

PAKISTAN'S AGRICULTURAL TERMS OF TRADE

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ABSTRACT: Changes in the terms of trade have consequences of great significance for the overall economic performance of a country. In this paper the terms of trade (1991-2003) for Pakistan's crop sector have been worked out to reveal how the sector has performed over time in terms of profitability. Various indices were worked out to view the profitability from different angles using weights, giving due importance to all the contributing factors. The results revealed that Pakistani farmers' profitability improved slightly during the study period but at the same time overall purchasing power of the farmers dropped. Pakistani farmers are expected to loose and consumers to gain if free agricultural trade (in selected commodities) opened with the neighboring India. It is suggested that farmer friendly policies and cost effective technologies should be transferred to farmers to make agriculture an attractive investment domestically and competitive internationally.

Key Words: Agriculture; Economics; Terms of Trade; Profitability; Pakistan.

INTRODUCTION

The terms of trade for the crop sector are defined as the ratio of the index of prices received by the crop sector and the index of prices paid by the sector. Changes in the terms of trade have consequences of great significance for the economic performance of a country. According to Keynesian theory, the terms of trade affect the saving decisions in an economy by altering a country's real income.

According to Harberger-Laursen-Metzler (HLM) hypothesis an improvement in terms of trade improves the country's real income level as well as the trade balance. Singer (1950) argued that fluctuations in the terms of trade dramatically affected the funds available to underdeveloped countries for capital formation, and hence growth. As quoted by Khan and Ahmed (2005), high farm prices not only benefit the large producers but also the small farmers. Higher prices in agricultural sector not only have implications for an efficient use of resources but can also shift the production function upwards by price-induced technological and institutional innovations and infrastructure investment in rural areas. Brown (1978) has shown a

link between public investment and farm prices in agriculture. Financial rate of return on agricultural projects increases when prices for agricultural produce increase. This justifies increased allocations for the agricultural sector. HLM hypothesis dominated for about three decades. However studies based on intertemporal utility maximization, to some extent challenged the HLM view. Studies that questioned the HLM effect include those by Obstfeld (1982), Svensson and Razin (1983), and Persson and Svensson (1985). They observed that the linkage between the terms of trade changes and the trade balance depends on the nature of the shock to the terms of trade. Assuming that marginal propensity to consume from permanent income is one, there will be no change in saving and hence no effects on trade balance. This is just the opposite to what the HLM hypothesis foresees.

Generally, a change in the terms of trade changes the level and the composition of aggregate real spending. A portion of this spending goes on non-tradable goods. Ostry (1988) and Edwards (1989) took into account the non-tradable goods into the analysis. They explained that when there

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are nontraded goods a deterioration in the terms of trade causes the consumers to substitute non-tradable (home) goods for more expensive import-substitutes. The resulting increase in the relative price of non-tradable goods makes the current goods more expensive relative to the future goods. The result is an increase in the saving. The parameter that gains importance in this process is the intratemporal elasticity of substitution. The larger this elasticity the greater will be the substitution towards non-traded goods away from the import-substitutes. The resulting increase in the relative price of the non-traded goods will be higher, and a result of the mechanism above the increase in saving will be higher.

Chaudhry and Chaudhry (1997) blamed the pricing policies of the government, for having more adverse effect on small farmers than on large farmers. Agricultural commodities have generally been under-priced (except for the 1960s) leading to lower profit margins for the farmers resulting in declining employment opportunities for agricultural labor. Chishti and Malik (2001) pointed out reduction in duties and subsidies on agricultural trade by the government in increased efficiency in agricultural production due to increased competition from other countries. Producers of high priced products gain from the higher prices and larger market. Consumers in this case have to pay higher prices. On the other hand when the prices in the international market are lower than the domestic market the farmers suffer but at the same time consumers gain.

Many indices are useful for the calculation of terms of trade. The important ones are those measuring the relative changes between prices received by the agriculture sector for its produce and the prices paid by the sector for consumption goods. These indices show changes in purchasing power of the farmers and hence the living standard. These indices also help in analyzing the income distribution. Another important index could show the relative

price changes between prices received by the sector and the input prices paid by the sector for obtaining its produce.

