Prices, Terms of Trade, and the Role of Government in Pakistan's Agriculture

Kee-Cheok Cheong
Emmanuel H. D'Silva

The World Bank
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Despite the importance of agriculture to the national economy of Pakistan and the major role played by the government in its development, a number of key issues have not been adequately addressed by existing studies. This paper provides an empirical basis for discussion of changes in the agricultural terms of trade, growth of agricultural productivity and incomes, pricing of agricultural inputs and outputs, and subsidization and taxation of agriculture.

The paper notes that the terms of trade between agriculture and the other sectors have not significantly deteriorated during the period 1960-83. Indeed, in absolute terms, farmers' purchasing power whether measured in terms of the quantity of output or per unit of productive effort, has actually improved, even if gradually. Hence, the farmers' ability to pay for agricultural inputs, despite gradual increases in their prices, did not erode over the years.

Net returns to farmers have increased, until recently, because of increases in crop prices and because of substantial government subsidies for inputs. The recent sharp increases in fertilizer prices have reversed this trend, but they should not affect the continued profitability in the use of fertilizer even at higher prices. Similarly, despite increases over the past four years, water charges remain a small proportion of total production costs and are in any case, substantially less than the estimated scarcity value of irrigation water to the farmer.

Until 1977, agriculture contributed more in taxes to the economy than it took out through financial subsidies, but the position has reversed since then. There has been a decline in net subsidies, particularly after 1981, mainly because of reduction in fertilizer subsidies. With the government committed to eliminate fertilizer subsidies by 1985, this trend is expected to continue. However, the economic taxation of wheat and basmati rice (as a result of setting domestic prices below their international levels) in contrast to the economic subsidies provided to sugar (to offset higher domestic prices relative to imports) should be a matter of concern. The paper argues that appropriate price policies that are responsive to changes in international prices are likely to have as salutary an effect as any attempt to reduce financial subsidies or to increase taxes.
Pese a la importancia de la agricultura para la economía de Pakistán y la gran influencia del Gobierno en el desarrollo del sector agropecuario, hay varios aspectos fundamentales que no han sido abordados debidamente en los estudios que se han realizado. Este trabajo proporciona una base empírica para examinar las variaciones en la relación de intercambio de este sector, el aumento de la productividad y los ingresos agrícolas, los precios de los insumos y productos agrícolas, y la subvención y tributación de la agricultura.

En el trabajo se observa que la relación de intercambio entre la agricultura y los demás sectores no se deterioró en medida significativa durante el período de 1960-83. En realidad, en términos absolutos, el poder adquisitivo de los agricultores --medio en función de la cantidad de producto o del costo de los insumos-- ha mejorado, aunque gradualmente. Por consiguiente, la capacidad de los agricultores para comprar insumos agrícolas no ha disminuido con el tiempo, pese al aumento gradual de sus precios.

Hasta hace poco, los ingresos netos de los agricultores aumentaron, debido a incrementos de los precios de los cultivos y a las considerables subvenciones gubernamentales a los insumos. Esta tendencia se ha invertido a causa de los pronunciados aumentos recientes de los precios de los fertilizantes, pero esto no debería afectar la rentabilidad continua del uso de éstos, aun cuando sus precios sean más altos. Asimismo, pese a los aumentos de los últimos cuatro años, las tarifas que se cobran por el agua siguen representando una proporción pequeña de los costos totales de producción y, en todo caso, son muy inferiores al precio en razón de la escasez que, según se ha estimado, tendría que pagar el agricultor por el agua para riego.

Hasta 1977 la agricultura aportó más a la economía en forma de impuestos que lo que recibió de ésta en forma de subvenciones financieras, pero la situación ha cambiado desde entonces. Las subvenciones netas han disminuido, en particular a partir de 1981, principalmente debido a la reducción de las otorgadas a los fertilizantes. Se prevé que esta tendencia continuará, pues el Gobierno está decidido a eliminar las subvenciones a los fertilizantes hacia 1985. Sin embargo, la tributación económica del trigo y el arroz Basmati (como resultado de la fijación de precios internos inferiores a los internacionales), por oposición a las subvenciones económicas que se otorgan al azúcar (para compensar el precio interno, que es más alto que el de importación), debería ser motivo de preocupación. En el trabajo se aduce que unas políticas de precios adecuadas que respondan a las variaciones de los precios internacionales tienen las mismas probabilidades de surtir efectos saludables que los intentos de reducir las subvenciones financieras o de aumentar los impuestos.
Malgré la place que tient l'agriculture dans l'économie pakistanaise et le rôle que l'État joue dans son développement, les études publiées jusqu'à présent laissent l'ombre un certain nombre de questions clés. Cette étude fournit des données empiriques et examine quatre paramètres du secteur agricole : variations des termes de l'échange, croissance de la productivité et des revenus, détermination des prix des intrants et ces produits, et imposition et subventions.

Il apparaît que les termes de l'échange entre l'agriculture et les autres secteurs ne se sont pas sensiblement dégradés au cours de la période 1960-83. En termes absolu, le pouvoir d'achat des paysans, mesuré en fonction de la production ou du coût des intrants, s'est même amélioré peu à peu. Bien que les prix des facteurs de production aient progressivement augmenté, les paysans ne sont donc pas moins à même de les payer qu'ils y a quelques années.

