Trends and Growth Estimation of Farm, Wholesale and Retail Prices of Essential Agricultural Commodities in Pakistan

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ABSTRACT

This paper estimates growth rates of farm, wholesale and retail prices of essential food commodities wheat, rice, lentil and potato for the time period 1981-2010. Semi-log growth model was used for growth estimation and future projections based on estimated growth coefficients. In case of wheat, farm, wholesale and retail prices shown 9.9, 9.4 and 9.6 percent growth per annum respectively with projected per Kg prices of Rs. 45.1, Rs. 62.0 and Rs. 63.5 respectively in 2020. For rice farm, wholesale and retail prices showed proportionate growth of 8.7 percent per annum with projected per Kg prices of Rs. 38.2, Rs. 45.8 and Rs. 101.1 respectively in 2020. Per annum increase in lentil farm, wholesale and retail prices was estimated 9.1 percent, 9.4 percent and 8.9 percent respectively with projected per Kg prices of Rs. 100.0, Rs. 228.1 and Rs. 285.2 respectively in 2020. For Potato farm, wholesale and retail prices shown 12.0, 11.0 and 7.8 percent growth per annum respectively with projected per Kg prices of Rs. 36.6, Rs. 47.4 and Rs. 50.3 respectively. It is concluded that prices of all essential food items showed high percentage growth per annum which calls for the policy intervention by the government to control the prices for coming years.

KEY WORDS: Prices, wheat, rice, lentil, potato, growth trends

INTRODUCTION

Price is the primary mechanism that links raw farm commodities through the various levels of the market system to the retail food product. The nature of price transmission between farm and retail levels depends, in general, on the size of the farm share of the retail price and the degree of market competition at each stage of the marketing chain (Schnepf, 2013). Pakistan is experiencing double-digit inflation over the last several years mainly due to increase in prices of food at all levels of marketing. Food inflation was low in the start of 21st century but in the year 2005-06 it raised up to double digit and severity of the issue arise when it becomes 26.6 percent in 2007-08. The reasons for the rising food prices are manifold which include wheat production short fall due to natural calamities, surging international food prices in 2008 and political instability (Ahsan *et al.*2011).

Prices of wheat has been stabilized by the government through procurement of wheat stock and increased government control on wheat movements in order to ensure food security of rural and urban masses across provinces (Karusaki 1996). Prices of all essential food commodities like rice, vegetables and pulses have increased during the last one decade which increased budget deficit for the consumer point of view as they had to reduce other non food expenses to fulfill the minimum food requirements of their families. Prices of food legumes has witnessed highest price increment than other food commodities like wheat which creates serious threat to the nutritional food security as this cheap source of protein is also becoming out of the reach of poor rural masses (Rani *et al.* 2012).

Rising food prices are the issue of concern for the policy makers as it has the strong implications on the wellbeing of masses. As the result of soaring food prices living cost has increased, poor daily wage laborers, small farmers and fixed wage earner groups are worst hit of this rise in prices as food budget is the major proportion of income (Khan *et al.* 2007). On the other hand the increase in the energy prices and prices of inputs increased the pressure on the farming communities by increasing their production cost. This increasing imbalance between the returns to farmers and increasing living costs has lower the living standard of farming communities' especially small farmers (Abdullah and Kalim, 2010). Keeping in view the importance of the issue of the food inflation this paper has

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been designed to investigate the price trend of prices of essential food commodities like wheat, rice, lentil and potato at all levels of marketing (farm, wholesale and retail). This paper aims to evaluate the compound annual growth rates for the farm, wholesale and retail prices of selected commodities and make future projection of wheat, rice, lentil and potato farm, wholesale, retail prices till 2020.