The importance of measuring terms of trade cannot be challenged and the preceding text is a glimpse of that. Few studies have been done on Pakistan's agricultural terms of trade in the past and with long intervals of time. A detailed study was done by Zahid and Hussain (1974), while perhaps the latest one is by Khan and Ahmed (2005). The methodology adopted by the former was superior as the Consumer Price Indices (CPI) were calculated for the rural population while the later used the published combined CPI for both rural and urban population. The other point worth mentioning is the use of wholesale prices as a proxy for farm gate prices by the latter. The former study though a very elaborate one was conducted about three decades ago and this warranted its repetition hence a justification for the present study which uses both the rural CPI as well as the farm gate prices.

In the present study various terms of trade are calculated. Terms of trade for the particular sector are defined as the ratio of the index of prices received by the sector and the index of prices paid by the sector. For international prices, Indian prices under free trade were taken, as trade in agricultural commodities with India would be the most probable one under free trade. The present study aims at computing relative price changes in the crop sector to explore whether profitability in this sector has improved or deteriorated. It further measures the impact of price changes on the standard of living of the farmers. For the purpose, various terms of trade are calculated using time series data during 1991-2003.

This paper aims at computing relative price changes in the crop sector to explore whether profitability in this sector has improved or deteriorated. It further attempts to measure the impact of price changes on standard of living of the farmers.

PAKISTAN'S AGRICULTURAL TERMS OF TRADE MATERIALS AND METHODS

For the present study, data were collected from 1991 to 2003. The reason for selecting the period starting from 1991 was to avoid the period where the sudden changes in technology could affect the outcome.

All the data were obtained from secondary sources including, Agricultural Statistics of Pakistan (GoP, 2006), Statistical Yearbook of Pakistan, Economic Survey of Pakistan (various issues 1991-2003) FAO's Online Agricultural Statistics (2006) and personal collection from Hydrocarbon Institute of Pakistan.

Rural Consumer Price Index was developed using prices from Economic Survey of Pakistan, while for working out the weights, data was obtained from the Household Income and Expenditure Survey (1991), the year 1991 was used as the base year and data for the subsequent years was adjusted accordingly.

Working out Indices

Cheong and D'Silva (1984) computed the terms of trade indices by using the estimates of GDP at factor costs in current prices originating in agricultural and manufacturing sectors and their corresponding estimates at constant prices. The main purpose of their study was to assess the performance of agricultural sector in the light of government policy. Qureshi (1985) calculated three types of terms of trade for the agricultural sector, period 1951-64: (a) net barter terms of trade, (b) income terms of trade, and (c) single factorial terms of trade. The net barter terms of trade of the agriculture sector are computed by dividing the GDP deflator for the agriculture sector by the GDP deflator for the manufacturing sector. The income terms of trade for any sector measure the purchasing power of that sector. The income terms of trade are defined as the ratio of the value of sales by a sector to its average import price. Since no data series exists for the marketed surplus, Qureshi (1985) measured the income terms of trade as a

product of the net barter terms of trade and an index of agricultural output. Single factorial terms of trade, is the net barter terms of trade adjusted for changes in the productivity of agricultural inputs.

The best and logical prices to use for the purpose are the farm gate prices or the producer prices. For this study, farm gate prices and production statistics were obtained from the FAO's online database, FAOSTAT Agriculture, which provided data for 24 commodities viz., apples, bananas, barley, cottonseed, garlic, grapes, groundnuts, lemons and limes, lentils, linseed, onions green and ripe, oranges, pears and quinces, potatoes, rapeseed and mustard seed, rice, paddy, sesame seed, sorghum, soybeans, sugar cane and sugar crops, sunflower seed, sweet potatoes, walnuts and wheat. For international prices the same commodities were selected for a logical comparison. Indian prices were used for international prices as the most probable trade partner after the WTO comes into full force. Weights were worked out using the formula described in the following text.

