

## **Policy Imperatives: Stabilisation of Production and Price Swings of Potato and Onion Crops in Pakistan**

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### **I. INTRODUCTION**

Potatoes and onions are bracketed with other minor crops, but are consumed as a table food in almost every household. Thus both commodities are listed as sensitive food items. Production instability and erratic price behaviour of these crops adversely affect both producers and consumers. This leads to excess supply/demand situation with resultant price swings. These fluctuations are studied for the period 1972 to 1990-91.

The demand for potatoes and onions is highly price inelastic ( $-0.07$  and  $-0.13$  for potatoes) and ( $-0.10$  and  $-0.17$  for onions) in rural and urban areas, respectively [Najmi (1991), p. 193]. The year-to-year swings in supply coupled with an inelastic demand causes wide fluctuations in prices. Given a change in price, the change in quantity supplied is lagged and or distributed through time. Thus, a one-time increase in price would result in observed increases in quantity supplied over two or even more years. For both the crops, higher prices lead growers to increase production in a following period, which adversely affect prices and this in turn reduces acreage/production in the subsequent years and so on.

Production decisions are based on current or recent past prices while the realised production because of the time lag, is a function of past prices (see Figure 1 and 2), while prices are mainly a function of supply, depending upon the given year production. In economic theory, cycles are generated through lagged responses in price changes and other variables. Figure 1 shows the cyclical behaviour of price and quantity in a Cobweb framework for the potato crop. A rising wholesale price trend during 1972 through 1974 led to an increase in the production of potatoes in the subsequent years (1974 to 1976), thus excess supply resulted in low prices from 1974 to 1976, and hence smaller production in the next two years. A similar cyclical behaviour is depicted in Figure 2 for onions. The length of a cycle i.e., the

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*Authors' Note:* We are highly grateful to Dr Sohail J. Malik for his valuable comments and suggestions.

time from one peak/trough to the next is longer for onions than for potatoes during the period under consideration. But potato production experienced more fluctuations as compared to onion as shown in Figures 3 and 4. This perhaps, is due to fluctuations in the area under the potato crop while wholesale prices show the same trend for both crops. The production cycle of potato in the period under review began in 1974, (Figures 5 and 6) troughed at almost the same level in the following year, with systematic fluctuations over the entire period. The production cycle of onion started in 1973, appears to be stabilising out because each trough in the following years appears to be of lower amplitude than the preceding one. The individual cycles range from 5 to 8 years and 3 to 4 years for onions and potatoes, respectively. But not all farmers understand that a high price this year could lead to more output by other farmers in the subsequent years, few who do learn this, make profit by taking contra-cyclical actions. It has been observed in many countries that improved information on expected prices coupled with farmers education programme could result in basing of present production decisions not on past prices but on expected future prices. Therefore, it is believed that such an approach could be used to mitigate or moderate the year to year fluctuations in production and prices of potato and onion in Pakistan.

## **II. DATA AND ANALYTICAL TECHNIQUES**

The crop data pertain to year 1971-72 through 1990-91. The data were taken from various issues of the monthly Statistical Bulletin, Economic Survey of Pakistan (1992), Agricultural Statistics of Pakistan (1991) and Government of Pakistan (1988). The data are analysed using descriptive statistics, graphical presentation and growth rates were obtained through regression techniques.

## **III. AREA, YIELD AND PRODUCTION OF POTATO AND ONION**

The production of potatoes during the last two decades increased at an annual compound growth rate of 5.88 percent solely due to an increase in area by 6.19 percent; while the reduction in yield by 0.31 percent had an adverse impact on the overall growth rate of production in the country. Expansion in production of the crop took place due to the increase in area in Punjab, NWFP and Balochistan by 7.04, 3.39 and 6.38 percent respectively, while in Sindh it declined by 3.14 percent. Almost 81 percent of the entire production of potato is obtained from Punjab and Balochistan provinces. In both the provinces, the production was highly unstable as indicated by the coefficient of variation (CV) (Punjab 40.79 percent and Balochistan 56.28 percent). This instability is mainly due to fluctuations in area under the potato crop and the same is true for the country as a whole where the range of the CV is 36.47 and 38.21 percent for area and production respectively. The growth rate in area in the Punjab is the highest but CV (47.32 percent) is also the highest as compared to the other provinces. The higher the coefficient of variation, the lower

