmers is expected to increase by 10.64 percent.

Table 5.Price Transmission Elasticities for Basmati Rice and Non - Basmati Rice

Wholesale price transmission elasticity of basmati rice	0.98
Farm gate price transmission elasticity of basmati rice	1.12
Wholesale price transmission elasticity of non-basmati rice	1.26
Farm gate price transmission elasticity of non-basmati rice	0.82

3.2.2 Impact on Domestic Demand for Basmati Rice

The estimated equations for demand and supply are presented in table 6. The per capita demand for basmati rice is positively related to per capita income and negatively related to its own price as expected. Coefficient for non-basmati price is positive, indicating substitution in demand. However, the coefficient of LPCI is statistically insignificant showing no impact on the per capita demand for basmati rice. The coefficients of LWPB and LWPNB are statistically significant, indicating the impacts on the per capita demand for basmati rice.

The own- price elasticity of demand for basmati rice is estimated as –0.43. This means that a 1 percent increase in the Lahore wholesale price of basmati rice is expected to decrease the domestic demand by 0.43 percent. Therefore the impact of 10.3 percent increase in the world price of basmati rice on wholesale price of basmati rice by 10.09 percent would cause the per capita demand for basmati rice to decline by 4.34 percent. While cross-price elasticity of demand for basmati rice with respect to wholesale price of non–basmati rice is 0.21.Thus an increase in wholesale price of non- basmati rice by 12.98 percent in Pakistan due to trade liberalization would cause the per capita demand for basmati rice to raise by 2.73 percent. The net impact on the per capita demand for basmati rice would be a decline of 1.61 percent i.e. from 12.22 kg to 12.02 kg. Considering the total population of 153.96 million during

2005-06,the total domestic demand for basmati rice is estimated to decline from 1881.4 thousands tons to 1850.6 thousands tons during the same year.

The increase in wholesale price of basmati rice in Pakistan and resulting a decrease in quantity demanded of basmati rice would cause a loss of consumer surplus of Rs. 4282.54 millions.

Table 6. Estimated Parameters of Basmati Rice Demand and Supply

Variables	LPCCB	LQSB
Constant	-40.60 (-10.54)***	4.69 (2.75)*
LWPB	-0.43 (-5.67)***	
LWPNB	0.21 (3.49)**	
LPCI	0.85 (1.11)	
LFPB (-1)♠		0.54 (5.28)***
LFPNB (-1)		0.24 (–3.91)**
LFTP (-1)		-0.10 (–0.69)
TR		0.05 (1.09)
AR(1)	0.95 (26.84)***	0.90 (7.8)
MA(2)	0.91 (11.93)***	-0.88 (-19.91)***
R^2	0.80	0.97
$\bar{R}$	0.78	0.96
DW	2.00	2.04
F-Stat	20.14	98.57
Prob(F-Stat)	0.00	0.00

♠ Since farm prices of rice are not known at planting time, farmers are assumed to make planting decisions based on the previous year's price (naïve expectation). Similarly, the previous year's production costs form information set at planting time.

t-values given in parenthesis with,***, **, *,indicate significance at 1 ,5 and 10 percent probability level respectively.

3.2.3 Impact on Domestic Supply of Basmati Rice

All variables in the supply equation are statistically significant except fertilizer price and have expected relations. The coefficient of own farm gate price is positive while that of non- basmati price is negative, implying basmati rice and non-basmati rice are competing for limited land. The fertilizer (input) price is negative which is consistent with theory. The trend coefficient is positive and significant. The coefficient for this variable estimates the effect of improvement in technology that enhances the marginal productivity of various inputs.

The elasticity of supply of basmati rice with respect to the farm gate price of basmati rice is 0.54. This value indicates that if price of basmati rice is increased by 1 percent, production of basmati rice would go up by 0.54 percent. The impact of the 10.3 percent increase in the world price of basmati rice on the price of basmati rice received by the Pakistani farmers is estimated at 11.30 percent. Therefore, this would cause an increase in domestic production of basmati rice by 6.1 percent. Whereas, the cross- price supply elasticity of basmati rice with respect to the farm gate price of non-basmati rice is –0.24. The impact of the 10.3 percent increase in the world price of non- basmati rice on the price of non-basmati rice received by the Pakistani farmers is estimated at 10.64 percent. Therefore, this would cause a decrease in domestic production of basmati rice by 2.55 percent. The net change in the production of basmati rice will be 3.55 percent rise i.e. from 2920.4 thousand tons to 3024.07 thousand tons. This increase in the production of basmati rice would generate a gain of producer surplus of Rs. 5053.35millions.