Light Diesel Oil (LDO) was taken for fuel (as it is the major oil used for agriculture in Pakistan) and its consumption in agriculture was multiplied by the respective prices during 1991-2003 for working out weights. The use of high speed diesel oil was not available separately for agriculture (common experience tells that its use in Pakistan's agricultural production is negligible) hence to avoid inaccuracy in data HDO was dropped. Seed prices of rice and wheat were used and the grain price was taken, as a very small percentage of farmers use purchased certified seed. For pesticides, as the prices for each type of pesticide (based on active ingredients) was not available as a time series, annual value of pesticides consumed was obtained. Following are the details of indices worked out:

Ratio of the Prices Received by Farmers to the Prices of Consumer Goods Farmers Buy Domestically

This index shows trends in standard of living of farmers under domestic price regime. To calculate index of domestic

prices received by farmers, 234 agricultural commodities were selected. The prices of the commodities taken for this index are the farm gate prices. A CPI for the rural population was worked out using 30 household essential items.

Inputs included were fertilizers, pesticides and LDO. For calculating the prices of inputs a different methodology was used. As data on consumption of fertilizers was available in nutrient tonnes, the prices were calculated per nutrient tonne and then per nutrient kilogram. Weights were accordingly given per nutrient use and indices were developed for each nutrient as a separate input. The value of pesticides was used as a whole i.e. the value of pesticides consumed in a given year then weights calculated as per formula.

The following formulas were used to work various indices

$$PI = \sum_{j=1}^n W_{oj} \times (P_{ij}/P_{oj}) \times 100$$

where,

PI = Price Index for any group

j = Commodity and i = year (1990-91 to 2003)

W_{oj} = Weight of commodity 'j' in the base year 'o'

P_{ij} = Current year price of commodity 'j' and

P_{oj} = Base year price of commodity 'j'.

$$W = q_{oj} \times P_{oj} / \sum_{j=1}^n q_{oj} \times P_{oj}$$

where,

W = weight of commodity 'j',

q_{oj} = base year quantity of commodity 'j'.

P_{oj} = base year price of commodity 'j'

P_{ij} = current year price of commodity 'j'

The above indices do not take into consideration, changes in real per capita income over time. To take this into account Zahid and Hussain (1974) and Khan and Ahmed (2005) used the following adjustment factor:

$$\frac{\text{Price received}}{\text{Price paid}} \times 100 \quad \times$$

$$\frac{\text{Index of agricultural production}}{\text{Index of rural population}}$$

Ratio of the Domestic Prices Received by Farmers to the Prices of Major Agricultural Inputs

Index of prices of agricultural inputs was calculated to find the price trends of the agricultural inputs that farmers purchase domestically for crop production. Four major inputs i.e. fertilizer, light diesel oil (which covers most of the operational cost of mechanical technology i.e. tractors, tubewells, and other machines), seed (wheat and rice) and pesticides were selected to compute this index.

Separate simple price indices were calculated for each input. Each nutrient of fertilizer was also used as a separate input. Then the weights were found by using the base year value of each input's consumption.

Ratio of the Indian Prices of Crops to the Prices of Consumer Goods and Services in Pakistan

The indices used to calculate these terms of trade are the index of Indian prices of crops that farmers can get in the international/ Indian market (under unrestricted trade scenario) and the index of Pakistan's consumer prices of goods and services. Twenty four commodities were selected to calculate the index of international/Indian prices received by farmers.

The prices of these commodities were converted into Pakistani rupees from dollars on the basis of prevailing exchange rates in the respective periods. In the denominator the adjusted consumer price index was used.

Ratio of the Indian Crop Prices to the Prices of Major Agricultural Inputs

These terms of trade are calculated using the price index of eight agricultural commodities assuming that the farmers sell the commodities directly in the international market. Denominator depicts the price index of four agricultural inputs.

Real Per Capita Income Terms of Trade (Domestic)

As suggested by Khan (2005) the real per capita income terms of trade is a modification to the simple terms of trade which

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is based on changes in prices. They argue that the gains from trade are also affected by changes in productivity and the output levels and even if the prices decline for a certain period an increase in per capita production would result in higher gains despite low margins. The tools used for the suggested adjustment are described in the following text.