Jusqu'à une époque récente, les bénéfices nets des exploitants augmentaient, par suite de la hausse des prix des récoltes et des subventions de l'État aux intrants agricoles. Cette tendance s'est renversée à la suite de la brusque augmentation du prix des engrais, qui ne devrait toutefois pas compromettre la rentabilité de l'emploi des engrais. De même si les redevances d'eau ont été relevées au cours des quatre dernières années, elles ne représentent toujours qu'une petite partie du coût global de la production, et elles sont nettement inférieures à la valeur de rareté qu'à l'eau d'irrigation pour le paysan.

Jusqu'en 1977, les impôts que l'État percevait sur l'agriculture étaient supérieurs aux subventions qu'il lui versait. Mais la situation s'est inversée depuis lors. Aujourd'hui, et surtout depuis 1981, les subventions nettes sont en baisse, du fait surtout de la réduction des subventions aux engrais. Les pouvoirs publics s'étant engagés à éliminer les subventions aux engrais d'ici à 1985, cette tendance devrait se poursuivre. Cependant, la taxation économique du blé et du riz basmati (dont le prix sur le marché national est inférieur : sur cours sur le marché international), comparée à la subvention économique dont bénéficie le sucre (du fait que son prix intérieur est élevé par rapport à celui du sucre importé), est inquiétante. Cette étude montre que des politiques de prix appropriées et modulées en fonction des mouvements des prix internationaux peuvent avoir un effet tout aussi salutaire que toute tentative de réduire les subventions ou d'augmenter les impôts.
PRICES, TERMS OF TRADE, AND THE ROLE OF GOVERNMENT
IN PAKISTAN'S AGRICULTURE

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I. INTRODUCTION

Agriculture remains the most important economic activity in Pakistan, accounting for 30% of the gross domestic product (GDP). Crops provide 69% of agricultural GDP, livestock 28%, and fishing and forestry the remaining 3%. Taxes on products of agricultural origin make up roughly 20% of public revenue, while agricultural workers account for over 50% of the workforce. Products originating in the agricultural sector figure prominently in Pakistan's trade; rice, cotton, yam and cloth are major exports while edible oil and (until recently) wheat are the major imports.

The government plays a major role in the agricultural economy. It sets procurement or minimum prices for crops (wheat, rice, sugarcane, and cotton), and fixes prices for agricultural products (sugar and flour), and for inputs (such as fertilizer and water). Although to a diminishing extent, it participates in the processing, production, import and domestic marketing of agricultural crops and key inputs. Incentives to farmers have been provided through subsidies; in fiscal year (FY) 1980, these subsidies (both producer and consumer) amounted to about Rs 6,000 million, or about 28% of the country's annual development plan. 1/

Despite the importance of agriculture and the major government role, not many studies of its impact on incomes, and on the transfer of resources

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1/ See "Potential for Irrigated Agricultural Development in Pakistan," mimeo prepared by Tariq Husain, July 1981; Pakistan: Economic Developments and Prospects, April 1982; and Pakistan: Special Agriculture Sector Review, Vol. 1, January 1976. (These are internal World Bank documents with restricted circulation.)
among sectors, have emerged. This appears to be partly the consequence of paucity of data; while terms-of-trade indices between Pakistan and the rest of the world are part of the country’s official statistics, up-to-date information on intersectoral terms of trade is less readily available. Even so, a number of views expressed on Pakistan’s agriculture appear not to have been based upon any analysis of existing data. Among these views are that agriculture’s terms of trade have been declining over the years, that a major factor for the relative stagnation of agriculture is its lack of productivity, that improvements in yields have made only marginal contributions to growth in agricultural output, and that the mobilization of resources in agriculture has been inadequate.

The purpose of this paper is to provide an empirical basis for discussion of four issues.

- Changing trends in the terms of trade for agriculture.
- The growth of agricultural incomes and productivity.
- The prices of agricultural inputs and outputs and their relationship.
- Subsidies for, and taxation of, agriculture.

These issues are examined in the context of the government’s role in agriculture.

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II. AGRICULTURE'S TERMS OF TRADE

As countries advance economically, there is a progressive decline in the share of agriculture in GDP. In Pakistan, while the real value added in agriculture increased, on the average, 2.7% per year between FY70 and FY82, its share of the total GDP fell from 39% in FY70 to 31% in FY82. In contrast, the share of manufacturing (including mining) increased from 16.5% to 17.9% during the same period.

An important measure of agriculture's position relative to other sectors is its terms of trade (TOT), or the relationship between the prices of goods bought and sold by farmers. There are at least two reasons why economists are interested in agriculture's TOT. First, it indicates whether income is being transferred out of agriculture. Second, it signals the strength of incentives to the agriculture sector to adopt innovations and to produce more.

Four terms-of-trade concepts are used in this section. The first and most common index of TOT is the net barter terms of trade, which is an index of the ratio of prices of agricultural products to the prices of manufactured goods. 1/ This index is estimated for FY60-FY83 in column 1 of Table 1. In the early 1950s, trade-restricting policies have turned the terms of trade against agriculture. From the mid-1950s to mid-1960s, this

situation is reversed on account of the slower growth of agriculture relative to industry, bad weather and a decline in the import of American wheat under PL-480 followed by a slight decline toward the end of the 1960s in the years marked by the onset of the "green revolution." \[1\] However, despite some variations shown in column 1, a declining trend in agriculture's terms of trade has not been observed over the past two decades.

<table>
<thead>
<tr>
<th>Fiscal year</th>
<th>Net Barter Terms of Trade/a (FY60=100)</th>
<th>Output Index Terms of Trade/b (FY60=100)</th>
<th>Income Terms of Trade/c (FY60=100)</th>
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</table>

/a Calculated from ratios of GNP deflators, with FY60=100.
/b Net barter terms of trade x quantum index of output
/c Net barter terms of trade x productivity index.
/d Estimated.

