The Pakistan Development Review
45 : 4 Part II (Winter 2006) pp. 601–617

The Impact of Global Cotton and Wheat Prices on Rural Poverty in Pakistan

DAVID ORDEN, ABDUL SALAM, RENO DEWINA,
HINA NAZLI, and NICHOLAS MINOT

The incidence of rural poverty in Pakistan increased during the late 1990s after having declined during the 1980s and early 1990s. A number of structural factors have been identified as contributing to rural poverty in Pakistan. Among them are low levels of health and education spending and the unequal of farmland distribution. These structural factors help explain the levels of poverty in Pakistan, but not the increase in poverty in the late 1990s. One hypothesis is that the increase in rural poverty is the result of an adverse trend in world commodity prices, particularly cotton, a major commercial crop, and other agricultural commodities such as wheat, rice, and sugar.

The overall objective of this paper is to measure the impact of changes in world commodity prices on poverty in rural Pakistan, with particular focus on cotton prices and the main cotton producing districts of Punjab and Sindh provinces.

GLOBAL COTTON MARKETS

About one third of global cotton production is traded internationally. The US, Australia, Uzbekistan, Egypt, and Greece are the five main exporters of cotton, accounting for more than 60 percent of global cotton exports. The production of the other four major producers (the PRC, India, Pakistan, and Turkey) is destined mainly for local consumption by their own textile industries. For a number of other poor countries, cotton is an important component of their merchandise trade. The United Nations classifies about one third of cotton-producing countries as least developed countries.

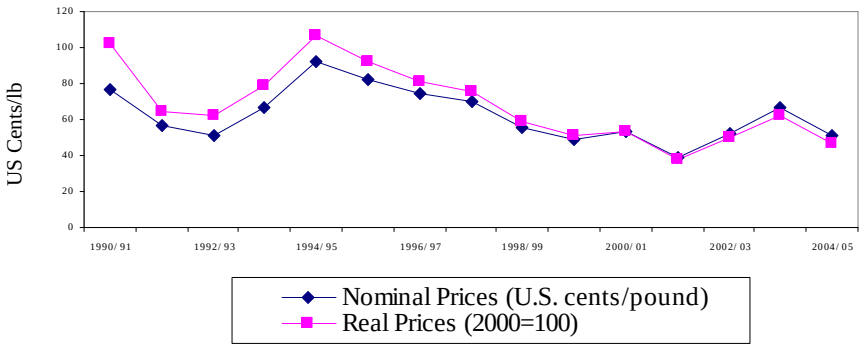
David Orden <d.orden@cgiar.org> is Senior Research Fellow, in the Markets, Trade and Institutions Division, International Food Policy Research Institute (IFPRI), Washington, DC. Abdul Salam <drabdulsalam@email.com> is Professor, Federal Urdu University of Arts, Science and Technology, Islamabad. Reno Dewina <r.dewina@cgiar.org> is Senior Research Assistant, IFPRI. Hina Nazli <hnazli@uoguelph.ca> is PhD student, University of Guelph. Nicholas Minot <n.minot@cgiar.org> is Senior Research Fellow, IFPRI.

Authors' Note: Our research for this paper was supported by the Asian Development Bank (ADB) as part of a project on cross-cutting poverty issues in rural Pakistan. A report on the cotton analysis is available from the ADB Islamabad Resident Mission titled "Background Paper 8. Pakistan Poverty Assessment Update", An earlier version of the paper was presented at the American Agricultural Economics Association Annual Meeting, Long Beach, California, July 23-26, 2006, and the full report was presented at a seminar at the ADB Islamabad Resident Mission in February 17, 2006.

Cotton is the main cash crop and major source of government revenue, foreign exchange earnings, investment, and economic growth, for several countries in Central and Western Africa, considered the world's poorest regions. In these developing countries, cotton is an important aspect of the livelihoods of the poor. Around one billion people, mostly in developing countries, are either directly or indirectly involved in the production and marketing of cotton [Towsend (2004)].

Traditionally Pakistan exported large quantities of raw cotton, but has now shifted to exporting value-added textile products and cotton 'made ups'. In recent years, Pakistan has participated in the world market as both an exporter and importer of cotton to meet the requirements of its domestic textile industry. International cotton prices remain an important reference for domestic transactions in cotton lint and hence for prices of seed cotton at the farm level. In view of various technical considerations and characteristics important in determining its quality (such as staple length, micronaire, quality of ginning, and the price received in the international market), Pakistani cotton is grouped with Index B cottons. Average annual world market prices of this group are illustrated in Figure 1. World cotton markets exhibit substantial annual price variability around a slight declining trend in nominal and real terms from 1990-91 to 2004-05. The price of index B cotton decreased from its peak in 1994-95 to trough in 2001-02 by 57.8 percent in nominal terms. In real terms, the Index B cotton price (in 2000 US dollars) declined from $107.13 per 100 lb to $37.87, a decrease of 64.7 percent.

Fig.1. Annual Average Prices of Index B Cottons in International Market



Sources: International Cotton Advisory Committee. *Cotton World Statistics*. Issues through 1992-93; *Cotton Outlook*. Various issues 1994-95 onward.

Note: Index B is the average of the three cheapest cottons among the following: Orleans/Texas (SLM 1-1-32"); Brazilian type 5/6 (1-1-16") Argentine Grade c-1/2, (1-1-16"); Turkish Adnast.1 white, (1-1-16"); RG Central Asian (SLM 1-1/16"); Pakistani Sindh/Punjab (SG Afzal 1-1-32"); Indian J-34 SG; and Chinese (Type 527). Prices for 2000-01 onward are based on a revised index as reported in *Cotton Outlook* 83 (25), 2005.