Terms of Trade Adjustment Factor

The adjustment factor would reflect the changes in trade due to change in agricultural production with changes in population. Rural population was taken for the analysis. This factor requires construction of two more indices viz., Quantum Index of Agricultural Production and Rural Population Index.

The ratio of these two indices was taken as a proxy for changes in real per capita income.

Quantum Index

Quantum Index was calculated using the Laspeyers formula (1991 a base year) as follows:

$$QI = \sum_{j=1}^n W_{oj} \times (q_{ij}/q_{oj}) \times 100$$

where,

QI = Quantum Index

j = Commodity and i = Year (1990-91 to 2003)

W_{oj} = Weight of commodity 'j' in the base year 'o'

q_{ij} = Current year quantity produced of commodity 'j' and

q_{oj} = Base year quantity produced of commodity 'j'.

While the weights were worked out using the following relation.

$$W = q_{oj} \times P_{oj} / \sum_{j=1}^n q_{oj} \times P_{oj}$$

where,

W = Weight of commodity 'j',

q_{oj} = Base year quantity of commodity 'j'.

P_{oj} = Base year price of commodity 'j'

P_{ij} = Current year price of commodity 'j'

Rural Population Index

RPI = (Popi / Popo)x100

where,

RPI = Rural Population Index

Popi = Current year rural population,

Popo = Rural population in the base year.

RESULTS AND DISCUSSION

Terms of trade needs to be improved in favour of agriculture if investment in the sector and hence absorption of unemployed labour is to be sought. Tutwiler and Straub (2005) noted that trade reforms that cause the terms of trade against agriculture will lead to higher unemployment in rural areas.

Ratio of the Prices Received by Farmers to the Prices of Consumer Goods Farmers Buy Domestically

Enhancement of purchasing power is a motive that drives the farmer's decisions regarding enterprise selection. Macours and Swinnen (1997) have quantified the relative importance of the different casual factors of the changes in agricultural production in Central and Eastern Europe since 1989 using a production function and supply response approach. The analyses showed that the deterioration of the agricultural terms of trade explains a considerable part of the production change.

Much fluctuation during the period under study was noted (Table 1). The down-

Table1. Ratio of the domestic prices received by farmers to the prices of consumer goods and services

Year	Producer (Pak)/ Rural CPI	Producer Index (Pak)	CPI
1991	100.00	100.00	100.00
1992	99.33	110.24	110.99
1993	98.06	122.03	124.44
1994	99.26	137.39	138.41
1995	89.04	142.75	160.32
1996	94.45	168.09	177.97
1997	97.31	198.19	203.67
1998	89.47	198.21	221.55
1999	86.07	200.30	232.71
2000	91.17	217.86	238.96
2001	85.69	215.22	251.17
2002	96.17	245.04	254.79
2003	97.86	259.18	264.86

ward trend started immediately in 1992 with 1995, 1999 and 2001 being the years where index hit the bottom before starting recovery. However, 1994 and 2003 were the best years in the period but during the course, the index could never regain its base year level. This shows the falling purchasing power of the farmers over time.

Producer prices and the prices paid by the farmers for essential consumer goods kept rising quite sharply during the period under study but the producer price index never crossed the CPI. This combined effect has become evident with the falling terms of trade, depicting the worsening purchasing power of the Pakistani farmers.

Ratio of the Domestic Prices Received By Farmers to the Prices of Major Agricultural Inputs

The ratio of the domestic prices received by farmers and the prices of major agricultural inputs reflects the profitability of the domestic farmers over time. Except from 1992 to 1994 the terms of trade line has stayed around the base year mark (Figure 1). This shows that the profitability of the domestic farmers has remained more or less unchanged. The input price

and the producer price indices can be seen to intertwine but finally the input price index manages to overtake the producer price line in 2001.