Sources:
Table 2: RATIOS OF WHOLESALE PRICE INDICES FOR AGRICULTURE TO THE WHOLESALE PRICE INDEX FOR MANUFACTURES, FY70-FY82/a

<table>
<thead>
<tr>
<th>Fiscal year</th>
<th>Food</th>
<th>Raw materials</th>
<th>Wheat</th>
<th>Rice</th>
<th>Sugar</th>
<th>Cotton</th>
<th>Meat</th>
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/a For all wholesale price indices, FY70=100.

Source: Ministry of Finance, Planning and Economic Affairs.

The other three terms-of-trade indices used to determine the relative status of agriculture are:

- Wholesale price ratios. Agricultural prices relative to the price index of manufactured goods were higher in FY82 than in FY70, the base year (see Table 2).

- Income terms of trade. This is a measure of the purchasing power of agriculture. As a result of the rising trend of agricultural output, there was steady improvement in purchasing power (over 250% between FY60 and FY82) as measured by the income TOT.
Single factorial terms of trade. 1/ This index reflects the purchasing power of agriculture per unit of productive effort. The gradual, if erratic, increase in this index (shown in column 6 of Table 1) is mainly the result of improvements in the productivity of inputs used during the past two decades.

The overall trends in these terms-of-trade indices indicate that in absolute terms, farmers' purchasing power, whether measured in terms of the quantity of output, or of the unit of productive effort, has increased. Hence, farmers' ability to pay for agricultural inputs has not been eroded over the years, a conclusion also emphasized by other studies. 2/ However, because of the ways they are defined, these indices are not the most direct measures of farmers' welfare, nor can they be used to infer whether farmers are better off than those in the nonagricultural sector. These major issues, however, are the subject of the rest of this paper.

1/ This is defined as the product of the net barter index by an index of factor productivity. For Pakistan's agriculture, Wizarat has constructed a total productivity index which is the ratio of an index of agricultural value added to an aggregate index of agricultural inputs. The inputs considered are land, labor, and capital. The last is approximated by number of tubewells and the livestock population. Three alternative definitions for land—cropped area, net area sown, and cultivated area—were used. Clearly, the usefulness of the single factorial index depends on the validity of the productivity index. See Wizarat, S., "Technical Change in Pakistan's Agriculture: 1953-54 to 1977-78," Research Paper No. 120, PIDE, Feb. 1981.

III. OUTPUT GROWTH AND PRODUCTIVITY

Of the factors influencing the agricultural terms of trade, output recorded higher growth during FY70-FY82 than in earlier decades. This growth has often been attributed to expansion of acreages rather than to improvements in yields. 1/ As Table 3 shows, however, this judgment is not always consistent with the evidence, and is, in any case, an oversimplification. Over the period FY70-FY82, growth in yields was more important in contributing to growth in output in 5 out of 6 years for cotton, 6 out of 8 for rice, 9 out of 11 for wheat, and 3 out of 9 for sugarcane.

At the same time, the decline in yields played a dominant role in the fall in output in 6 years out of 7 for cotton, 3 out of 4 for rice, 2 out of 2 for wheat, and 3 out of 4 for sugarcane. Even when averages are taken, the results vary significantly among crops and time periods. For cotton and wheat, improvements in yields played a major role in increasing output regardless of the time period selected. The reverse is true for rice and sugarcane, but in both cases, yields improved after FY79. Insofar as improvements in productivity are associated with an increase in yield, the evidence from Table 3 points to a greater role for productivity in the historical growth of agricultural output than is often admitted.

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1/ Pakistan: Economic Development and Prospects, op cit.
Table 3: THE SHARE OF MOVED YIELDS IN THE GROWTH OF OUTPUT OF MAJOR CROPS, FY70-FY82

<table>
<thead>
<tr>
<th>Fiscal year</th>
<th>Cotton Rate of Growth (¥)</th>
<th>Cotton Share of Rate of Growth (%)</th>
<th>Rice Rate of Growth (¥)</th>
<th>Rice Share of Rate of Growth (%)</th>
<th>Wheat Rate of Growth (¥)</th>
<th>Wheat Share of Rate of Growth (%)</th>
<th>Sugarcane Rate of Growth (¥)</th>
<th>Sugarcane Share of Rate of Growth (%)</th>
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<td>-15.36</td>
<td>108.53</td>
<td>4.54</td>
<td>53.08</td>
<td>5.21</td>
<td>12.48</td>
<td>15.56</td>
<td>16.84</td>
</tr>
<tr>
<td>1978</td>
<td>32.19</td>
<td>111.84</td>
<td>7.78</td>
<td>-15.17</td>
<td>-8.50</td>
<td>91.06</td>
<td>1.88</td>
<td>-128.14</td>
</tr>
<tr>
<td>1979</td>
<td>-17.66</td>
<td>116.59</td>
<td>10.92</td>
<td>38.19</td>
<td>18.92</td>
<td>66.54</td>
<td>-9.15</td>
<td>7.46</td>
</tr>
<tr>
<td>1980</td>
<td>53.86</td>
<td>75.64</td>
<td>-1.11</td>
<td>133.92</td>
<td>9.17</td>
<td>61.29</td>
<td>0.63</td>
<td>853.97</td>
</tr>
<tr>
<td>1981</td>
<td>-6.10</td>
<td>43.11</td>
<td>-2.89</td>
<td>-80.97</td>
<td>5.67</td>
<td>82.89</td>
<td>17.68</td>
<td>13.74</td>
</tr>
<tr>
<td>1982</td>
<td>9.42</td>
<td>28.66</td>
<td>5.88</td>
<td>74.71</td>
<td>1.11</td>
<td>151.35</td>
<td>12.99</td>
<td>6.54</td>
</tr>
</tbody>
</table>