Effect of Subsidies and Trade Barriers on World Cotton Prices

As for other agricultural commodities, the production and international trade of cotton in most countries has been the subject of considerable government subsidies, border protection, and other interventions. Interventions that cause market distortions include high tariffs, tariff escalation, large domestic production support, vague rules on

what constitutes trade-distorting support programmes, and considerable export subsidies. The International Cotton Advisory Committee (ICAC) estimates that more than half of world cotton production benefits from direct price and income supports. On the demand side, there is a complex range of trade barriers in the form of tariffs, quotas, and other measures on raw cotton, yarns, textiles, and apparel. Aksoy and Beghin (2004) estimate that the combined support for cotton production by eight major world producers (the US, PRC, Greece, Spain, Turkey, Egypt, Brazil, and Mexico) between 1997-98 and 2001-02 ranged from $3.8 billion to $5.3 billion.

Numerous recent studies have attempted to measure the impact of cotton subsidies on world cotton prices and production. A summary of several of these studies is provided by the Food and Agriculture Organisation [Poonyth, Sarris, Sharma, and Shui (2004)]. The studies have adopted several modeling frameworks, focusing on different countries to examine the impact of subsidies and other policies in recent years, and have shown a range of estimates of the effects of subsidy elimination. The studies generated divergent results, reflecting partly the particular structure of the models and assumed elasticities, as well as the base period, subsidies considered, and other factors. Estimates of the studies fall into three categories: those reporting relatively small effects (2-5 percent); those reporting moderate effects (10-25 percent), and those reporting relatively large effects (near 30 percent or more). The WTO panel in the Brazil/US cotton case found that US support policies damaged Brazil by depressing world prices but did not give an empirical estimate of the magnitude of this effect. The middle-range estimates receive the most support in the studies.

Nominal and Real Domestic Cotton Prices

Table 1 shows the harvest-season market and government support prices of seed cotton between 1990-91 and 2004-05. Nominal support prices were revised upward in 11 years, and substantially downward once, during the reference period. The average annual growth rate of nominal seed cotton prices during 1990-91 to 2004-05 was 10 percent compared to the average annual increase of 7.25 percent in the consumer price index (CPI). Correspondingly, the real value of support prices has trended upward since 1990-91.

The nominal price of seed cotton in the domestic market during the reference period was also marked by large fluctuations. The overall mean value of the nominal domestic price of seed cotton for the period under review was PRs730/40 kg, with a coefficient of variation of 34.39 percent.

As shown in Table 1, except in 2 recent years (2001-02 and 2004-05), market prices have been higher than support prices. In those years, as market prices fell, the Government of Pakistan (GoP) tried to maintain prices above the support price level by procuring cotton lint through the TCP. The TCP procured from the market 0.203 million bales in 2001-02 and 1.6 million bales in 2004-05, but these interventions, notwithstanding their positive impact on market sentiment, failed to sustain the support price announced by the GoP as the price received by cotton growers.

In 1999-2000, no support price was agreed on and announced by the GoP; moreover, there was a change in government on 12 October 1999, the middle of the cotton season. The new government took time to design the required policy framework

Table 1

Support and Market Prices of Seed Cotton

Year	Nominal Price (PRs/40 kg)		CPI	Real Price (PRs/40 kg)	
	Support Price	Market Price		Support Price	Market Price
1990-91	245	327	43.20	567	758
1991-92	280	334	47.41	591	704
1992-93	300	384	52.07	576	737
1993-94	315	497	57.94	544	858
1994-95	400	785	65.48	611	1,198
1995-96	400	754	72.60	551	1,039
1996-97	500	793	81.11	616	978
1997-98	500	843	87.45	572	964
1998-99	–	914	92.46	–	989
1999-2000	–	641	95.78	–	669
2000-01	725	900	100.00	725	900
2001-02	780	761	103.54	753	735
2002-03	800	914	106.75	749	857
2003-04	850	1,219	111.63	761	1,092
2004-05	925	885	121.99	758	725

Sources: Market prices are an average of the prices in important producer area markets during the cotton harvest season, and are taken from various reports of the Agricultural Prices Commission and Pakistan Central Cotton Committee. Support prices are adapted from policy reports of the Agricultural Prices Commission and *Pakistan Journal of Agricultural Economics*. No support price for seed cotton was fixed for the 1998-99 and 1999-2000 crops, while that for the 2000-01 crop was announced by the federal Ministry of Commerce in its Cotton Policy. The CPI is taken from the *Pakistan Economic Survey 2004–05* and adjusted in light of the 9.28 percent inflation reported for 2004-05 in *Dawn* (16 August 2005).

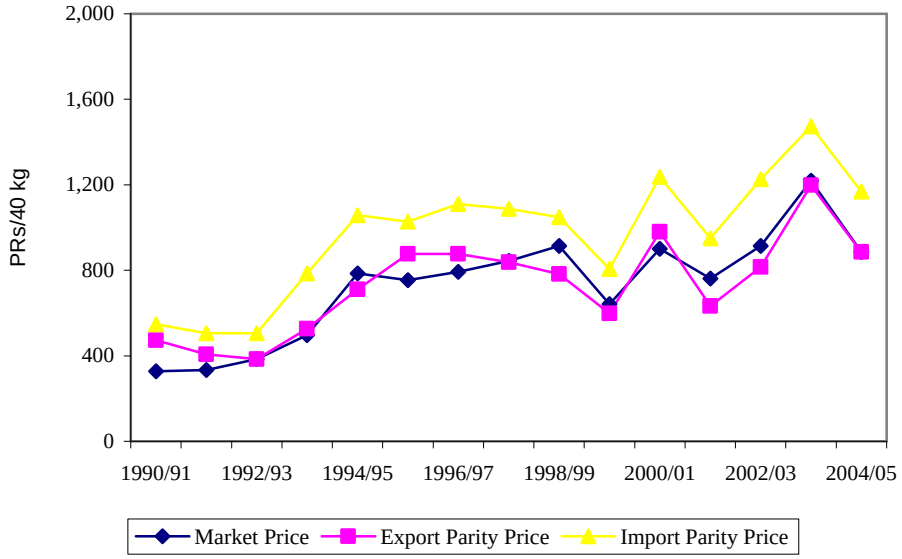
CPI = consumer price index.

