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## The Implications of WTO Agreement on Production and Consumption of Wheat in Pakistan: A Time Series Analysis

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**Abstract:** The present study was conducted by using time series data of wheat production, consumption, domestic wholesale and farm gate prices and international prices to evaluate the impact of trade liberalization under WTO regime. The demand and supply elasticity was found inelastic that is  $-0.131$  and  $0.240$ , respectively. The elasticity of price transmission of wholesale price of wheat with respect to international price of wheat is  $1.213$ . Thus expected 7% increase in international price of wheat due to trade liberalization, would increase wholesale price by 8.50% in Pakistan. Thus Rs.  $8750 \text{ ton}^{-1}$  wholesale price of wheat in 2003, which was taken as a base year, would become Rs.  $9494 \text{ ton}^{-1}$  after trade liberalization at current market price, whereas, price transmission elasticity of farm gate price with respect to wholesale price, is  $0.98$ . Since wholesale price is expected to increase by 8.5% under total liberalization, farm gate price to be received by farmers in Pakistan is expected to increase by 8.33% that is from  $8125$  to  $8802 \text{ ton}^{-1}$ . With a demand elasticity estimate of  $-0.131$ , domestic consumption is expected to fall by 1.11% that is from  $18303$  thousand tones to  $18100$  thousand tones. Loss in consumer surplus would be Rs.  $15226$  millions at current market price.

**Key words:** WTO, price policy, wheat, trade liberalization, elasticity of demand, price transmission elasticity

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### INTRODUCTION

Pakistan is a low income, food deficit country with a gross national product per capita of US \$  $736^{[1]}$ . Agriculture is a major economic activity in Pakistan. The share of agriculture in GDP of the country though declined over time as a result of structural adjustment, its performance still have a major impact on the over all performance of the economy because of its linkages with the rest of the economy. Therefore, a higher and sustained growth in the agricultural production is imperative for a rapid development of the economy and poverty reduction in the country.

Until mid 1980s, the government pursued an economic policy that was strongly interventionist. One of the consequences has been price discrimination against agriculture in a sense that government taxed the producers and subsidized consumers<sup>[2]</sup>. During late 1980s, Pakistan turned from inward-looking policies toward trade liberalization and export promotion strategies. Since then the government changes frequently but all of them considerably liberalized the economy<sup>[3]</sup>.

Pakistan joined WTO in 1994. The WTO Agreement on Agriculture (AoA) was one of the many agreements, which were negotiated during the Uruguay Round (UR).

The Agreement comprises of three main areas namely; market access, domestic support and export subsidies.

In the UR, Pakistan committed itself to bind more than 90% of the agricultural tariff lines. Products for which tariffs have not been bound include alcoholic beverages, swine and pig meat etc., for religious grounds. For ten tariff lines however, the binding was 150% and for ten others it was understood that these high levels of binding were adopted in order to safeguard import-competing agricultural sectors in the short run from possible disruption as non-tariff barriers were removed. Tariff levels for wheat and rice were bound at 100 and 150%, respectively. The applied rates are much less than the bound rates. As Pakistan offered ceiling bindings, no commitment was required for the tariffs during the UR implementation period<sup>[2]</sup>.

After joining the WTO, Pakistan trade sector has undergone the radical changes in compliance with WTO rules and regulations. Pakistan's applied tariffs have been reduced and simplified, the maximum tariff brought down in phases to 65% in 1996 and to 30% in early 2002<sup>[4]</sup>. Similarly Pakistan made appreciable progress in reducing non tariff barriers. The quantitative quotas have been eliminated. Negative and restrictive list of imports has also undergone reductions. Only a few agricultural items are

subject to restrictions<sup>[5]</sup>. Pakistan presented a detailed schedule on domestic support measure under Uruguay Round of Agreement on agriculture. AMS figures being negative, Pakistan is not required to reduce its support level as per agreement<sup>[5]</sup>. Pakistan did not notify the existence of any export subsidies on agricultural products in the base period and accordingly could not resort to them in the future<sup>[2]</sup>.