METHODOLOGY

Time series data for producer, wholesale and retail prices of selected food commodities (Wheat, Rice, Potatoes and Lentil) has been taken from the national and international published data sources like Economic Survey of Pakistan, Pakistan Agricultural Statistics and FAO Stat for the period 1981-2010. Growth trends and future projections of prices of selected commodities will be executed by using semi-trend growth model given below:

$$ln\ Y = \beta_0 + \beta_1 t + e \quad .... (1)$$

where

   Y = dependent variable (farm, wholesale and retail prices of selected commodities)
   t = trend over specific period.
   β_1 = coefficient of trend
   ln = natural logarithm
   e = error term

Compound annual growth rates were computed to estimate the growth trends of producer, wholesale and retail prices of wheat. The mentioned model was used by Ghafoor *et al,* 2005, Rani *et al.* 2011, Rehman *et al.* 2011 and Abid *et al.* 2014. The following regression function has been used to find out the trend and estimate the growth rate of selected crops.

$$Y_t = Y_0\ (1+r)^t .... (2)$$

Where;

   Y_t = farm, wholesale and retail prices of selected commodities in year t
   Y_0 = initial (i.e 1980-81) farm/wholesale/retail prices of selected commodities.
   r = the compound (i.e over time) rate of growth of Y_t, where stands for the year t.

For the estimation of projected farm, wholesale and retail prices of wheat following equation has been estimated.

$$Y_p = Y_c * (1+\beta_1)^n .... (3)$$

Where;

   Y_c = Current year (i.e 2010-11) farm, wholesale and retail prices of selected commodities
   β_1 = estimated coefficients of farm, wholesale and retail prices models of selected commodities
   n = number of projected year

RESULTS AND DISCUSSION

Wheat Price Trends and Growth Rates Estimation

The prices of wheat showed upward trend over the time period 1980-2010. Wheat prices faced less fluctuation at all the three levels and per kg prices increased steadily at all levels of marketing from 1980-81 till year 1995-96 but afterwards the upward price movements seemed obvious and in the year 2008-09 the highest increment in the wheat prices have emerged which continues till 2010. The price of wheat at all levels increased at the same pace and this is due to the government interventionist policies that help to control the prices of wheat at all levels of marketing (Fig 1). The growth model of all three price levels of wheat farm, wholesale and retail prices showed highly significant results with the coefficients of 0.094,

Fig 1. Wheat Farm, Wholesale and Retail Price trends (1980-2010)
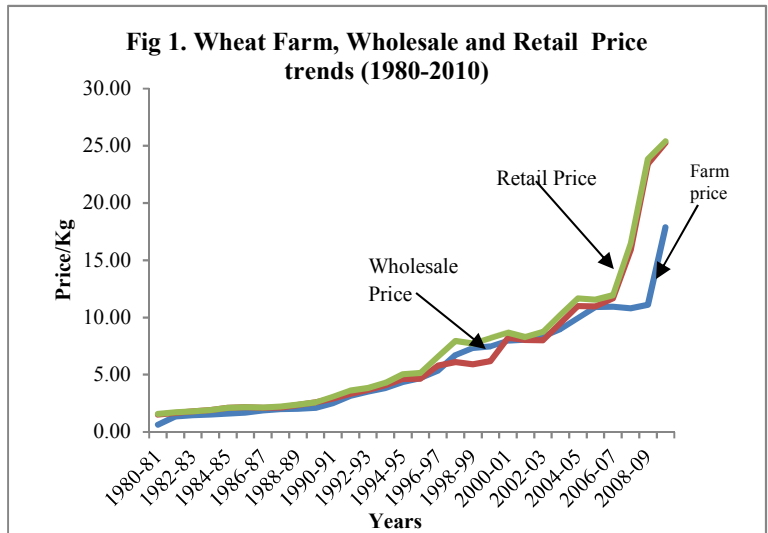
0.090 and 0.092 respectively. This indicates that the wheat farm, wholesale and retail prices shown 9.9, 9.4 and 9.6 percent growth per annum respectively from 1981-2010. The data indicates that farm price of wheat was Rs. 0.63/kg in 1981 with wholesale price Rs. 1.51/kg and retail price Rs. 1.57/kg. Wheat farm, wholesale and retail prices reached to Rs. 17.89/ kg and Rs. 25.26/kg and Rs. 25.40/kg respectively in 2010. The projected farm prices of wheat in 2020 will be computed as Rs. 45.98/kg, with projected wholesale price of Rs. 62.04/kg and projected retail price of Rs. 63.52/kg showing annual average growth of 9.9, 9.4 and 9.6 percent respectively.