Note: Real prices are expressed in terms of 2000-01 rupees (PRs).

and institutional arrangements for market intervention. In the meantime, international prices continued to fall, exerting downward pressure on domestic prices. The textile industry, taking advantage of low international prices, arranged for substantial imports of cotton from abroad, which also depressed the domestic market price. The market price of seed cotton in the 1999-2000 crop season thus averaged only 70 percent of the previous year's level.

The nominal domestic market price of seed cotton can also be compared to the nominal world prices implied by the export and import parity prices (border prices) of cotton lint. As estimated from the prices of Index B cottons the import and export parity prices of seed cotton also vary considerably, as shown in Figure 2 (see the ADB Background Paper 8 for technical discussion of the parity prices). The average value of export parity prices between 1990-91 and 2004-05 comes to PRs 733/40 kg, with a coefficient of variation of 31.13 percent. The average value of import parity prices during this period comes to PRs 976/40 kg, with a coefficient of variation of 28.59 percent. The average increase in nominal export parity price of seed cotton, worked back from the international price of Index B cottons and expressed in rupees, is estimated at 5.52 percent per year. In contrast, the nominal price of Index B cottons (in $) is estimated to have decreased by minus 2.54 percent per year on average for the reference period. These opposite trends illustrate the effect of substantial inflation in Pakistan on nominal seed cotton price levels.

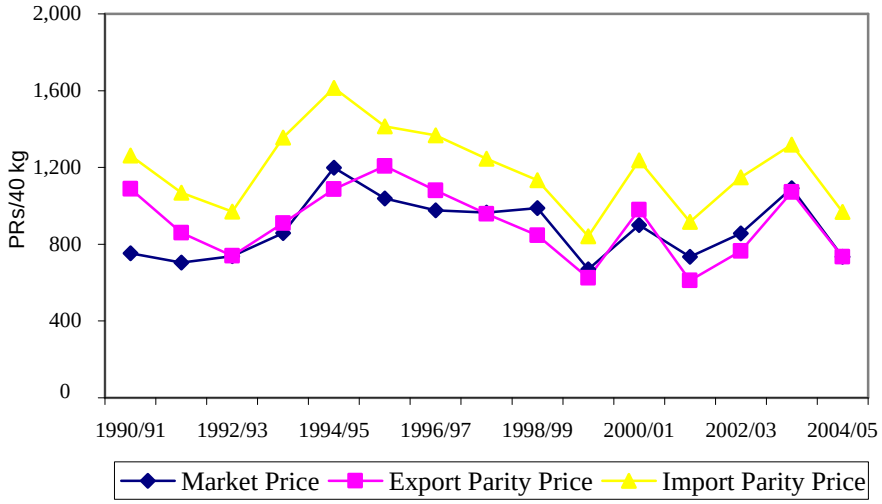
Fig. 2. Market, Export, and Import Parity Nominal Prices of Seed Cotton



Comparison of export parity prices with the corresponding domestic market prices of seed cotton shows that the two price series generally track closely together (Figure 2). Even so, in 7 out of 15 years, export parity prices were higher. Import parity prices are on average 25–35 percent higher than export parity prices. A comparison of domestic prices with import parity prices indicates that the price of imported cotton was substantially higher than the domestic price. Accordingly, the coefficient of nominal protection, estimated using the import parity price, is always less than one and by a considerable margin. Generally, years in which substantial quantities of cotton were exported are characterised by higher export and import parity prices while those with considerable imports have been years of lower parity prices.

While nominal domestic prices track export parity prices relatively closely, the real price of cotton (adjusted for domestic inflation) depicts more realistically price levels affecting the purchasing power and economic well-being of cotton farmers. Real market prices of seed cotton in Pakistan and real export and import parity prices of seed cotton are shown in Figure 3. The real cotton price in Pakistan dropped in the late 1990s—a similar pattern to world prices in US dollars—but the decline in real prices in Pakistan was moderated by real depreciation of the rupee, which raised the value of world prices in domestic currency. In real terms (adjusted for inflation in Pakistan and the US), the rupee depreciated by 32.5 percent between 1994-95 and 2001-02. Due to this real depreciation, the real domestic market price of cotton declined by 38.7 percent between 1994-95 and 2001-02, compared to the world price decline of 64.7 percent in real dollars. The decline in the 3-year averages of real world and domestic prices centred on the peak and trough years are less: a decline of 49.1 percent in world dollar prices and 19.6 percent in domestic rupee prices.

Fig. 3. Market, Export, and Import Parity Real Prices of Seed Cotton



Source: *Cotton Outlook* (various issues) for Index B cotton prices.

Note: Real prices are expressed in terms of 200-01 rupees (PRs). The export parity price is the harvest season average, and import parity price is the annual average, based on international prices of Index B cottons.

The real market price of seed cotton also fluctuated widely during the period under review. For 7 out of 14 yearly changes from 1990-91 to 2004-05, the real value of market prices was less than the preceding year. Further, in 5 of the years, the purchasing power of seed cotton was less than in 1990-91. The real value was highest in the 1995-96 crop season while the highest nominal price was observed in 2003-04. As a result of the swings in the real value of market price of seed cotton, there is no statistically significant trend during the reference period.

Effects of World Cotton Prices on Poverty in Pakistan

Pakistan's population was estimated to be 148 million in 2003. The incidence of rural poverty in Pakistan, income sources, and other characteristics of poor and nonpoor rural households, have been carefully assessed in a recent study by Malik (2005). The next sections provide an additional overview of the income levels of nonfarm and farm households, paying particular attention to landowner and sharecropper cotton-producing households in Punjab and Sindh. Then a simulation analysis is provided of the effects of cotton prices on incomes and poverty in Pakistan.