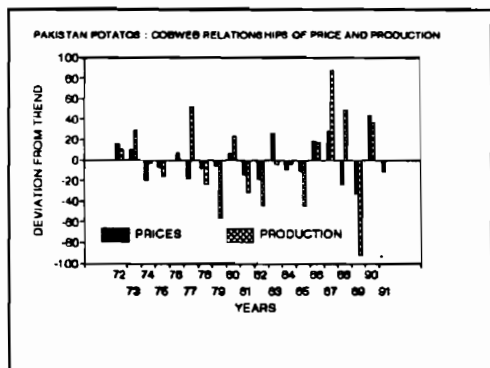


Figure 1

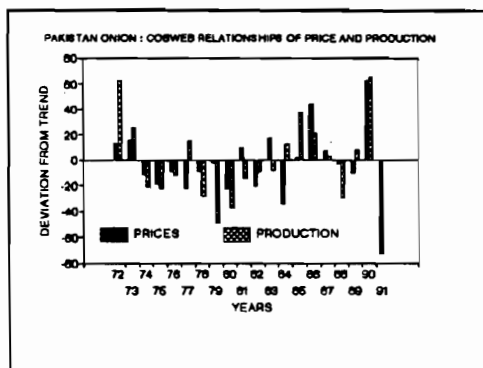


Figure 2

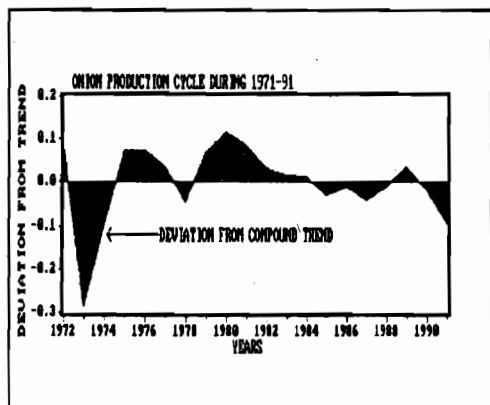


Figure 3

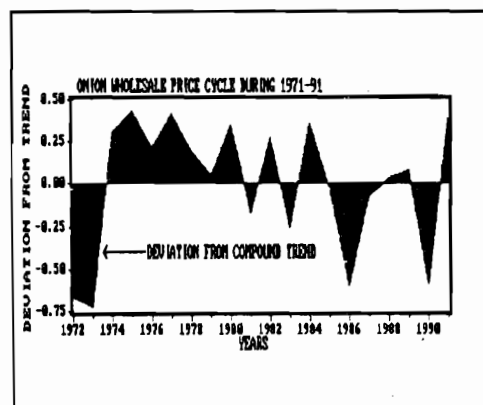


Figure 4

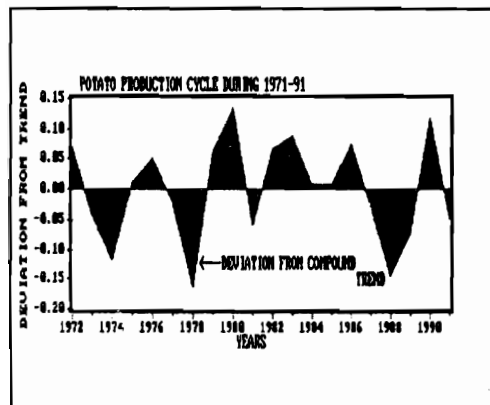


Figure 5

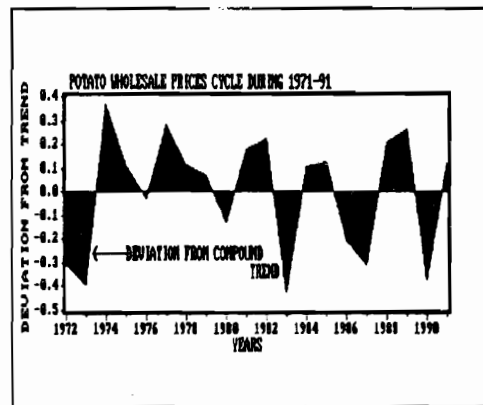


Figure 6

the stability in area which leads to more production instability. The growth rate in yield is very discouraging in all the provinces (Pakistan: -0.31 percent, Punjab - 0.45 percent and -0.86 in NWFP). There is nominal increase of 0.06 and 1.27 percent in Sindh and the Balochistan, respectively. The yield variability is noted more in the Balochistan (CV: 25.78 percent) followed by the Punjab (CV: 13.66 percent). Thus, intensive efforts are needed to enhance the yield of potato throughout Pakistan (Table 1).

Table 1

*Average Annual Compound Growth Rates of Area,  
Yield and Production of Potatoes, 1971-72 to 1990-91*

Country/Province	Area	Yield	Production
PAKISTAN	(+) 6.19	(-) 0.31	(+) 5.88
Punjab	(+) 7.04	(-) 0.45	(-) 6.53
Sindh	(-) 3.14	(+) 0.06	(-) 3.11
NWFP	(+) 3.39	(-) 0.86	(+) 2.53
Balochistan	(+) 6.38	(+) 1.27	(+) 7.69

Source: Annexure I.

Note: The growth rates have been worked out by estimating the equation  $\ln Q = a + bt$ .

The annual average compound growth rate of production of onion is 5.52 percent mainly due to the increase in the area by 4.75 percent and a nominal increase in yield (0.71 percent) in the country during the last two decades.

The growth rate of onion production in Punjab is (1.15 percent); showing only nominal increase due mainly to increase in area. The production growth rate in Sindh is 8.25 percent and that of NWFP 4.73 again due to expansion in area in both the provinces. The Balochistan province registered high growth rates of production (9.36 percent), area (6.44 percent) and yield (2.56 percent) (Table 2).