The study conducted by Abbasi *et al.* 2015 comes up with the findings that; prices of wheat has upward trend since 1975. The estimated forecast of wheat prices from 2012-2017 shows normal price increase till 2015 whereas for 2016 and 2017 the price increase witnessed more than normal increase. An annual increase of Rs. 200-300 per 40 kg have been forecasted in this study and wholesale price will jumped to 2676/mound in 2016-17. Byerlee and Iqbal 1987, calculated the wheat price variability index and concluded that government intervention in wheat marketing successfully limit its year to year variability. The increasing share of wheat marketing under government procurement also reduces the seasonal price fluctuations which controls its price increment over the year.

Table 1. Estimated Growth Rates of Wheat at different Stages of Marketing

| Wheat	Farm Price (Rs/Kg)	Wholesale Price (Rs/Kg)	Retail Price (Rs/Kg)
F Statistics	779.758***	928.185***	1067.119***
R²	0.965	0.971	0.974
Coefficient	0.094	0.090	0.092
Standard Error	0.003	0.003	0.003
T Statistics	27.924***	30.466***	32.667***
1981	0.63	1.51	1.57
2010	17.89	25.26	25.40
Compound Growth Rate	9.9	9.4	9.6
Projected 2020	45.98	62.04	63.52

Source: Author's Estimation
*** shows 1 percent level of significance

Rice Price Trends and Growth Rates Estimation:

Farm, wholesale and retail prices of rice have increasing trend since 1980. The per kg prices of rice increased at steady pace till 1993-94 but afterwards all prices increased sharply and reached their maximum level in year 2007-08. Retail prices of rice faced the highest increment during mentioned period relative to wholesale and farm prices. The farm gate prices remain well below the retail prices from 1990-91 onward till year 2010 (Fig 2).

The growth models of farm, wholesale and retail prices of rice showed highly significant results with the coefficient of 0.083 for all prices. This indicates that the rice farm, wholesale and retail prices showed proportionate growth of 8.65 percent growth per annum from 1981-2010. The data indicates that farm price of rice was Rs. 0.94/kg in 1981 with wholesale price Rs. 2.20/kg and retail price Rs. 3.39/kg whereas per kg farm,

Fig 2. Rice Farm, Wholesale and Retail Price Trends (1980-2010)
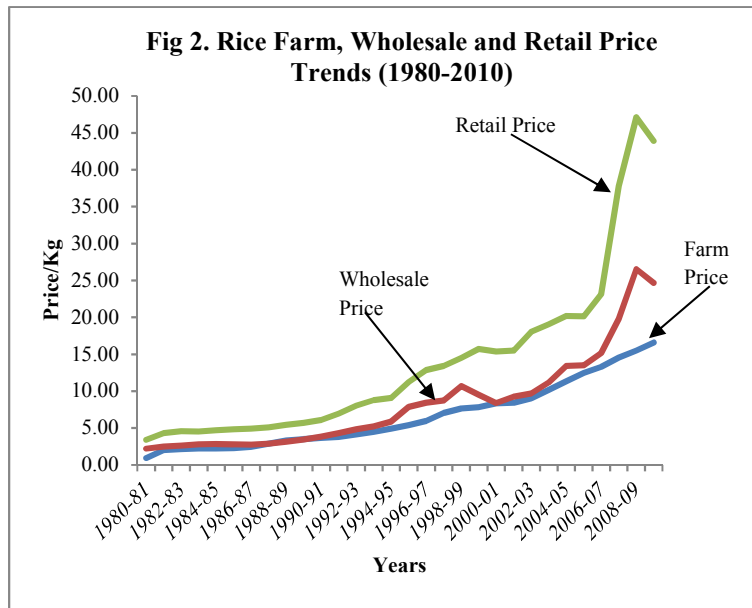
wholesale and retail prices of rice in the end year of mentioned time period 2010 was recorded Rs. 16.60, Rs. 24.63 and Rs. 43.92 respectively. The projected farm price of rice in 2020 will be Rs. 38.23/kg with wholesale price Rs. 45.81/kg and retail price Rs. 101.15/kg showing an average growth of 8.65 percent per annum. According to Abbasi *et al.*2015 wholesale level average prices of rice showed a significant increment from year 2006 to 2010, and results in doubling the wholesale price from 500/40 kg in 2006 to Rs. 1000/40 kg in 2010. Ghafoor and Aslam 2012 took wholesale price data from five major markets viz Lahore, Faisalabad, Sarghoda, Multan, and Gujranwala and identified the upward trend of wholesale prices in all mentioned markets during 2000-09.