HOUSEHOLD CHARACTERISTICS

The HIES for 2001-02 carried out by the GoP's Federal Bureau of Statistics (FBS) consists of an adjusted sample of 16,182 households within seven provinces/regions: Punjab, Sindh, the North-West Frontier Province (NWFP), Balochistan, Azad Jammu and Kashmir, the Northern Areas, and the Federally Administered Tribal Areas. For this analysis, following FBS (2003) and Malik (2005), the focus is on the four provinces,

represented by a sample of 14,522 households. Table 2 provides some summary household statistics by location and agricultural activities for the national level, the provinces of Punjab and Sindh, and the primary cotton-producing districts of both provinces. The results reported in Table 2 and in subsequent tables are nationally representative, and based on weighted sample data.

Table 2

Distribution of Households by Location and Agricultural Activity

Household	National [a]	Province		Primary Cotton-producing Districts of [b]	
		Punjab	Sindh	Punjab [c]	Sindh [d]
Percent of All Households					
Total Population	100.0	59.8	23.6	25.9	8.5
Nonfarmers	59.3	34.4	15.3	11.9	4.3
Farmers	40.7	25.4	8.3	14.1	4.1
Urban Population	29.4	17.0	9.8	3.7	1.9
Nonfarmers	27.5	15.9	9.4	3.2	1.6
Farmers	1.9	1.2	0.5	0.5	0.3
Rural Population	70.6	42.8	13.8	22.2	6.6
Nonfarmers	31.8	18.5	6.0	8.6	2.8
Farmers	38.8	24.2	7.8	13.6	3.8
Percent of Farm Households					
Among Farmers	100.0	62.4	20.3	34.6	10.2
Livestock Only	23.4	17.4	4.0	9.4	1.8
Producing Crops	76.6	45.0	16.3	25.2	8.4
Landowners	55.4	35.8	7.6	19.7	3.9
Sharecroppers	13.9	4.1	8.0	2.6	4.1
Other Land Tenures [e]	7.3	5.1	0.7	2.9	0.4
Of Which Producing					
Cotton	24.0	17.0	6.8	15.1	6.2
Landowners	16.6	13.1	3.3	11.4	2.9
Sharecroppers	5.1	1.9	3.2	1.8	3.0
Other Land Tenures [e]	2.3	2.0	0.3	1.9	0.3
Wheat, but not Cotton	42.7	24.5	6.7	8.7	1.7
Landowners	31.8	19.9	3.1	7.1	0.8
Sharecroppers	6.9	2.1	3.3	0.8	0.8
Other Land Tenures [e]	4.0	2.5	0.3	0.8	0.1
Neither Cotton nor Wheat	9.9	3.5	2.8	1.4	0.5

Sources: Based on weighted sample from the 2001-02 *Household Integrated Economic Survey*.

[a] Based on Punjab, Sindh, the North-West Frontier Province, and Balochistan.

[b] Primary cotton-producing districts are determined as districts with more than 1 percent of national acreage during 2001-02 to 2003-04.

[c] Includes the districts of Bahawalpur, Rahimyar Khan, Vehari, Lodhran, Rajanpur, Khanewal, M.Garh, Bahawalnagar, Multan, Dera Ghazi Khan, Sahiwal, Jhang, Toba Tek Singh, Pakpatan, Faisalabad, and Layyah.

[d] Includes the districts of Ghotki, Sanghar, Khairpur, Nawab Shah, Hyderabad, Mirpurkhas, Nowshero Feroze, and Sukkur.

[e] Includes other types of land arrangement and non-respondents.

At the national level, 29.4 percent of households are urban and 70.6 percent rural. Households engaged in farming comprise 40.7 percent of the total sample. Farmers are concentrated in rural areas where more than half of households engage in some farming activity. A small set of households (1.9 percent of all households nationally) are classified as urban and also engage in some farming activity. These households are 6.5 percent of urban households.

Sources of Income of Cotton-producing Households

Table 3 provides information on the sources of income of landowner cotton-producing households by geographic area. The average income of landowner cotton-producing households is estimated to exceed the national average among rural households, while sharecroppers farm less acreage and report lower incomes (not shown in the table). Reported net incomes of landowner cotton farmers are higher in Sindh than Punjab. Among landowner cotton farmers nationally, crops account for 78.9 percent of average household net income and wages for 10.0 percent. Distributing crop production expenses in proportion to the acreage of each crop, cotton accounts for 48.9 percent of net crop income or 38.6 percent of household total net income for landowners. For sharecroppers, income from crops accounts for 77.5 percent of the total net income at the national level and cotton income for an estimated 57.5 percent of crop income and 44.6 percent of total income. Thus, cotton income is important to the well-being of landowner and sharecropper households.

Table 3
Sources of Income of Landowner Cotton-producing Households at the National, Provincial, and Primary Cotton-producing District Levels

		Province		Primary Cotton-producing Districts of	
	National	Punjab	Sindh	Punjab	Sindh
Income Source	Annual Income (PRs)				
Total	**77,721**	**69,672**	**108,915**	**67,383**	**112,575**
			Percent		
Crops	78.9	73.5	93.7	75.0	93.1
Livestock	3.0	6.2	(5.5)	5.4	(5.2)
Rental	1.4	1.8	0.3	1.9	0.3
Nonfarm Business	5.1	6.5	1.6	5.1	1.8
Wages	10.0	9.8	9.9	10.0	10.3
Transfers	1.7	2.2	0.0	2.6	(0.3)
Among Crops	100.0	100.0	100.0	100.0	100.0
Cotton	48.9	44.4	56.9	45.8	57.3
Wheat	29.5	32.6	23.9	32.6	24.0
Sugarcane	8.8	6.1	14.3	5.5	14.1
Rice	1.0	1.3	0.5	1.0	0.4
Maize	0.1	0.2	0.0	0.2	0.0
Pulses	0.3	0.5	0.0	0.4	0.0
Fruits/Vegetables	2.1	2.4	1.5	2.3	1.5
Fodder	5.4	7.4	1.5	7.0	1.3
Other	3.9	5.2	1.3	5.2	1.3
Farm Size (ha)	4.7	4.2	6.7	4.2	6.9

Source: Based on weighted sample from the 2001-02 *Household Integrated Economic Survey.*

Within Punjab, crop income accounts on average for 73.5 percent of total income among landowner households producing cotton, and cotton for 44.4 percent of crop income and 32.6 percent of total income. In Sindh, crops account on average for 93.7 percent of the total income of landowner cotton-producing households. Crop and cotton income appear to be more important for landowner and sharecropper cotton-producing households in Sindh than in Punjab. The higher proportion of net income reported from

crops arises largely because of reported losses on livestock, which offset earnings from other sources.[1] Cotton accounts for 56.9 percent of average crop income and 53.3 percent of total income among landowner cotton-producing households in Sindh.