Average:

<table>
<thead>
<tr>
<th>Period</th>
<th>Cotton Rate of Growth (¥)</th>
<th>Cotton Share of Rate of Growth (%)</th>
<th>Rice Rate of Growth (¥)</th>
<th>Rice Share of Rate of Growth (%)</th>
<th>Wheat Rate of Growth (¥)</th>
<th>Wheat Share of Rate of Growth (%)</th>
<th>Sugarcane Rate of Growth (¥)</th>
<th>Sugarcane Share of Rate of Growth (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY70-FY79</td>
<td>-1.38</td>
<td>60.14</td>
<td>3.43</td>
<td>27.11</td>
<td>3.46</td>
<td>77.17</td>
<td>0.44</td>
<td>-39.45</td>
</tr>
<tr>
<td>FY79-FY82</td>
<td>16.6</td>
<td>72.54</td>
<td>-0.40</td>
<td>-122.50</td>
<td>5.90</td>
<td>77.12</td>
<td>9.99</td>
<td>28.83</td>
</tr>
<tr>
<td>FY70-FY82</td>
<td>2.96</td>
<td>69.14</td>
<td>2.46</td>
<td>33.33</td>
<td>4.07</td>
<td>77.15</td>
<td>2.79</td>
<td>-21.51</td>
</tr>
</tbody>
</table>

Note: A negative share for yield implies an increase in yield corresponding to a decrease in output or vice-versa.

Source: Planning and Development Division, Government of Pakistan.
Further support for this view is provided in Table 4. The data in the Table show that the increase in the use of inputs is the major factor in only 10 out of 17 years that the agricultural value added has increased since FY60. Taking the entire period FY60-FY81, the increase in the agricultural input index accounted for 65% of the increase in output, but this share is less than 50% if the period FY70-FY78 is excluded. (During the latter period, output soared 152% during the eight years.) These findings, however, are in no way inconsistent with the perception that the growth in productivity has been erratic and disappointing, that the growth of real output per capita has been much slower in agriculture than in other sectors (see Annex, Table A.3), and that considerable potential remains for improving yields.

1/ Since productivity is treated as a residual, the well-known problems apply when measurement is attempted. Under fairly restrictive assumptions, the share of productivity change in total output growth is equal to one minus the share of increase in total inputs. In Table 4, no attempt has been made to quantify productivity. The lower the share of agricultural input in total output growth, however, the greater the likelihood that productivity is important.
Table 4: THE SHARE OF PRODUCTIVITY IN OUTPUT GROWTH IN AGRICULTURE, FY60-FY81
(Percent)

<table>
<thead>
<tr>
<th>Fiscal year</th>
<th>Annual Growth of Agricultural Value Added</th>
<th>Annual Growth of Agricultural Input Index</th>
<th>Ratio of Growth Rates: Input/Value Added</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>-1.0</td>
<td>1.1</td>
<td>-110.0</td>
</tr>
<tr>
<td>1961</td>
<td>-1.4</td>
<td>8.7</td>
<td>-621.4</td>
</tr>
<tr>
<td>1962</td>
<td>3.9</td>
<td>3.7</td>
<td>41.3</td>
</tr>
<tr>
<td>1963</td>
<td>7.0</td>
<td>3.9</td>
<td>55.9</td>
</tr>
<tr>
<td>1964</td>
<td>2.8</td>
<td>1.4</td>
<td>52.2</td>
</tr>
<tr>
<td>1965</td>
<td>6.7</td>
<td>4.4</td>
<td>65.6</td>
</tr>
<tr>
<td>1966</td>
<td>-0.4</td>
<td>2.0</td>
<td>-500.0</td>
</tr>
<tr>
<td>1967</td>
<td>7.2</td>
<td>2.9</td>
<td>40.7</td>
</tr>
<tr>
<td>1968</td>
<td>16.5</td>
<td>2.5</td>
<td>15.3</td>
</tr>
<tr>
<td>1969</td>
<td>5.9</td>
<td>-0.7</td>
<td>-11.9</td>
</tr>
<tr>
<td>1970</td>
<td>12.5</td>
<td>0.8</td>
<td>6.0</td>
</tr>
<tr>
<td>1971</td>
<td>-5.1</td>
<td>2.6</td>
<td>-51.0</td>
</tr>
<tr>
<td>1972</td>
<td>4.5</td>
<td>3.3</td>
<td>72.7</td>
</tr>
<tr>
<td>1973</td>
<td>1.2</td>
<td>2.3</td>
<td>187.9</td>
</tr>
<tr>
<td>1974</td>
<td>5.3</td>
<td>3.7</td>
<td>70.0</td>
</tr>
<tr>
<td>1975</td>
<td>-3.1</td>
<td>1.9</td>
<td>-61.3</td>
</tr>
<tr>
<td>1976</td>
<td>5.9</td>
<td>2.1</td>
<td>35.4</td>
</tr>
<tr>
<td>1977</td>
<td>2.0</td>
<td>1.5</td>
<td>77.7</td>
</tr>
<tr>
<td>1978</td>
<td>2.1</td>
<td>1.2</td>
<td>56.3</td>
</tr>
<tr>
<td>1979</td>
<td>2.6</td>
<td>5.3</td>
<td>202.7</td>
</tr>
<tr>
<td>1980</td>
<td>8.3</td>
<td>2.4</td>
<td>28.5</td>
</tr>
<tr>
<td>1981</td>
<td>3.8</td>
<td>3.5</td>
<td>92.3</td>
</tr>
</tbody>
</table>