**Table 2. Estimated Growth Rates of Rice at different Stages of Marketing**

Rice	Farm Price (Rs/Kg)	Wholesale Price (Rs/Kg)	Retail Price (Rs/Kg)
F Statistics	1154.262***	681.133***	675.732***
R²	0.976	0.961	0.96
Coefficient	0.083	0.083	0.083
Standard Error	0.002	0.003	0.003
T Statistics	33.974***	19.394***	25.995***
Start Date estimate	0.94	2.20	3.39
End Date estimate	16.60	24.63	43.92
Compound Growth Rate	8.65	8.65	8.65
Projected	38.23	45.81	101.15

Source: Author's Estimation

*** shows 1 percent level of significance

Lentil Price Trends and Growth Rates Estimation:

Prices of lentil has fluctuating upward trend across the mentioned time period 1980-2010. Farm prices of lentil remain well below the wholesale and retail prices during the mentioned time period. It has also been clear from the Fig 4 that the difference between per Kg farm gate and retail prices is widening with the passage of time and farm, wholesale and retail prices reached at their maximum point in the year 2008-09 and then start decreasing. According to Agricultural Marketing Information Service report (2007), production of pulses is stagnant since 1995-96 onward but the pulses demand has been increased due to the expanding population in the country along with the soaring prices of meat and vegetables. The demand supply gap of pulses is widening over time which induce upward pressure on the prices of all legume crops including lentil. The import of pulses is also a big reason behind the recent price hike of the pulses.

Fig 3. Lentil Farm, Wholesale and Retail Price Trends (1980-2010)
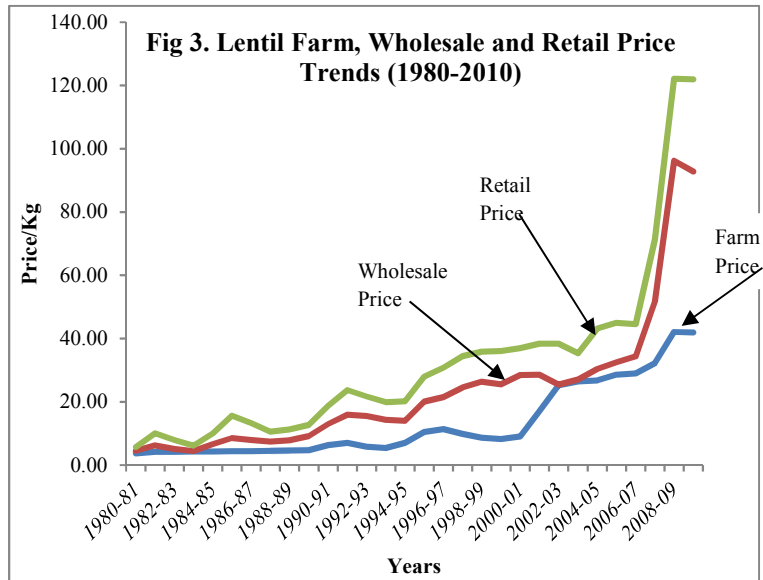
The growth model of farm, wholesale and retail prices of lentil showed highly significant results with the coefficient of 0.087, 0.090 and 0.085 respectively. This indicates that the lentil farm price has been shown 9.09 percent growth per annum from 1981-2010 followed by annual growth of 9.42 percent in wholesale prices and 8.87 percent in retail prices. The farm price of lentil was Rs. 3.75/kg in 1981, with wholesale price of Rs. 4.56/kg and retail price Rs. 5.77/kg. the farm, wholesale and retail prices of lentil was recorded Rs. 41.90/ kg, Rs. 92.76/kg and Rs. 121.92/kg in 2010. The projected farm price of lentil in 2020 will be Rs. 100.01/kg showing an average growth of 9.09 percent per annum coupled with the projected wholesale price of Rs. 228.15/kg and retail price Rs. 285.25/kg in 2020 showing annual growth of 9.42 percent and 8.87 percent respectively. Among food legumes prices of lentil faced a highest markup as result of global food crises. Price of lentil has increased by 11.9 percent during 1976-2010 (Rani *et al.* 2012). The findings of Qasim *et al.* 2013 however postulate the reduction of lentil acreage in Pothwar region Punjab and basic reason identified for acreage reduction was price fluctuation as 97 percent lentil growers were not satisfied with the prevailing farm gate prices of lentil.