Direct Effects of Cotton Prices on Household Incomes and Poverty

To measure the linkages between global cotton prices and rural poverty in Pakistan a simulation analysis is undertaken, as in the study of the impact of lower cotton prices on rural poverty in Benin by Minot and Daniels (2005). The direct effects of changes in cotton price on incomes and poverty among cotton-producing households are assessed first assuming no change in production levels. The direct effects on the incomes of and poverty among these households are also assessed allowing for a supply response by the farmers.

Direct Effects: The direct effects of changes in cotton price are analysed based on survey information on the value of cotton sales by households. For cotton farmers who own their land, per capita income derived from a price change can be calculated as

$$\Delta y_i = \frac{1}{H_i}(Q_{ci}\Delta P_c) \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

where Δy_i is the change in per capita income of household *i* due to a change in the price of cotton; Q_{ci} is the quantity of cotton sold by household *i*; ΔP_c is the change in the real price of cotton; and H_i is the number of members in household *i*. If a household does not grow cotton, then $Q_{ci} = 0$ and the direct effect of cotton prices is zero ($\Delta y_i = 0$), but if $Q_{ci} > 0$, then a price reduction (ΔP_c, < 0) implies that income will fall ($\Delta y_i < 0$). Conversely, a price increase implies that income also rises. From Equation 1, the change in per capita income can be calculated for each household in the sample to provide a detailed picture of the distributional impact of lower or higher cotton prices. To further assess the poverty impacts of changes in cotton price on cotton-producing households, the analysis takes into account the fact that farmers will, at least to some extent, substitute away from cotton and reduce input use when cotton prices fall, and substitute into cotton production and expand input use when cotton prices rise. Sharecroppers only retain half the cotton they produce, and Equation (1) is modified accordingly. This 'micro-simulation' approach makes it possible to estimate the change in income for any sample group defined by income, farm size, or other variables.

Poverty Measures: The simulated impact of price changes on poverty is evaluated using the Foster-Greer-Thorbecke (1984) measures of poverty, defined as

$$P_\alpha = \frac{1}{N}\sum_i \left[\frac{\mu - y_i}{\mu}\right]^\alpha \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

where P_a is the poverty measure, N the number of households, μ the poverty line, and y_i the income or expenditure of poor household *i* (the summation occurs only over poor households). Different values of a (a = 0, 1, and 2) yield different

[1]Overall, cotton farmers in Sindh report average feed costs of PRs17,453 versus gross revenue from livestock of PRs12,793, resulting in negative net income reported for livestock.

measures of poverty, giving different weights to the degree of poverty and inequality among the poor. When a = 0, the poverty measure P0 is the incidence of poverty, i.e., the proportion of households whose income is below the poverty line. When a = 1, the poverty measure P1 is the poverty-gap measure. The poverty gap is equal to the incidence of poverty multiplied by the average gap between the poverty line and the income of a poor household, expressed as a percentage of the poverty line. Thus, it takes into account the depth of poverty as well as the percentage of households that are poor. If a = 2, then the poverty measure P2 takes into account the degree of inequality among poor households, as well as the depth of poverty and number of poor households. This 'poverty-gap squared' is a measure of the severity of poverty.

Simulated Direct Effects of Cotton Price on Incomes and Poverty

Simulations based on the 2001-02 HIES data were carried out to evaluate the direct effects of cotton prices on incomes and poverty in Pakistan. Since the base data refers to a period of low cotton prices, the simulations incorporated a range of increases in the farm-level price of seed cotton (ΔP_c), consistent with recent historical experience. To evaluate whether or not a household was in poverty, the study compared its annual per capita (adult equivalent) consumption expenditure with a per capita poverty line based on the government-recognised level of PRs 748/person/month. Additional income resulting from an increase in cotton prices was assumed to be utilised to increase household consumption.

Average annual consumption expenditures by cotton-producing households, and the effects on their incomes of 10 percent to 40 percent increases in cotton price are shown in Tables 4 and 5 for landowners and sharecroppers, respectively. Table 6 aggregates these results for all cotton farmers (landowners, sharecroppers, and other types of land tenure). Separate results are shown for Punjab, Sindh, and at the national level. Total household consumption expenditures are higher among landowners than sharecroppers. Total consumption expenditures are higher in Sindh than Punjab despite lower per capita expenditures in Sindh (not shown in the table), where households are larger.[2]

In the simulation analysis, every 10 percent increase in the price of cotton raises a landowner's average household income by PRs 4,806 in Punjab and PRs11,700 in Sindh, assuming fixed levels of production.[3] Among sharecroppers, every 10 percent increase in the price of cotton raises average household income by PRs 3,914 in Punjab and PRs 4,894 in Sindh. A modest supply elasticity of 0.3 is assumed for supply response simulations. This leads to slightly higher gains in household income (for example, PRs 4,878 and PRs 11,876 for landowners in Punjab and Sindh, respectively, for every 10 percent increase in cotton price).

[2]The average household size nationally is 7.0. Among cotton farmers, it is 7.8 nationally, 7.3 in Punjab, and 8.9 in Sindh. These estimates are based on the weighted sample data but are not adjusted to an adult-equivalent basis.

[3]With production fixed, this represents an increase in gross and net income from cotton, whereas the initial net income from cotton is reported (as a percentage of net crop income) in Table 6.