Table 2

*Average Annual Compound Growth Rates of Area,  
Yield per Hectare and Production of Onion: 1971-91*

Country/Province	Area	Yield	Production
PAKISTAN	(+) 4.75	(+) 0.71	(+) 5.52
Punjab	(+) 2.06	(-) 0.97	(+) 1.15
Sindh	(+) 6.64	(+) 1.61	(+) 8.25
NWFP	(+) 4.69	(+) 0.02	(+) 4.73
Balochistan	(+) 6.44	(+) 2.56	(+) 9.36

Source: Annexure II.

With better market prices, longer duration of crop and enhanced irrigation facilities, Balochistan has the potential of becoming the major onion producing

province of the country. The CV for the production, area and the yield shows greater instability in production again attributed to fluctuation in area. Relatively speaking, fluctuations in yield had a minor role.

#### IV. YIELD POTENTIAL OF ONION AND POTATO

During the period under study 85 percent of the increased production came from the expansion in area, and only 15 percent from the improvement in the yield. The yield potential of both the crops needs to be exploited to meet the excess demand for consumption and export. As revealed in Table 3, there is a potential to increase yield by 73 percent and 77 percent of potato and onion respectively. The potential gap can be filled by providing proper incentives to the grower. The increase in area is perhaps not possible without a trade-off between other important food and fibre crops.

Table 3  
*Yield Gap of Potato and Onion (Kg/Ha)*

Crop	Yields under Experimental Conditions	National Average Yield	Yield Gap (2) - (3)	Potential Increase
(1)	(2)	(3)	(4)	(5)
Potato	38,128	10,403	27,725	73
Onion*	48,782	11,220 **	37,563	77

Source: [Government of Pakistan (1988), p. 255].

\*Figures against onion in all but Column (3) have been worked out by taking the average of unachieved potential of all other commodities.

\*\*Annexure II.