Table 3. Estimated Growth Rates of Lentil at different Stages of Marketing

| Lentil	Farm Price (Rs/Kg)	Wholesale Price (Rs/Kg)	Retail Price (Rs/Kg)
F Statistics	240.204***	396.274***	304.883***
R²	0.896	0.934	0.916
Coefficient	0.087	0.090	0.085
Standard Error	0.006	0.005	0.005
T Statistics	15.499***	19.907***	17.461***
Start Date estimate	3.75	4.56	5.77
End Date estimate	41.90	92.76	121.92
Compound Growth Rate	9.09	9.42	8.87
Projected	100.01	228.15	285.25

Source: Author's Estimation
*** shows 1 percent level of significance

Potato

Prices of potato had experienced fluctuating upward and downward trend during 1980-2010 (Fig 4). All Price levels remain highly fluctuating and farm prices remain well below the retail prices and this gap is widening with the passage of time. The highly fluctuating upward and downward trend of potato farm, wholesale and retail prices is due to its perish ability as it is prone to damage in quality due to improper transportation, packing and storage facilities both at farms and wholesale markets.

The growth model of farm, wholesale and retail prices of potato showed highly significant results with the coefficient of 0.114, 0.105 and 0.075 respectively. This indicates that the potato farm, wholesale and retail prices shown 12.0 percent, 11.0 percent and 7.8 percent growth per annum respectively from 1981-2010. The data indicates that farm price of potato was Rs. 0.34/kg with wholesale price Rs. 1.99/kg and retail price Rs. 2.6/kg in 1981. Average farm, wholesale and retail prices of potato in 2010 was 11.71/ kg, 16.59/kg and Rs. 23.74/kg. The projected mean farm, wholesale and retail prices of potato was estimated Rs. 36.63/kg, Rs. 47.40/kg and Rs. 50.26/kg respectively.