Table 4

Simulated Effects of Increased Cotton Prices on Poverty among Landowner Cotton-producing Households at the Provincial and National Levels

	Effect on Cotton-producing Households					
	Punjab		Sindh		National	
Item	Fixed Supply	Supply Response	Fixed Supply	Supply Response	Fixed Supply	Supply Response
Base Expenditures (PRs)	79,015		84,835		80,376	
Net Income per 10% Cotton Price Increase (PRs)	4,806	4,878	11,700	11,876	6,181	6,273
Poverty Incidence (P0)	Percent (as Proportion)					
Base	0.32		0.43		0.34	
With Cotton Price Increase of						
10%	0.28	0.28	0.29	0.29	0.28	0.28
20%	0.25	0.25	0.22	0.21	0.24	0.24
30%	0.23	0.23	0.12	0.11	0.20	0.20
40%	0.21	0.20	0.09	0.08	0.18	0.17
Poverty Gap (P1)						
Base	0.064		0.089		0.068	
With Cotton Price Increase of						
10%	0.053	0.053	0.052	0.051	0.053	0.052
20%	0.045	0.045	0.031	0.030	0.042	0.041
30%	0.039	0.038	0.020	0.019	0.035	0.034
40%	0.033	0.032	0.014	0.013	0.029	0.028
Poverty Gap Sq. (P2)						
Base	0.019		0.028		0.020	
With Cotton Price Increase of						
10%	0.015	0.015	0.014	0.014	0.015	0.014
20%	0.012	0.012	0.008	0.008	0.011	0.011
30%	0.010	0.010	0.005	0.005	0.009	0.009
40%	0.009	0.008	0.004	0.003	0.007	0.007

Source: Based on weighted sample from the 2001-02 *Household Integrated Economic Survey*.

Table 5

Simulated Effects of Increased Cotton Prices on Poverty among Sharecropper Cotton-producing Households at the Provincial and National Levels

Item	Effect on Cotton-producing Households					
	Punjab		Sindh		National	
	Fixed Supply	Supply Response	Fixed Supply	Supply Response	Fixed Supply	Supply Response
Base Expenditures (PRs)	60,861		66,211		64,241	
Net Income per 10% Cotton Price Increase (PRs)	3,914	3,973	4,894	4,967	4,533	4,601
Poverty Incidence (P0)	Percent (as Proportion)					
Base	0.56		0.58		0.57	
With Cotton Price Increase of						
10%	0.44	0.44	0.53	0.53	0.49	0.49
20%	0.38	0.38	0.45	0.44	0.42	0.42
30%	0.34	0.34	0.34	0.33	0.34	0.33
40%	0.34	0.32	0.29	0.28	0.31	0.29
Poverty Gap (P1)						
Base	0.118		0.144		0.135	
With Cotton Price Increase of						
10%	0.090	0.089	0.110	0.110	0.103	0.102
20%	0.072	0.071	0.082	0.081	0.078	0.077
30%	0.058	0.057	0.062	0.060	0.061	0.059
40%	0.048	0.046	0.047	0.044	0.047	0.045
Poverty Gap Sq. (P2)						
Base	0.035		0.049		0.044	
With Cotton Price Increase of						
10%	0.024	0.024	0.033	0.033	0.030	0.030
20%	0.017	0.017	0.023	0.023	0.021	0.021
30%	0.013	0.013	0.016	0.015	0.015	0.014
40%	0.010	0.009	0.011	0.010	0.011	0.010

Source: Based on weighted sample from the 2001-02 *Household Integrated Economic Survey*.

Table 6

Simulated Effects of Increased Cotton Prices on Poverty among all Cotton-producing Households at the Provincial and National Levels

	Effect on Cotton-Producing Households					
	Punjab		Sindh		National	
	Fixed Supply	Supply Response	Fixed Supply	Supply Response	Fixed Supply	Supply Response
Base Expenditures (PRs)	75,942		75,013		75,848	
Net Income per 10% Cotton Price Increase (PRs)	4,857	4,930	8,305	8,430	5,839	5,927
Poverty Incidence (P0)	Percent (as Proportion)					
Base	0.36		0.50		0.40	
With Cotton Price Increase of						
10%	0.31	0.31	0.39	0.39	0.33	0.33
20%	0.27	0.27	0.32	0.31	0.28	0.28
30%	0.24	0.24	0.22	0.21	0.24	0.23
40%	0.21	0.21	0.18	0.17	0.20	0.20
Poverty Gap (P1)						
Base	0.073		0.113		0.084	
With Cotton Price Increase of						
10%	0.058	0.058	0.077	0.077	0.063	0.063
20%	0.047	0.046	0.054	0.053	0.049	0.048
30%	0.039	0.038	0.039	0.038	0.039	0.038
40%	0.032	0.031	0.029	0.027	0.031	0.030
Poverty Gap Sq. (P2)						
Base	0.021		0.036		0.025	
With Cotton Price Increase of						
10%	0.016	0.016	0.023	0.022	0.017	0.017
20%	0.012	0.012	0.015	0.014	0.013	0.013
30%	0.010	0.009	0.010	0.010	0.010	0.009
40%	0.008	0.008	0.007	0.007	0.008	0.007

Source: Based on weighted sample from the 2001-02 *Household Integrated Economic Survey*.

Note: Includes cotton-producing households that are landowners, sharecroppers, or subject to other land tenures. Net income per 10 percent cotton price increase exceeds that of landowners or sharecroppers shown in Tables 4 and 5 for Punjab because of the higher gross cotton income of cotton-producing households in the other land tenures category, which includes 11.8 percent of cotton-producing households in the province.

households to 25 percent in Punjab and 22 percent in Sindh. These represent 22 percent and 49 percent reductions in the poverty level among landowner cotton farmers. The depth and severity of poverty are also reduced by cotton price increases, as shown by the measures of poverty gap (P1) and poverty gap squared (P2).