The challenges for agriculture sector of Pakistan and particularly for wheat are quite different from those met in the previous decades. Average wheat yield realized per hectare in Pakistan is far below as compared to the rest of the world. Estimates show that productivity gap from world's highest average yield of wheat is 5.2 MT ha<sup>-1</sup> which is 69.3% higher than the national average<sup>[6]</sup>. Although there is a big productivity gap yet it occupies the highest cultivated area of the country. The planted area, production, average yield and per annum growth rate of wheat is presented in Table 1.

Pakistan is one of the major producers of wheat in the world, but the domestic wheat production remains insufficient for the needs of its population. To ensure food security, the country has to supplement the local production with imports. Estimates show that import cover from 10-20% of national consumption needs<sup>[7]</sup>. Because of the strategic importance of wheat as a major staple food commodity, government used to intervene not only to guarantee affordable supplies to consumer but also to provide market support to producers<sup>[8]</sup>.

The impact of the UR on wheat has been predicted more than most other grains due in part to the greater degree of subsidization of wheat in the past. Total subsidized wheat exports are scheduled to fall from 59 million tones in initial year to 40 million tones. During the UR Round of Talks, the United States and Canada, promised to reduce government subsidies on wheat farmers. These two countries are the price leader in the wheat world market. The elimination of subsidies on wheat by these countries would result in higher prices of Pakistan's wheat imports. Most global exercises have predicted almost 7-11% increase in wheat price, following implementation of UR Agreement on Agriculture.

Since the landscape of the world economy is undergoing considerable change, there has been growing concern on the impacts of WTO on Pakistan's agriculture production, price and market and consumption. In order to address to the question to sustain agricultural growth, achieve food security and increase farmer's income with the process of agricultural trade liberalization.

To evaluate the price transmission elasticities in order to measure the effect on domestic prices of wheat resulting from change in international prices following the implementation of AoA.

Table 1: Area planted, production, yield of wheat (Unit: Area = 000 ha; Production = 000 ton; Yield = kg ha<sup>-1</sup>; Growth = %)

Years	Area	Production	Yield
1981-82	7223	11304	1565
1982-83	7398	12414	1678
1983-84	7343	10882	1482
1984-85	7858	11703	1734
1985-86	7403	13923	1881
1986-87	7706	12016	1559
1987-88	7308	12655	1734
1988-89	7730	14419	1865
1989-90	7844	14315	1825
1990-91	7911	14565	1841
1991-92	7878	15684	1990
1992-93	8300	16156	1946
1993-94	8334	15213	1893
1994-95	8170	17002	2081
1995-96	8376	16907	2018
1996-97	8109	16650	2053
1997-98	8355	18694	2238
1998-99	8230	17858	2170
1999-00	8463	21079	2491
2000-01	8180	19024	2325
2001-02	8057	18226	2262
2002-03	8034	19255	2384
2003-04	8216	19500	2375
Growth rate/annum	0.68	2.91	2.07

Source: Agricultural Statistics of Pakistan (various issues)

To measure price elasticity coefficients for demand and supply of wheat for forecasting the likely impact of trade liberalization on domestic production and consumption of wheat at national level.

To examine the extent of benefits and losses to be gained by Pakistan as a result of trade liberalization with special reference to wheat.

## MATERIALS AND METHODS

In evaluating the quantitative effects of liberalization on wheat, following functions were estimated i.e. domestic demand and supply functions and two price linkage equations. Nominal prices were used for the analysis purpose. The equations were estimated through double log standard regression analysis.