The yield potential can be gained by providing good quality disease-free indigenous seed; evolving high-yielding varieties to expand autumn cultivation of onion in the Punjab province; establish onion research stations at a suitable location which, *inter alia*, should determine the alternative farming system which could extend the onion harvesting period in NWFP and early harvesting in Balochistan. Training farmers and strengthening outreach programme for improved practice of cultivation; provision of improved storage for onions and potatoes; proper grading to replace the manual grading with mechanical grading to ensure quality control; and the stabilisation of the inter annual variation in production.

#### V. SEASONAL VARIATION IN PRICE ELASTICITY OF DEMAND

The price elasticities of demand of both the commodities for each quarter of the year given in detail by Najmi (1991) show the seasonal variation. The seasonal

pattern of these elasticities is quite consistent with our general observation regarding consumer behaviour, that is, there is a substantial seasonal variation in household response to variation in total expenditure. The seasonal variation in price elasticities of potato does not vary in all the four quarters as much as that of onion which progressively declines (in absolute terms) both in the urban and the rural areas. Stated differently, the price level of onion was noted to be maximum between August and December, i.e. in the second and fourth quarter, while it remained below or in the vicinity of the annual average price in the first and the second quarter. This is due to varying agro-climatic conditions prevailing in the country, onions are grown at different times in different parts of the country resulting in year round harvesting except for the months of July and August, which leads to an increase in the price level in the ensuing months of the year. The price level of potato was observed to be maximum between July through November. A comparison of sectoral seasonal price elasticities of demand of potato revealed that the overall rural elasticity of demand of potatoes throughout the year is greater than that of the urban elasticity of demand, put differently, rural consumers are charged less than urban consumers for the commodity in question (Tables 4 and 5).

Table 4

*Sectoral Price Elasticity of Demand of Potato and Onion*

Commodity	Urban	Rural
Potato	(-) 0.13	(-) 0.07
Onion	(-) 0.17	(-) 0.10

Source: Burney and Akmal (1991).

Table 5

*Sectoral Expenditure Elasticity of Demand of Potato and Onion*

Commodity	Urban	Rural
Potato	0.28	0.29
Onion	0.37	0.40

Source: Burney and Akmal (1991).

Since expenditure elasticity of demand of onion is greater for rural areas (0.40) than urban areas (0.37), demand for onion will grow faster in rural areas as compared to urban areas.

## VI. SUPPORT PRICE OF ONION AND POTATO

The Agricultural Marketing and Storage Limited (AMSL) is designated as the implementing agency for support prices. The support prices are recommended

according to the two grades (i.e. size of onion 40-50 mm and over 50 mm) while for potato the size is 40-55 mm and over 55 mm. The support price for bigger size of onion and potato is higher by approximately Rs 5. Potatoes below 40 mm are mostly used as seed. It is generally believed that the present procurement scheme has been beneficial and helpful only for the larger and financially sound farmers and has not helped the poorer and smaller farmers. The support price policy has had almost no impact on prices because of prices being too low coupled with inadequate storage capacity and lack of efficient management. A comparison of growth rates of the support prices of potato and onion with that of the consumer price index, retail price index and the wholesale price shows that the support prices lagged behind the consumer price index and wholesale price index by a very wide margin i.e. almost 50 percent. The deflated prices declined over time. The growth rate of nominal wholesale as well as retail prices was almost double the support prices. The support price data of the potato crop for the entire length of time could be divided into three periods, viz., 1976-77 to 1981-82, 1982-83 to 1987-88 and 1988 onwards. The support price for the crop was rupees 26.80, 40.50 for the years 1981 to 1987 and then it increased every year starting from 1988. While for the onion crop, the entire period could be broken down into two periods, namely, 1976-77 to 1981-82 and 1982-83 onwards. Ignoring a relatively smaller period of time 1983-84 to 1984-85 when we had a constant support price of Rs 30, the onion support price that prevailed during the entire first period was rupees 19.30, and during the second period it kept on increasing each year. Fluctuations in the support price of potatoes caused corresponding fluctuations in the area over which the crop was grown, which in turn gave birth to greater fluctuations in the production of potato as compared to the onion.