The effects of increases in cotton price on the level, depth, and severity of poverty among cotton-producing households are shown in the lower part of Tables 4, 5, and 6. Based on an analysis of the 2001-02 HIES data, 32 percent of landowner cotton-producing households in Punjab are estimated to have per capita expenditures below the poverty line, with a corresponding 43 percent in Sindh. A 20 percent rise in cotton prices—such as would offset the decline in real domestic prices observed between 3-year averages centred on the peak and trough years of 1994-95 and 2001-02—is estimated to reduce the rate of poverty among landowner cotton-producing Among sharecroppers, a 20 percent increase in cotton prices reduces initial poverty rates of 56–58 percent in Punjab and Sindh to 38 percent and 45 percent, respectively. These represent declines in initial poverty rate of 33 percent in Punjab and 23 percent in Sindh. Again, the depth and

severity of poverty also fall. Overall, cotton prices have quite a significant effect on rural poverty among cotton-producing households. When farmers respond to a price increase by expanding cotton production, the estimated reductions in poverty are similar even though the supply response increases their average household incomes somewhat more.

The aggregated results shown in Table 6 encompass poverty reductions among all cotton-producing households. For the nation as a whole, 40 percent of cotton-producing households are estimated to have per capita consumption expenditures below the poverty line in 2001-02, based on the 2001-02 HIES data [FBS (2003)]. A 20 percent increase in cotton prices reduces the poverty rate among cotton-producing households to 28 percent. Using the population estimate of 148 million in 2002, assuming a national average household size of 7.0, and an estimated 9.8 percent of households producing cotton, there are an estimated 828,800 cotton-producing households below the poverty line. With a 20 percent increase in cotton prices, this falls to 580,160 households in poverty. Cotton-producing households have an average size of 7.8 persons, and thus a 20 percent increase in cotton prices is estimated to reduce poverty in Pakistan by 1.939 million people.

Effects of Farm Household Poverty on Regional Poverty Levels

While the rate and degree of poverty among households producing cotton is strongly affected by cotton prices, only a subset of farm households actually produce cotton. The broader impact on poverty levels of direct reductions in poverty among cotton farmers depends on the area of geographic aggregation, as shown in Table 7.

Table 7

Simulated Effects on Increased Cotton Prices on Poverty at the Primary Cotton-producing District, Provincial, and National Levels

	Effect on Regional Population				
	Primary Cotton-producing Districts of		Province		National
	Punjab	Sindh	Punjab	Sindh	
Base Expenditures (PRs)	62,268	72,939	72,919	92,392	78,561
Poverty Incidence (P0)	Percent (as Proportion)				
Base	0.45	0.43	0.34	0.32	0.33
With Cotton Price Increase of					
10%	0.44	0.39	0.33	0.30	0.33
20%	0.43	0.37	0.33	0.29	0.32
30%	0.42	0.34	0.33	0.28	0.32
40%	0.42	0.32	0.32	0.28	0.31
Poverty Gap (P1)					
Base	0.108	0.091	0.077	0.067	0.072
With Cotton Price Increase of					
10%	0.105	0.080	0.075	0.063	0.070
20%	0.102	0.073	0.074	0.060	0.068
30%	0.100	0.068	0.073	0.058	0.067
40%	0.098	0.066	0.072	0.057	0.067
Poverty Gap Sq. (P2)					
Base	0.037	0.028	0.026	0.021	0.023
With Cotton Price Increase of					
10%	0.035	0.024	0.025	0.019	0.022
20%	0.034	0.022	0.025	0.018	0.021
30%	0.034	0.020	0.024	0.017	0.021
40%	0.033	0.019	0.024	0.017	0.021

Source: Based on weighted sample from the 2001-02 *Household Integrated Economic Survey*.

Within the primary cotton-producing districts of Punjab and Sindh, cotton farmers account for 23.7 percent and 29.3 percent of households, respectively. When cotton prices rise by 20 percent, poverty levels within these geographic regions decrease by 2 percent in Punjab and 6 percent in Sindh because of the direct effect on incomes of cotton-producing households. Cotton farmers account for 11.6 percent and 11.8 percent, respectively, of the population of Punjab and Sindh. At the provincial level, overall poverty falls by only 1–3 percent as a direct effect of a 20 percent increase in cotton prices. At the national level, overall poverty falls by 1 percent and rural poverty by 2 percent since households producing cotton are only 9.8 percent of all households.

COMPARATIVE RESULTS FOR WHEAT

To put these results into a broader context, we also examined the evolution of wheat prices internationally and domestically from 1990-91 to 2004-05. World prices of wheat decline during the late 1990s but by less than cotton prices. Nominal wheat prices in Pakistan are found to track closely the estimated import parity prices in Karachi through the 1990s, but fall below these import parity prices after the large domestic harvest in 2000. In real terms, the overall level of domestic wheat prices at the farm level is found to have been quite stable in Pakistan although with some annual variability.

To assess the effects of an increase of wheat prices on poverty simulation analysis is undertaken for price increases of 5 percent to 20 percent. Results for all households producing wheat are shown in Table 8. Whereas, cotton is produced by 24.0 percent of farm households in Pakistan, wheat is produced by most of these households and by another 42.7 percent of farm households that do not grow cotton. Thus, wheat prices have effects on the income of more farm households, as well as affecting the cost of a key food consumption commodity for farm and non-farm households. The net incomes of farm households producing wheat are less dependent on its production than net incomes of households producing cotton depend on cotton income. Moreover, a change in wheat price affects household income only for that portion of the wheat produced that is sold commercially. For these reasons, the effects of a given increase in wheat prices on incomes of households producing wheat, and the reduction of the initial rates of poverty among these households is less than the effects of the same percentage increase of cotton prices on those households producing cotton. Because more households produce wheat, and also taking effects on non-wheat-producing households into account, we estimate that the overall effects of a given percentage change in wheat prices on poverty levels among all farmers, and on poverty measured at the provincial or national level, are similar to the deeper but more concentrated effects of an equal percentage increase in cotton prices. In interpreting the simulation results for wheat, it must be kept in mind that wheat prices did not decline as much as cotton prices in the late 1990s.