Ratio of the Indian Prices of Crops to the Prices of Consumer Goods and Services in Pakistan

The index was developed to see the impact of free trade with India (where Pakistani farmers would attempt to sell their produce in the Indian market) on the standard of living of Pakistani farmers. The results revealed that the Pakistani farmers would suffer keeping in view the historical data (Figure 2). Throughout the period under consideration the terms of trade remained below the base year mark, indicating that the standard of living continues to fall.

The price index developed for the input prices included nutrient wise fertilizer prices, prices of pesticides, seed prices (farm gate prices of grain), pesticide prices and price of LDO. This index aims to show the profitability of Pakistani farmers in the scenario when they have to buy the inputs locally and sell the produce to India. The results show that during 1992-95 the Pa-

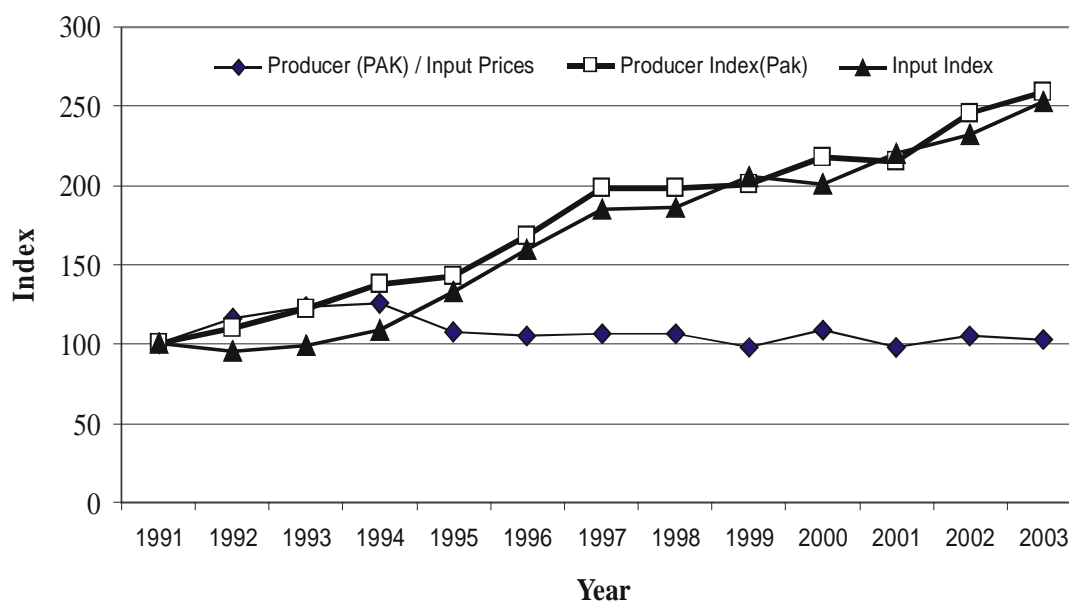


Figure 1. Ratio of the domestic prices received by farmers to the prices of major agricultural inputs

Figure 2. Ratio of the Indian prices of crops to the prices of consumer goods and services in Pakistan

Table 2. Ratio of the Indian crop prices to the prices of major agricultural inputs

Year	Producer (Ind) / Input Prices	Producer Index (Ind)	Input Index
1991	100	100	100
1992	114.67	109.11	95.15
1993	120.16	118.51	98.62
1994	116.10	126.63	109.06
1995	104.18	138.31	132.75
1996	94.19	150.58	159.86
1997	74.55	138.17	185.32
1998	83.01	154.40	185.99
1999	84.69	173.72	205.11
2000	84.82	170.24	200.69
2001	76.70	169.15	220.51
2002	75.33	175.36	232.77
2003	71.39	180.60	252.95

kistani farmers could have gained but after that the terms worsened and terms of trade consistently stay below the base year mark 100 (Table 2).

Real Per Capita Income Terms of Trade (Domestic)

The terms of trade focus on the ratio of prices received and paid by the farmers. The actual income impact on the farmers is not reflected by the terms of trade. This

is due to the fact that it does not take into account the population increase and the growth of output over time. The real per capita income terms of trade are worked to do just that. Hossain (2008) while studying the case of Bangladesh found that there existed a co-integral relationship between agricultural prices, industrial prices, per-capita real income and the real exchange rate between the Bangladesh taka and the US dollar.