Average:

| FY60-FY70 | 6.4 | 2.9 | 45.7 |
| FY70-FY78 | 1.5 | 2.3 | 151.9 |
| FY75-FY81 | 6.0 | 2.9 | 48.6 |
| FY60-FY81 | 4.3 | 2.8 | 65.3 |


/B A negative ratio indicates that agricultural value added and the agricultural input index change in opposite directions.
IV. INPUT/OUTPUT PRICES AND FARMERS' INCOMES

While output and income terms of trade are important measures of agricultural performance, farmers' net incomes are a more appropriate measure of their welfare. The data in Table 5 show that net returns of average farmers in Pakistan rose for all major crops during the last decade; increases for leading farmers in the Punjab were even higher.

The data also show that in the Punjab, Basmati, the finer-quality and higher-value rice, had an advantage over other varieties, which explains why the leading farmers, in particular, have been switching to the higher-value crop in the last few years. This conclusion, based on the data in Table 5, however, needs to be regarded as tentative. In general, however, better returns and higher yields from the seed-fertilizer revolution have significantly altered the allocation of resources among various crops. Some crops, such as wheat, have retained or extended the acreage that had customarily been devoted to winter cereals. Just as Basmati has replaced coarser rice, in many areas other high-yielding rice varieties (Irri-6, for example) have replaced cotton in traditional cotton-growing areas.

The small sample sizes used in Table 5 (see footnote (a)) raise questions about how representative these samples are, while differences in the characteristics of the two types of farmers measured would make direct comparisons hazardous.
<table>
<thead>
<tr>
<th>Fiscal year</th>
<th>Wheat (Maxi-Pak)</th>
<th>Rice Paddy</th>
<th>Cotton (American)</th>
<th>Sugarcane</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>54</td>
<td>42</td>
<td>8</td>
<td>32</td>
</tr>
<tr>
<td>1976</td>
<td>259</td>
<td>206</td>
<td>120</td>
<td>94</td>
</tr>
<tr>
<td>1978</td>
<td>193</td>
<td>60</td>
<td>84</td>
<td>194</td>
</tr>
<tr>
<td>1979</td>
<td>167</td>
<td>209</td>
<td>196</td>
<td>377</td>
</tr>
<tr>
<td>1980</td>
<td>196</td>
<td>159</td>
<td>240</td>
<td>449</td>
</tr>
</tbody>
</table>

Average Farmer, Pakistan /a

<table>
<thead>
<tr>
<th>Fiscal year</th>
<th>Wheat (Maxi-Pak)</th>
<th>Rice Paddy</th>
<th>Cotton (American)</th>
<th>Sugarcane</th>
</tr>
</thead>
<tbody>
<tr>
<td>1975</td>
<td>342</td>
<td>707</td>
<td>660</td>
<td>496</td>
</tr>
<tr>
<td>1976</td>
<td>372</td>
<td>456</td>
<td>565</td>
<td>701</td>
</tr>
<tr>
<td>1977</td>
<td>398</td>
<td>460</td>
<td>539</td>
<td>632</td>
</tr>
<tr>
<td>1978</td>
<td>361</td>
<td>429</td>
<td>513</td>
<td>906</td>
</tr>
<tr>
<td>1979</td>
<td>570</td>
<td>591</td>
<td>497</td>
<td>1,007</td>
</tr>
<tr>
<td>1980</td>
<td>1,093</td>
<td>753</td>
<td>458</td>
<td>1,315</td>
</tr>
<tr>
<td>1981</td>
<td>1,198</td>
<td>909</td>
<td>588</td>
<td>1,173</td>
</tr>
</tbody>
</table>

Average Leading Farmer, Punjab /b

/a "Average farmer" data was obtained from farmers selected by a multi-stage sampling design with districts, villages and farmers making up the sampling units from each stage. The FY76 data came from 1,209 farmers located in 152 villages and 10 districts.

/b "Average leading farmers" are those who possess land holdings generally between 12.5 acres and 25 acres. Generally such farmers produce marketable surpluses of agricultural commodities.

Source: Food and Agriculture Division, Ministry of Food and Agriculture; Survey Reports of Cost of Production of Major Crops.
The increases in crop prices have been partly responsible for the rising trend in net returns, (see Annex, Table A.5). At the same time, the prices of agricultural inputs have also declined in relative terms as a result of very considerable government subsidies (more in the next section). As Table 6 shows, the ratio of fertilizer prices to major crop prices has remained relatively stable over the last decade. 1/ This indicates that prices of both fertilizers and crops have moved closer together. The exceptions are the years FY73-FY75 for wheat and Irri-6 rice, when sharp increases in the price of fertilizer raised the ratio substantially. The further increase in fertilizer prices in February 1980 is reflected in the higher ratio for FY80, but upward adjustments in crop prices were able to partially offset this increase, so that even after two upward revisions in fertilizer prices in FY82 and FY83, ratios would be no higher than the levels reached in FY80.

Because output prices in Pakistan have generally kept pace with input prices, it is difficult to determine the price-induced effects on input use. Gotsch and Falcon have suggested that input demand responses are of two types. 2/ For example, if the price of fertilizer is lowered, farmers already using fertilizer may use more of it, or farmers not previously using chemicals

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1/ See also Annex, Table A.7.