Fig 4. Potato Farm, Wholesale and Retail Price Trends (1980-2010)
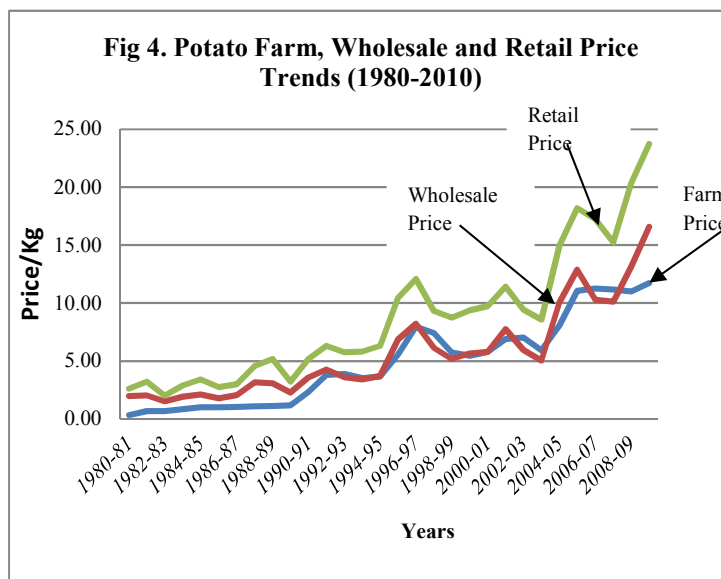
According to Fatima *et al.*2015 the estimation of compound annual growth trends indicate increasing wholesale prices of potato in main markets like Lahore, Hyderabad, Peshawar and Quetta during time period 1981-2012.The report published by Small and Medium Enterprises Development Authority (SMEDA) 2008, the prices of potato widely fluctuate around the year with the lowest price in the months of February and March to the highest in the month of September. According to the report findings the production of potato is usually constrained by the fluctuating potato prices.

Table 4. Estimated Growth Rates of Lentil at different Stages of Marketing

Potato	Farm Price (Rs/Kg)	Wholesale Price (Rs/Kg)	Retail Price (Rs/Kg)
F Statistics	278.87***	4.053*	305.569***
R²	0.909	0.126	0.916
Coefficient	0.114	0.105	0.075
Standard Error	0.007	0.007	0.004
T Statistics	16.699***	2.013*	17.481***
Start Date estimate	0.34	1.99	2.6
End Date estimate	11.71	16.59	23.74
Compound Growth Rate	12.0	11.0	7.8
Projected	36.63	47.40	50.26

Source: Author's Estimation
*** shows 1 percent level of significance and * shows 10 percent level of significance

Conclusion and Recommendations

The paper evaluated the price trends and growth estimation of essential agricultural food commodities at farm, wholesale and retail levels and comes up with the conclusion that prices of all selected commodities (wheat, rice, lentil and potato) has significantly increased during 1981-2010 and witnessed growth of more than 8 percent. The farm prices of potato experienced highest percentage growth of up to 12 percent followed by wheat (9.9 percent), lentil (9.09 percent) and rice (8.65 percent). The wholesale prices witnessed annual growth of 11.0 percent for potatoes, 9.4 percent for each lentil and wheat whereas 8.65 percent for rice. In case of retail prices the estimated compound annual growth showed per annum growth in wheat retail prices of 9.6 percent followed by lentil (8.87 percent), rice (8.65 percent) and potato 7.8 percent. The farm, wholesale and retail prices of potato has the more fluctuating trend followed by lentil, rice and wheat. The observed highly fluctuating trend of potato is due to it's perish ability and lacking marketing infrastructure like transportation, packing and storage facilities. In the light of the study findings it is concluded that prices of all essential food items are showing high percentage growth per annum which calls for the policy intervention by the government to control the prices for coming years.

The prices of wheat are somehow stable due to government procurement and support price measures, such measure are also required for rice as well to ensure its stable supply in domestic market and also to proper channelize the rice export market to benefit the producer through direct procurement. The public private partnership can emerge as the viable and efficient mode of policy intervention to control the soaring prices of essential food commodities like rice. The prices of pulses like lentil can be controlled through increased production by ensuring the promising profit to the farmers to encourage production of pulses. To stabilize the prices of potato the establishment of proper marketing infrastructure like washing and storage are necessary to reduce the spoilage risk of produce. The establishment of production regions of lentil and potato keeping in view their comparative advantage in different districts can help to enhance their production and stabilize their prices. The development of nearby wholesale markets in the production region of pulses and vegetables can be a viable option to increase market access of farmers to dispose their produce timely and on good prices.

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