It is concluded from the above analysis that the 10.3 percent increase in the international price of rice due to the full trade liberalization under the Doha Round will have a positive impact on the production of basmati rice in Pakistan. On the other hand, it will also have a negative impact on the consumers. However, gain in producer surplus is greater than the loss in consumer surplus; therefore, net gain to Pakistan would be Rs.770.81millions.

4.Conclusions and Policy Implications

Rice is a highly valuable cash crop that earns substantial foreign exchange for the country. The stable growth of rice production has helped Pakistan to not only meet the domestic demand of rice but also export its surplus quantity. Rice has two distinct varieties namely non-basmati rice, which is a short duration variety and basmati rice, which is a long duration variety. Basmati rice accounts for almost 63 percent while non-basmati rice for the remaining 37 percent of total rice area in Pakistan

For quantifying the impacts of trade liberalization on basmati rice in Pakistan, a partial equilibrium model has been used where first of all we have tested price integration to test the degree of price transmission from the world level to farm gate level. Results confirm the existence of a stable long-run relationship between the wholesale price and world price and between farm gate price and the wholesale price of basmati and non-basmati varieties of rice. Direction of influence is from world price to wholesale price and from wholesale price to farm gate price under Granger causality tests.

The impact of trade liberalization on basmati rice reveals that with the increase in the price of basmati rice at national and international level, there is no doubt that its demand would fall. However due to less elastic demand and increasing trend in rice consumption, the resultant decrease in its demand would be small. On production side we find that basmati rice production will increase and there will be an opportunity to have higher prices of our basmati rice exports. The welfare analysis shows that the gain in producer surplus exceeds loss in consumer surplus as a result of rise in the price basmati rice at national and international levels. Consequently, there is a net welfare gain to the whole society for basmati rice.

In conclusion, it may be assumed that the membership of WTO is not a magic formula that will abruptly bring only positive aspects for Pakistan. However, globalization trend in the coming years suggests the need for a critical review of Pakistan's agricultural policies and it is understood that with the right policies and right reforms, the necessary environment for improved and sustained economic performance will be at hand.

4.1 Policy Implications

- The responsiveness of basmati rice production to change in price has been found to be moderate. Therefore, price policy of agriculture should not be pressed to increase production but its main function should be to act as a signal for proper allocation of resources.
- In order to increase the productivity of basmati rice, non-price factors should be well appreciated. Non- price support can be provided to producers through the Special and Differential Treatment (SDT) provisions and the Green Box exemptions. Following measures can be applied to take the full advantage of these exemptions:

(a)Technology meant to increase water efficiency and other inputs can be made available for hiring at union council level.
(b)Proper and timely supply of inputs like seeds, fertilizers and permitted pesticides etc. should be ensured.
(c)Agriculture policy needs to aim at improved infrastructure so that Pakistan may able to take full advantage of the price increase in the world market.

- Exports of basmati rice are expected to gain from increased prices. Following comprehensive measures can be applied to remain competitive in international rice market:

(a) Government agencies should be responsible for day-to-day administration of basmati rice quality control in order to build up the trust and confidence of importers in the quality and safety of the food supply system.
(b) Government representatives and advisors should take part in identifying technical, institutional and policy constraints faced by the exporters in meeting Sanitary and Phyto-Sanitary (SPS) requirements.
© Government should play its role in terms of funding new research and development activities, aimed at basmati rice quality improvement and cost reduction.
(d) A permanent research unit should be established to evaluate the specific WTO commitments; monitor future developments associated with the agreed commitments and study the local impact of trade liberalization.

- In the agriculture sectors, most of the producers, exporters and policy makers are presently not well aware about the AoA of WTO. There is an urgent need to pursue public awareness progress on the impact of trade liberalization especially on agriculture, including trade policy developments, priorities and strategies of the major trading partners of Pakistan.

4.2 Future Research

Although the present study provides us with rather consistent econometric results and policy implications that interpret the possible situation in basmati rice crop of Pakistan, yet it is restricted with certain types of limitation due to which some propositions for future research appear to be expedient.

The analysis in the study has been conducted using partial equilibrium model. This is a simple and effective tool in evaluating the welfare effects from the trade policy changes within the agriculture sector. However, it does not capture the effects of reducing tariffs and eliminating subsidy on other crops within the agriculture sector and on other sectors of the economy. Therefore, spillover effects that can be calculated with the employment of Computable General Equilibrium (CGE) technique appear to be reasonable complement for future analysis of impact of trade liberalization. Although CGE analysis has its own limitations and may provide biased results due to the aggregated data, it allows consideration of the overall effect for the entire economy.

Furthermore, the number of observations used for each price series (about 31) prevents us from obtaining fully conclusive evidence from tests on dynamic properties of the price series and therefore, also from the co-integration tests. So, for getting more concrete evidence on price transmission, a future analysis will have to concentrate on using a more significant number of observations for each price series.

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