Table 6: RATIOS OF FERTILIZER PRICES TO CROP PRICES, FY70-FY82/a

<table>
<thead>
<tr>
<th>Fiscal year</th>
<th>Wheat</th>
<th>Basmati</th>
<th>Irri-6/b</th>
<th>Sugarcane/c</th>
<th>Seed Cotton/d</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>1.26</td>
<td>0.61</td>
<td>1.02</td>
<td>7.77</td>
<td>-</td>
</tr>
<tr>
<td>1971</td>
<td>1.36</td>
<td>0.72</td>
<td>1.10</td>
<td>8.41</td>
<td>-</td>
</tr>
<tr>
<td>1972</td>
<td>1.36</td>
<td>0.61</td>
<td>1.10</td>
<td>9.25</td>
<td>-</td>
</tr>
<tr>
<td>1973</td>
<td>1.68</td>
<td>0.61</td>
<td>1.36</td>
<td>6.71</td>
<td>-</td>
</tr>
<tr>
<td>1974</td>
<td>1.79</td>
<td>0.65</td>
<td>1.49</td>
<td>8.93</td>
<td>-</td>
</tr>
<tr>
<td>1975</td>
<td>1.64</td>
<td>0.68</td>
<td>1.52</td>
<td>11.68</td>
<td>-</td>
</tr>
<tr>
<td>1976</td>
<td>1.35</td>
<td>0.55</td>
<td>1.25</td>
<td>8.68</td>
<td>-</td>
</tr>
<tr>
<td>1977</td>
<td>1.27</td>
<td>0.90</td>
<td>1.56</td>
<td>8.17</td>
<td>0.38</td>
</tr>
<tr>
<td>1978</td>
<td>1.27</td>
<td>0.49</td>
<td>1.02</td>
<td>8.17</td>
<td>0.34</td>
</tr>
<tr>
<td>1979</td>
<td>1.04</td>
<td>0.42</td>
<td>0.96</td>
<td>8.17</td>
<td>0.34</td>
</tr>
<tr>
<td>1980</td>
<td>1.49</td>
<td>0.63</td>
<td>1.43</td>
<td>9.98</td>
<td>0.51</td>
</tr>
<tr>
<td>1981</td>
<td>1.28</td>
<td>0.54</td>
<td>1.18</td>
<td>7.71</td>
<td>0.47</td>
</tr>
<tr>
<td>1982</td>
<td>1.42</td>
<td>0.55</td>
<td>1.14</td>
<td>8.85</td>
<td>0.49</td>
</tr>
<tr>
<td>1983</td>
<td>1.47</td>
<td>0.62</td>
<td>1.06</td>
<td>9.79</td>
<td>0.54</td>
</tr>
</tbody>
</table>

/a (Sale price of urea—minimum or support price of crop) x 100, in Rs per lb.
/b Superior grade.
/c Millgate price, Punjab.
/d Variety AC 134-NT.

Source: Planning and Development Division.
may now decide to apply them. Though both types of response are important, little is known about either of these effects, particularly the latter. It is, however, generally believed that the price elasticity of demand is low for fertilizer and that its negative price effect is more than offset by the positive income effect. 1/ Support for the latter is found in numerous benefit-cost analyses which have demonstrated the continued profitability of using fertilizer (see Section V).

Table 7: Value-Cost Ratios of Fertilizer Use for Average Leading Farmer, Punjab, FY78-FY82/a

<table>
<thead>
<tr>
<th>Fiscal year</th>
<th>Wheat</th>
<th>Basmati</th>
<th>Irri-6</th>
<th>Cotton</th>
<th>Sugarcane</th>
</tr>
</thead>
<tbody>
<tr>
<td>1978</td>
<td>2.50</td>
<td>5.25</td>
<td>3.00</td>
<td>6.40</td>
<td>5.56</td>
</tr>
<tr>
<td>1979</td>
<td>3.29</td>
<td>6.56</td>
<td>3.23</td>
<td>8.75</td>
<td>5.99</td>
</tr>
<tr>
<td>1980</td>
<td>5.38</td>
<td>12.48</td>
<td>6.09</td>
<td>5.05</td>
<td>8.73</td>
</tr>
<tr>
<td>1981</td>
<td>4.38</td>
<td>11.81</td>
<td>5.48</td>
<td>3.99</td>
<td>7.93</td>
</tr>
<tr>
<td>1982/b</td>
<td>3.94</td>
<td>11.60</td>
<td>5.68</td>
<td>3.83</td>
<td>7.15</td>
</tr>
</tbody>
</table>

/a The value-cost ratio is the ratio of the value of output of a crop to the cost of fertilizers used to produce it. Average leading farmers own 12.5 to 25 acres of land and have marketable surpluses of agricultural commodities.

/b Estimated on the basis of fertilizer-crop price ratios in Table 6 and grain-nutrient ratios for FY81.

Source: Planning and Development Division, Government of Pakistan, "Cost of Production of Major Crops under Irrigated and Unirrigated (Barani) Conditions."