## **VII. DOMESTIC PRICE BEHAVIOUR OF POTATO AND ONION**

The coefficient of variation is used to measure the relative variability or spread of data around its mean. The yearly coefficient of variation depicts the variability in monthly prices during a year as a percent of the average price. On the other hand the monthly coefficient shows the variability in the same month in all the years. The higher the value of the coefficient of variation, the lower is the stability in prices. The respective values of the coefficient show that the spread of prices round the average are very large. The maximum yearly and monthly CV's of potatoes are 54.34 and 76.05 respectively. The highest monthly value registered was 76.05 which implies that if the price is taken as 100, it may vary from 176.05 to 23.95. The range is too wide and needs to be reduced in order to stabilise domestic supplies and ensure steady exports. A similar interpretation applies to onions as well.

## **VIII. EXPORTS OF POTATO AND ONION**

The production, exports and share of exports in production of potato from Pakistan have been given in Table 6. The data show that the export levels were not

consistent with production levels. During the period under consideration, exports declined at an average annual rate of 0.42 percent. In reality, the target set for exports of potato have never been met. It is obvious from the coefficient of variation of 139.81 that exports of potato are highly volatile because of the present approach of trying to sell low quality domestic sub-standard potato in times of glut and drop

Table 6  
*Production of Potato, Exports and Percentage Share  
in the Total Production*

Year	Production (000, TNS)	Export (000, TNS)	Share of Export in Production (%)
1971-72	253.7	2.6	1.02
1972-73	241.3	3.2	1.33
1973-74	238.8	0.0	0.00
1974-75	289.5	0.0	0.00
1975-76	320.8	3.2	1.00
1976-77	318.0	12.5	3.93
1977-78	293.5	7.7	2.62
1978-79	392.4	23.3	5.94
1979-80	448.5	41.3	9.21
1980-81	394.3	4.9	1.24
1981-82	476.6	3.2	0.67
1982-83	518.1	7.3	1.41
1983-84	509.8	3.5	0.69
1984-85	543.3	2.7	0.50
1985-86	618.4	1.3	0.21
1986-87	594.3	2.5	0.42
1987-88	563.2	0.2	0.04
1988-89	644.8	1.0	0.16
1989-90	830.9	20.3	2.44
1990-91	751.3	2.4	0.32
G. Rate	5.88%	-0.42%	-5.95%
Average	462.08	7.16	1.66
S.D.	168.52	10.00	2.26
C.V.	36.47	139.81	136.49

Source: (i) Economic Wing, Ministry of Food, Agriculture and Co-operatives (MINFA), Islamabad.  
(ii) Monthly Statistical Bulletin, Bureau of Statistics, Karachi, (Various issues).

out of the export market when domestic prices rise. In order to build up a sustained export trade, we have to provide an assured supply to the foreign markets. To maintain our foreign markets, exports must occur even when domestic prices are



high. For this, we need grading, cold storage, packing, handling, transportation facilities and an internationally competitive price. Almost a similar pattern is revealed in Table 7 for the onion crop and therefore, this is not discussed here for the sake of brevity.

Table 7  
*Production of Onion, Exports and Percentage Share  
in the Total Production*

Year	Production (000, TNS)	Export (000, TNS)	Share of Export in Production (%)
1971-72	252.6	2.8	1.11
1972-73	186.6	2.4	1.29
1973-74	239.4	0.0	0.00
1974-75	302.9	0.0	0.00
1975-76	322.7	0.9	0.28
1976-77	331.5	3.7	1.12
1977-78	325.4	47.4	4.57
1978-79	389.7	22.3	5.72
1979-80	434.0	68.6	5.81
1980-81	447.6	75.3	16.82
1981-82	451.8	33.9	7.50
1982-83	474.8	75.5	15.90
1983-84	503.4	45.0	8.94
1984-85	514.6	25.1	4.88
1985-86	558.5	66.3	11.87
1986-87	576.8	48.9	8.47
1987-88	633.1	63.2	9.98
1988-89	707.0	27.1	3.83
1989-90	712.9	82.5	11.57
1990-91	702.4	5.5	0.78
G. Rate	5.53%	3.62%	-1.81%
Mean	453.39	34.82	7.02
S.D.	156.79	28.94	5.79
C.V.	34.58	83.13	82.43

Source: (i) Economic Wing, Ministry of Food, Agriculture and Co-operatives (MINFA), Islamabad.  
(ii) Monthly Statistical Bulletin, Bureau of Statistics, Karachi, (Various issues).