On the basis of demand theory, demand of wheat in Pakistan is the function of wheat own price, prices of the substitutes and complementary products and per capita income<sup>[9]</sup>. For the study most important factor that is commodity's own price was used. Per capita income was dropped from the function as it was reported to be insignificant in explaining variation in per capita consumption<sup>[10]</sup>.

$$Qd_w = f(Pm_{aw}, I) \tag{1}$$

$$Ed_w = \frac{(\% \delta Qd_w)}{(\% \delta Pm_w)} \tag{2}$$

The supply response of wheat can be assumed to be a function of own output price, prices of all other relevant

crops, prices of inputs and technology<sup>[11]</sup>. The supply function estimated was in the form of:

$$Qs_w = f(Pf_w, T) \quad (3)$$

$$Es_w = \frac{(\% \delta Qs_w)}{(\% \delta Pf_w)} \quad (4)$$

In order to develop the relationship between world and domestic prices and between the wholesale and farm level prices the price linkage equations were estimated. The price linkages equations were of the form:

$$Pm_{dw} = Pw_w + \text{Tariff} + \text{Transfer cost} \quad (5)$$

$$Pf_w = \alpha + \beta Pm_w \quad (6)$$

$$Et_m = \frac{(\% \delta Pm_{dw})}{(\% \delta Pw_w)} \quad (7)$$

In order to determine the benefits and losses to be gained by Pakistan as a result of trade liberalization, the welfare analysis was done. Consumer and producer surplus were calculated by using following formulas:

$$\text{Consumer surplus} = (P_{wb} - P_{wt}) [D_w^1 + (D_w - D_w^1)] * 0.5 \quad (8)$$

$$\text{Producer surplus} = (P_w - P_{wt}) [S_w + (S_w^1 - S_w)] * 0.5 \quad (9)$$

$$\text{Net gain} = \text{Producer surplus} - \text{Consumer surplus} \quad (10)$$

Where:

- $Qd_w$  = Total quantity demanded of wheat.
- $Pm_{dw}$  = Domestic market price of wheat.
- $I$  = Income
- $Ed_w$  = Demand elasticity.
- $Qs_w$  = Total quantity supplied of wheat.
- $Pf_w$  = Farm gate price of wheat.
- $T$  = Trend (years as proxy for technology).
- $Es_w$  = Supply elasticity of wheat with respect to its price.
- $Pw_w$  = World market price of wheat.
- $\beta$  = Farm gate price transmission elasticity of wheat.
- $Et_m$  = Market price transmission elasticity of wheat with respect to its world price.
- $P_{wb}$  = Price of wheat in base year.
- $P_{wt}$  = Price of wheat after trade liberalization.
- $D_w$  = Quantity demanded of wheat in the base year.
- $D_w^1$  = Quantity demanded of wheat after trade liberalization.
- $S_w$  = Quantity supplied of wheat in the base year.
- $S_w^1$  = Quantity supplied of wheat after trade liberalization.

## RESULTS AND DISCUSSION

In order to determine the impact of trade liberalization on domestic prices, production and consumption of wheat, the equations specified in the previous section were estimated using the relevant data for the period 1980-2003. Using the FAO's study on Impact of Uruguay Round on Agriculture, 1995; it was assumed that the international price of wheat would increase by 7% at world level. Different price elasticity coefficients were then used to estimate this projected increase in price on wheat at national level. The estimated equations were as follow:

Estimated domestic demand equation

$$LnWCON = 10.223 - 0.131 LnWPW + 0.007 LnPCI$$

$$R^2 = 0.99 \quad (17.82)^{***} \quad (-2.45) \quad (0.101) \quad (4.00) \\ E_{dw} = -0.131 \quad DW = 1.38$$

Estimated domestic supply equation<sup>[12]</sup>

$$LnWPROD = 7.596 + 0.240 LnFPW + 0.006TR$$

$$R^2 = 0.94 \quad (9.290)^{***} \quad (2.06)^{**} \quad (0.60) \\ E_{dw} = 0.24 \quad DW = 2.03$$

Price linkage equations

Wholesale price of wheat at Lahore verses world price of wheat

$$LnWPW = -1.912 + 1.213 LnIPW$$

$$R^2 = 0.88 \quad (-2.25) \quad (11.85)^{***} \\ E_{ww} = 0.213 \quad DW = 1.73$$