The charges for water, another important input, vary widely depending on crops and areas. The charges for sugarcane are about three times those for wheat; those in the areas of salinity control and reclamation projects (SCARP) are about twice those in areas with canal and tubewell water supplies (see Table 8). All water rates have increased about twofold between FY66 and FY79. Crop prices however, have risen, on the average, three to four times over the same period, so that in FY80, water charges formed an even smaller part of the gross returns to farmers than they did in FY70 (see Table 9); these charges have also fallen in real terms. Table 10 shows that in canal command areas, water rates in constant prices for wheat had, by FY75, fallen to a third of its value in FY66; while for maize and oilseeds they had fallen to one-fourth. The sharp increase (of 75%) over the last four years should reverse this trend, but water charges remain only a small proportion of total production costs, and an even smaller proportion of the value of total water used. 1/

1/ See Chaudhary and Ashraf, op. cit., Chapter IV, for estimates of the value of irrigated water supply. Taking all crops together, they estimated water charges to be only 2.5% of the total value of irrigated water. This was obtained by multiplying the marginal value product of water (estimated by regression) by the average volume of water used.
Table 8: WATER CHARGES FOR MAJOR CROPS IN SELECTED AREAS, FY66-FY79
(Rupees per acre/feet)

<table>
<thead>
<tr>
<th>Crop</th>
<th>SCARP Areas</th>
<th></th>
<th>Canal &amp; Tubewell</th>
<th>Supply</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FY66</td>
<td>FY70</td>
<td>FY79</td>
<td>FY66</td>
</tr>
<tr>
<td>Wheat</td>
<td>14.40</td>
<td>20.80</td>
<td>26.00</td>
<td>7.20</td>
</tr>
<tr>
<td>Cotton</td>
<td>24.00</td>
<td>32.00</td>
<td>40.00</td>
<td>2.00</td>
</tr>
<tr>
<td>Rice</td>
<td>22.40</td>
<td>33.72</td>
<td>42.15</td>
<td>1.20</td>
</tr>
<tr>
<td>Sugarcane</td>
<td>48.00</td>
<td>71.20</td>
<td>89.00</td>
<td>4.00</td>
</tr>
<tr>
<td>Maize</td>
<td>17.28</td>
<td>19.20</td>
<td>24.00</td>
<td>8.64</td>
</tr>
<tr>
<td>Oilseeds</td>
<td>17.60</td>
<td>20.80</td>
<td>26.00</td>
<td>8.80</td>
</tr>
</tbody>
</table>

Table 9: SHARES OF FERTILIZER AND WATER IN TOTAL COST AND RETURNS FOR MAJOR CROPS, FY70-FY80
(Percent)

<table>
<thead>
<tr>
<th>Crop/Fiscal Year</th>
<th>As % of Total Production Cost/*</th>
<th>As % of Gross Return</th>
<th>As % of Net Return/*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fertilizer</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wheat (Maxi-Pak)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>6.0</td>
<td>5.1</td>
<td>n.a.</td>
</tr>
<tr>
<td>1976</td>
<td>12.8</td>
<td>9.3</td>
<td>n.a.</td>
</tr>
<tr>
<td>1978</td>
<td>10.4</td>
<td>9.0</td>
<td>67.0</td>
</tr>
<tr>
<td>1979</td>
<td>12.2</td>
<td>9.5</td>
<td>89.2</td>
</tr>
<tr>
<td>1980</td>
<td>10.8</td>
<td>8.5</td>
<td>71.3</td>
</tr>
<tr>
<td>Rice Paddy (Basmati)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>5.6</td>
<td>5.0</td>
<td>n.a.</td>
</tr>
<tr>
<td>1976</td>
<td>7.6</td>
<td>6.0</td>
<td>n.a.</td>
</tr>
<tr>
<td>1978</td>
<td>8.1</td>
<td>7.8</td>
<td>198.0</td>
</tr>
<tr>
<td>1979</td>
<td>8.6</td>
<td>6.9</td>
<td>42.2</td>
</tr>
<tr>
<td>1980</td>
<td>11.0</td>
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<td>103.3</td>
</tr>
<tr>
<td>Cotton (American)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>5.9</td>
<td>5.4</td>
<td>n.a.</td>
</tr>
<tr>
<td>1976</td>
<td>13.5</td>
<td>12.2</td>
<td>n.a.</td>
</tr>
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<td>9.7</td>
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<td>12.0</td>
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<td>1980</td>
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<td>7.1</td>
<td>26.5</td>
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<tr>
<td>Sugarcane</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>4.6</td>
<td>3.8</td>
<td>n.a.</td>
</tr>
<tr>
<td>1976</td>
<td>11.4</td>
<td>9.7</td>
<td>n.a.</td>
</tr>
<tr>
<td>1978</td>
<td>6.6</td>
<td>5.6</td>
<td>36.8</td>
</tr>
<tr>
<td>1979</td>
<td>8.6</td>
<td>8.1</td>
<td>220.7</td>
</tr>
<tr>
<td>1980</td>
<td>5.9</td>
<td>4.6</td>
<td>23.8</td>
</tr>
</tbody>
</table>