The main importers of potato from Pakistan are Dubai, Abu Dhabi, Saudi Arabia, Kuwait, Sri Lanka, Malaysia and Singapore. In Middle Eastern countries, large size white-skin potatoes rather than red-skin potatoes are preferred, while in the Far Eastern countries small-sized potatoes are preferred. The main reasons of

declining exports from Pakistan are irregular supply, lack of proper grading and packaging, irregular shipping services and inadequate information and lack of market intelligence. All these problems need to be taken care of, if exports of potato and for that matter all other exportable agricultural commodities are to be enhanced.

## CONCLUSIONS AND RECOMMENDATIONS

The main objective of an intervention by the government in the form of support price policy is to increase farmers' income above the level they would otherwise reach in a free market. In fact, it is a subsidy which alone cannot eliminate the fluctuations. The present storage capacity needs to be enhanced by about 50 percent to cater for a full-scale support operation. The present storage capacity is not enough. This was seriously realised in 1989 when AMSL did not have enough storage capacity to store their purchases.

Furthermore, it is believed that the present procurement scheme has not helped the poorer and smaller farmers, and has almost no impact on prices owing to these being too low, and coming into effect too late. Moreover, inadequate storage capacity and inefficient management add to the lack of impact.

To deal with the glut situation which occurs about once every three year for potato, supply could be restricted by an acreage set-aside policy. Such policy may be acceptable politically and practically in Pakistan. The promotion of consumer demand could be another approach which is a long-term proposition, and even if it is done, a permanent shift in demand would lead to even higher prices when supplies are low.

In order to iron out cyclical price and production movements or gluts and shortages, the following measures could be recommended. Provision of harvest credit through the Agricultural Development Bank of Pakistan (ADBP) is one way to assist small farmers to improve their income levels and to encourage them to store and delay the sale of the produce until the glut period is over and higher prices prevail in the market. This will somewhat mitigate price fluctuations.

Provision of market information on potatoes as well as onion regarding acreage planted, output, farmgate and *mandi* level prices, source of disease free, high-yield seed availability, weather, disease, and pest conditions during the season, predictions of expected crop output, actual production on farm and shipment by volume in the main wholesale markets, existing stock levels along with rising or declining trends if any, daily wholesale and retail prices and price predictions, shipping and storage costs are all crucial types of information which will enable the producers and traders to ascertain the existing and expected market conditions and thus enable them to increase or decrease the area to be planted and whether or not to delay harvesting. They can also base their storage decision and the like on such information which in turn would reduce the severity of the booms and busts of the potato and onion cycles. This type of information should be comprehensive and must be disseminated quickly to allow farmers to react well in time. In order to

reduce the marked seasonal variation in production levels as well as smoothing out of price swings of onion and potato, the suggested measures are itemised below:

- (a) Improvement of seasonal price information at the farm level.
- (b) Determination of the varietal differences in time of maturity.
- (c) Combining the information from (a) and (b) above to determine if alternative farming system could be defined which would extend the onion harvesting period in NWFP and bring about earlier harvesting in Balochistan in such a way as to increase farm incomes and lower peak seasonal consumer prices.
- (d) Buffer-stock should be maintained by organisation like Pakistan Agricultural Storage and Supply Corporation (PASSCO/AMSL) which should be released in off-season to mitigate the variations in prices.
- (e) There is a lot of potential of increasing onion production in Sindh, that needs to be exploited to reduce the severity of the problem.
- (f) Improve cheap methods of preservation and dehydration of onion needs to minimise the losses and regulate supplies over longer periods and especially during cold seasons. This will eradicate or minimise the erratic supply and price swings.
- (g) Development of farming system which closely fit market needs will help considerably in the development of high value export markets.