Table 8

Simulated Effects at the Provincial and National Levels of Increased Wheat Prices on Poverty among all Households Producing Wheat

	Effect on Wheat-producing Households					
	Punjab		Sindh		National	
Item	Fixed Quantities	Quantity Response	Fixed Quantities	Quantity Response	Fixed Quantities	Quantity Response
Base Expenditures (PRs)	78,455		75,277		79,570	
Net Income per 10% Wheat Price Increase (PRs)	2,211	2,260	2,520	2,577	2,007	2,053
Poverty Incidence (P0)			Percent (as Proportion)			
Base	0.31		0.50		0.34	
With Wheat Price Increase of						
5%	0.30	0.30	0.48	0.48	0.33	0.33
10%	0.29	0.29	0.46	0.46	0.32	0.32
15%	0.28	0.28	0.44	0.44	0.31	0.31
20%	0.28	0.27	0.43	0.42	0.30	0.30
Poverty Gap (P1)						
Base	0.062		0.111		0.069	
With Wheat Price Increase of						
5%	0.059	0.059	0.106	0.106	0.066	0.066
10%	0.057	0.057	0.101	0.100	0.064	0.063
15%	0.055	0.054	0.096	0.096	0.061	0.061
20%	0.052	0.052	0.092	0.091	0.059	0.059
Poverty Gap Sq. (P2)						
Base	0.018		0.036		0.020	
With Wheat Price Increase of						
5%	0.017	0.017	0.033	0.033	0.019	0.019
10%	0.016	0.016	0.031	0.031	0.018	0.018
15%	0.015	0.015	0.030	0.029	0.017	0.017
20%	0.015	0.015	0.028	0.027	0.017	0.017

Source: Based on weighted sample from the 2001-02 *Household Integrated Economic Survey*.
Note: Quantity Response includes supply and demand responses to higher prices.

SUMMARY AND CONCLUSIONS

In this study Pakistan domestic seed cotton prices are found to closely track their export parity values. Evaluation of the importance of cotton to the incomes of households is based on the 2001-02 Pakistan Household Integrated Survey (HIES). We distinguishe between landowners and sharecroppers and results are reported separately for Punjab and Sindh, and for the primary cotton-producing districts within each province.

Poverty was found to be substantial among cotton-producing households. Among all cotton-producing households, 40 percent are below the poverty line based on per capita consumption expenditures. Among landowner households producing cotton, 34 percent are below the poverty line. Sharecropper households producing cotton are more heavily concentrated in the lower end of the national income distribution, with 57 percent below the poverty line.

Simulation analysis was undertaken to evaluate the effects of cotton prices on poverty. A simulated increase of low cotton prices in 2001-02 back toward the higher levels of earlier years moves a substantial number of cotton farmers out of poverty. The

study examines changes of 10 percent to 40 percent with the discussion focused on a cotton price increase of 20 percent, which is the extent which real prices of cotton fell in Pakistan in the late 1990s and is consistent with several analyses of how much world prices might increase if all subsidies and tariff barriers were removed globally.

The study estimates that an increase of real cotton prices by 20 percent reduces the poverty rates among landowner cotton households in Punjab and Sindh from initial levels of 32 percent and 43 percent, respectively, to 25 and 22 percent. Among sharecropper households producing cotton, a 20 percent increase in cotton prices lowers rates of poverty from 56-58 percent in Punjab and Sindh to 38 percent and 45 percent, respectively. At the national level, a 20 percent increase in cotton prices causes poverty among all cotton-producing households to fall from 40 percent to 28 percent. Lesser effects are reported for a given percentage change in wheat prices, but a larger proportion of the farmers in Pakistan grow wheat.

REFERENCES

Aksoy, M. A., and J. C. Beghin (eds) (2004) *Global Agricultural Trade and Developing Countries*. Washington, DC: The World Bank.

Federal Bureau of Statistics (2003) *Household Integrated Economic Survey. Round 4: 2001–02*. Islamabad: Government of Pakistan.

Food and Agricultural Policy Research Institute (FAPRI) (2002) The Doha Round of The World Trade Organisation: Appraising Further Liberalisation of Agricultural Markets. FAPRI, Iowa State University, and University of Missouri-Columbia. (Working Paper 02-WP 317.)

Foster, J., J. Greer, and E. Thorbecke (1984) A Class of Decomposable Poverty Measures. *Econometrica* 52:3, 761–66.

International Cotton Advisory Committee (ICAC) (2002) *Production and Trade Policies Affecting the Cotton Industry*. Washington, DC: ICAC.

Malik, S. J. (2005) Agricultural Growth and Rural Poverty in Pakistan. Pakistan Resident Mission, Islamabad. Asian Development Bank. (Working Paper No. 2.)

Minot, N., and L. Daniels (2005) Impact of Global Cotton Markets on Rural Poverty in Benin. *Agricultural Economics* 33 (Supplement): 453–466.

Orden, David, *et al.* (2006) *Impact of Global Cotton Markets on Rural Poverty in Pakistan.* Pakistan Poverty Assessment Update, Islamabad. (ADB Background Paper 8.)

Pakistan, Government of (2000) *Agriculture Census 2000*. Lahore: Agriculture Census Organisation.

Pakistan, Government of (2003) Accelerating Economic Growth and Reducing Poverty: The Road Ahead, Poverty Reduction Strategy Paper. Ministry of Finance, Islamabad.

Pakistan, Government of (2004) *Pakistan Economic Survey 2003–04*. Islamabad: Ministry of Finance.

Poonyth, D., A. Sarris, R. Sharma, and S. Shui (2004) The Impact of Domestic and Trade Policies on the World Cotton Market. Rome: FAO. (FAO Commodity and Trade Policy Research Working Paper No. 8.)

Towsend, Terry (2004) Competitiveness in the World Cotton Industry. Washington, DC:ICAC. Available: http://www.icac.org/icac/cotton_info/speeches/Townsend/2004/competitive_2004.pdf

United States Department of Agriculture (2005) Cotton Statistics. Available: http://www.fas.usda.gov/cotton/circular/2005/07/table09.pdf