To reach at the real per capita income terms of trade the domestic terms of trade involving producer prices and the rural consumer prices was multiplied by the adjustment factor, which in turn is the quotient of quantum index and rural population index. The results obtained here differ from previous studies by Khan and Ahmed (2005) and Zahid and Hussain (1974) due to many factors like different period, selection of

base year and many changes in methodology. The results here show that there have been years where the farmers were better off when the terms of trade crosses the 100 mark of the base year but most of the time the terms of trade has stayed below the base year mark showing worse off case (Table 3). The rural population index however stayed above the base year mark, although

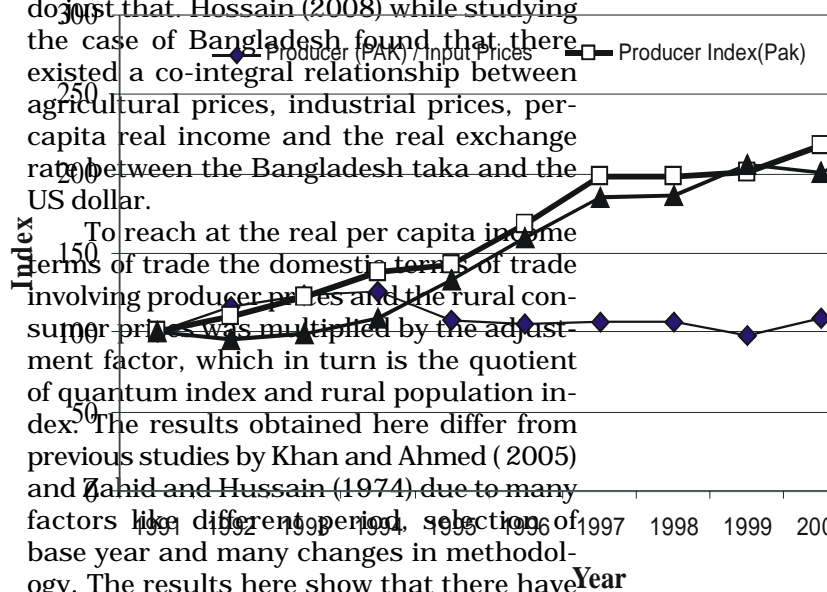


Table 3. Real per capita income terms of trade (domestic prices)

Year	Producer(Pak)	Index R. Pop.	QI(Pak)	Real Per Capita Income Terms of Trade Rural CPI
1991	100.00	100.00	100.00	100.00
1992	99.33	102.12	102.37	99.58
1993	98.06	104.49	109.80	103.04
1994	99.26	119.55	109.96	91.30
1995	89.04	121.81	122.29	89.39
1996	94.45	111.21	122.75	104.25
1997	97.31	113.46	121.36	104.09
1998	89.47	115.68	132.75	102.67
1999	86.07	117.91	130.62	95.35
2000	91.17	120.12	137.29	104.21
2001	85.69	122.33	124.03	86.88
2002	96.17	124.52	124.41	96.09
2003	97.86	127.16	130.62	100.52

a lot of fluctuations can be seen in earlier part of the period under study.

On the basis of the results it is concluded that farmers have had a tough time during the study period i.e., 1991-2003. The input prices have been rising, the rural CPI has been rising sharply while the producer prices have not risen as sharply. The subsidies have almost gone and the WTO regime would not allow much relief in the form of subsidies in future too. The land holdings have been historically going down in size and the increase in productivity can be the main reason behind keeping the farmers afloat. Intensive farming and partial shift towards high value agriculture would be helpful for the farmers and the economy as a whole. More efficient resource conservation technologies need to be developed and made to reach the farmers' fields. The input prices have been rising very sharply and to control these, the General Sales Tax on DAP fertilizers should be removed and research needs to be directed towards development of cheaper technologies for phosphatic fertilizer production. The possibility of a shift towards improved organic agriculture also needs to be explored to bring down the input costs.

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