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**Comments on  
"Policy Imperatives: Stabilisation of Production and  
Price Swings of Potato and Onion Crops in Pakistan"**

As the topic suggests, the paper deals with an important issue and is laudable for some of its conclusions and policy recommendations. This is especially true of the paper's conclusion regarding the ineffectiveness of the government's price support policy for the two crops under consideration to ensure stability of prices. The paper may also be appreciated for recommending a multi-faceted strategy for reduced variability of prices and the output of the potato and onion crops. Despite these merits, however, the paper suffers from many shortcomings as follows:

First, the methodology of the paper is defective and lacks precision. Although instability of prices and output should basically spring from the mismatch of demand and supply conditions, the paper fails to define them. Instead, it relies heavily on coefficients of variation for measurement of stability and argues that higher the coefficient of variation, the greater is the instability in prices, output, area and yields. It may, however, be noted that when applied to time-series data, coefficients of variation are only a rough guide to instability. They can assume higher values simply because of rapid inflation or rapidly increasing output, area or yields despite little upward and downward year to year fluctuations. Looking at the results of the paper, it would turn out clearly that this indeed had been the case. For example, coefficients of variation for yields have been consistently low because of stagnating yields of the two crops over the period under consideration. In addition, the paper fails to establish price links between output, prices and exports as sources of instability. While some type of regression analysis would have been useful, the paper's emphasis on comparisons of trends leaves much to be desired.

Secondly, the paper is marred by considerable inconsistencies, inept interpretations and unnecessary and seemingly unrelated issues. For example, although the paper assumes a highly price inelastic demand for potato and onion on the very first page on the basis of data in Table 5, Annexure III points to fairly elastic demand conditions with respect to prices. The annual growth rates of Pakistan's onion production for the period 1971-72 to 1990-91 have appeared in Table 2, Table 3 and Annexure II but differ from each other at all three places. Although the data in Table 4 clearly indicate that potential yields of the onion and potato crops could be raised four-fold the text of the paper has insisted on potential yield increases of 73-77 percent only. The paper equates high price elasticity of rural demand for potato to low prices which seems absurd. The same page also holds that demand for onion in the rural areas is likely to grow faster than that in the urban areas. I have doubts if the conclusion could be upheld without reference to growth of expenditures in the two areas and statistical significance of the

differences of the estimated expenditure elasticities. One would also wonder as to how sectoral and provincial demand elasticities, length of cycle and whole and retail prices are related to production and price instabilities especially when the prices of the two commodities are controlled by the government.

Finally, the paper makes a large number of recommendations. Many of them do not follow from the body of the paper and can be regarded as irrelevant. Those that do follow from the paper, either have limited appeal, are impracticable and hence ineffective or are likely to lead to a distortion of economic efficiencies. For example, although it has been argued repeatedly throughout the paper that price fluctuations are a major source of production instability, yet the paper stops short of recommending price controls. If the price support policy has failed in the past, the relevant policy issue is to redirect emphasis on making it more effective but again the paper has nothing to offer on this score. Likewise the recommended policy of greater institutional credit to small farmers is unlikely to deliver anything to small farmers in view of repeated failures unless steps are taken to improve its effectiveness. The paper has emphasised the need for stepping up production in Sindh but has ignored the comparative advantage of other provinces. If pursued, such a policy may lead to greater output of onion and potato but at the cost of reduced economic efficiency in the production process. Despite the immense unrealised yield potential of onion and potato crops, it seems strange that the paper makes no recommendations regarding the use of key modern inputs such as fertilizers and insecticides. Last but not the least, the recommendations of acreage set aside policy, supply of seasonal price information, effective management of buffer stocks and redirecting the farming system for compatibility with market needs can hardly be implemented without an efficient administrative set up of which there is a total lack in Pakistan.

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