Price of wheat received by farmers verses wholesale price of wheat at Lahore

$$LnFPW = 0.030 + 0.980 LnWPW$$

$$R^2 = 0.98 \quad (0.19) \quad (52.35)^{***} \\ E_{fw} = 0.98 \quad DW = 1.91$$

Where:

- $LnWCON$  = Natural log of Per capita wheat consumption (kg/year).
- $LnWPW$  = Natural log of wholesale price of wheat at Lahore market.
- $LnPCI$  = Natural log of per capita income.
- $TR$  = Trend (years as proxy for technology)

- $L_n$ WPROD = Natural log of wheat production in thousand of tones.
- $L_n$ FPW = Natural log of farm gate price of wheat in Rs./tones.
- $L_n$ IPW = Natural log of international price of wheat (c.i.f., Karachi) in Rs./tones.

The estimated parameters are consistent across equations. The price coefficient in demand equation, although, has negative sign but insignificant in explaining the variation in demand. The reason may be the lack of consistent time series data on consumption of wheat. Cornelisse and Naqvi<sup>[4]</sup> have mentioned that a consistent time series data of directly observed volume of wheat consumption is not available in Pakistan. Price transmission, demand and supply elasticities for wheat are given in Table 2.

The price elasticity of demand for wheat for food was calculated as -0.131. It shows that one percent increase in wheat price will cause 0.131% decrease in wheat consumption. Under a totally liberalized regime in wheat sector on the world level, wholesale price would increase by 8.50%. Thus with a demand elasticity estimate of -0.131, domestic consumption is expected to fall by 1.11% that is from 18233 thousand tones to 18031 thousand tones. Loss in consumer surplus calculated by equation number 10 would be Rs. 14360 million at current market price.

The elasticity of price transmission of wholesale price of wheat with respect to international price of wheat is 1.213. Thus expected 7% increase in international price of wheat<sup>[14]</sup> o trade liberalization, would increase wholesale price by 8.50% in Pakistan. Thus Rs. 9326 ton<sup>-1</sup> wholesale price of wheat in 2003, which was taken as a base year, would become Rs. 10118 ton<sup>-1</sup> after trade liberalization at current market price. Whereas, price transmission elasticity of farm gate price with respect to wholesale price, is 0.98. Since wholesale price is expected to increase by 8.5% under total liberalization, farm gate price to be received by farmers in Pakistan is expected to increase by 8.33% that is from 8687 to 9410 ton<sup>-1</sup>.

The supply elasticity of wheat with respect to its farm gate price was found to be 0.24. The elasticity coefficient indicates that if price of wheat goes up by one percent, the production of wheat goes up by 0.24%. As such an 8.33% increase in farm price would increase wheat

production by two percent that is from 19500 thousand tones to 19890 thousand tones. This increase in production would generate a producer surplus of Rs. 14239 million. However, the net impact to Pakistan is negative (121 million) and consumer would lose in liberalization process.

**CONCLUSIONS**

Inelastic supply elasticity of wheat suggests that price incentive alone cannot boost the production to a substantial level. Thus increase in wheat production may not be sufficient to meet the country’s deficit of wheat and price increases are likely to increase the import bill and burden on the poor people, who purchase food grains from the market. The gain in producer surplus would not be able to offset the loss in consumer surplus and there will be a net loss to the economy. Moreover, keeping in view relatively inelastic supply demand response, the finding of such means as increase agricultural productivity and issue of food security would be a challenge to Pakistan in the near future. Institutional support like research and extension are prerequisite to take full advantage of Uruguay induced higher prices for wheat.

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Table 2: Demand, supply and price transmission elasticities for wheat

Categories	Elasticity coefficient
Domestic demand elasticity	-0.131
Domestic supply elasticity	0.240
Wholesale price transmission elasticity	1.213
Farm gate price transmission elasticity	0.98

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