/* Production cost net of value of byproducts.
/* Gross returns less total production cost.
<table>
<thead>
<tr>
<th>Crop/Fiscal Year</th>
<th>As % of Total Production Cost</th>
<th>As % of Gross Return</th>
<th>As % of Net Return</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Water</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wheat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>9.4</td>
<td>8.0</td>
<td>n.a.</td>
</tr>
<tr>
<td>1976</td>
<td>7.8</td>
<td>5.7</td>
<td>n.a.</td>
</tr>
<tr>
<td>1978</td>
<td>3.5</td>
<td>3.0</td>
<td>18.0</td>
</tr>
<tr>
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<td>3.4</td>
<td>10.5</td>
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<tr>
<td>1980</td>
<td>5.8</td>
<td>4.6</td>
<td>8.6</td>
</tr>
<tr>
<td>Rice Paddy (Basmati)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>23.5</td>
<td>21.1</td>
<td>n.a.</td>
</tr>
<tr>
<td>1976</td>
<td>21.7</td>
<td>16.5</td>
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</tr>
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<td>9.3</td>
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<td>8.5</td>
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<td>41.5</td>
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<tr>
<td>1980</td>
<td>6.4</td>
<td>5.6</td>
<td>60.3</td>
</tr>
<tr>
<td>Cotton (American)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>6.6</td>
<td>6.1</td>
<td>n.a.</td>
</tr>
<tr>
<td>1976</td>
<td>5.1</td>
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</tr>
<tr>
<td>1978</td>
<td>4.1</td>
<td>3.7</td>
<td>34.9</td>
</tr>
<tr>
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<td>4.2</td>
<td>3.3</td>
<td>17.4</td>
</tr>
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<td>1980</td>
<td>4.4</td>
<td>3.1</td>
<td>11.6</td>
</tr>
<tr>
<td>Sugarcane</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>6.5</td>
<td>5.3</td>
<td>n.a.</td>
</tr>
<tr>
<td>1976</td>
<td>4.3</td>
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<td>n.a.</td>
</tr>
<tr>
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<tr>
<td>1979</td>
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<tr>
<td>1980</td>
<td>3.9</td>
<td>3.0</td>
<td>15.5</td>
</tr>
</tbody>
</table>

Source: Government of Pakistan, Ministry of Agriculture and Cooperatives, Food and Agriculture Division, "A Study on Cost of Production of Crops."
### Table 10: Water Charges in Canal Command Areas, FY66-FY78

(in constant 1978 rupees)

<table>
<thead>
<tr>
<th>Fiscal year</th>
<th>Wheat</th>
<th>Cotton</th>
<th>Rice</th>
<th>Sugarcane</th>
<th>Maize</th>
<th>Oilseeds</th>
</tr>
</thead>
<tbody>
<tr>
<td>1966</td>
<td>34.26</td>
<td>57.12</td>
<td>53.31</td>
<td>114.24</td>
<td>41.13</td>
<td>41.89</td>
</tr>
<tr>
<td>1967</td>
<td>30.95</td>
<td>51.58</td>
<td>48.14</td>
<td>103.15</td>
<td>37.13</td>
<td>37.82</td>
</tr>
<tr>
<td>1968</td>
<td>30.45</td>
<td>50.76</td>
<td>47.38</td>
<td>101.52</td>
<td>36.55</td>
<td>37.22</td>
</tr>
<tr>
<td>1969</td>
<td>29.52</td>
<td>49.20</td>
<td>39.92</td>
<td>98.40</td>
<td>35.42</td>
<td>36.08</td>
</tr>
<tr>
<td>1970</td>
<td>42.80</td>
<td>64.61</td>
<td>68.08</td>
<td>143.75</td>
<td>38.76</td>
<td>42.00</td>
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<tr>
<td>1971</td>
<td>41.37</td>
<td>63.64</td>
<td>67.06</td>
<td>141.60</td>
<td>38.18</td>
<td>41.37</td>
</tr>
<tr>
<td>1972</td>
<td>40.76</td>
<td>62.70</td>
<td>66.07</td>
<td>139.52</td>
<td>36.62</td>
<td>40.76</td>
</tr>
<tr>
<td>1973</td>
<td>36.00</td>
<td>55.38</td>
<td>58.35</td>
<td>123.21</td>
<td>33.32</td>
<td>36.00</td>
</tr>
<tr>
<td>1974</td>
<td>24.76</td>
<td>38.06</td>
<td>40.11</td>
<td>84.69</td>
<td>22.84</td>
<td>24.74</td>
</tr>
<tr>
<td>1976</td>
<td>14.66</td>
<td>22.56</td>
<td>23.77</td>
<td>50.20</td>
<td>13.54</td>
<td>14.66</td>
</tr>
<tr>
<td>1977</td>
<td>12.85</td>
<td>19.77</td>
<td>20.84</td>
<td>44.00</td>
<td>11.86</td>
<td>12.85</td>
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<tr>
<td>1978</td>
<td>10.40</td>
<td>16.00</td>
<td>16.86</td>
<td>35.60</td>
<td>9.60</td>
<td>10.40</td>
</tr>
</tbody>
</table>


The pricing of irrigation water continues to arouse controversy in Pakistan. Although water charges have been increased from time to time, they have never risen as fast as the prices received for agricultural commodities. Consequently, the scarcity value of the water being supplied is still substantially above the cost charged to the farmers. One indication of this is the sale of water by private farmers who own tube wells; these charges are some three to ten times those collected by the Irrigation Department. 1/

The issue of appropriate water charges has been extensively discussed in several papers. Several analytic studies in the 1960s have estimated the "real," or scarcity value of additional irrigation water in Pakistan. 1/ In 1970, Gotsch and Falcon, using the marginal value concept, estimated Rs 2 per acre-inch as a "fair approximation to long-run marginal cost" for obtaining additional water from both public and private wells. 2/

The government charged, on the average, Rs 0.4 per acre-inch, while the value to farmers often exceeded Rs 5 per acre-inch. These studies are unanimous in their conclusion that water charges should be raised to cover at least the operation and maintenance costs of irrigation wells. The main supporting arguments for this view are summarized below.

1. Farmers are now better able to pay for the use of water, partly because increases in crop prices have exceeded the increases in water rates, and partly because productivity (and hence the efficiency of water use) has improved. This conclusion needs to be tempered to the extent that average figures for net returns

---

1/ A Bank study, based on SCARP IV, estimated the value in the range of Rs 0.6 and Rs 3 per acre-inch. Harza Engineering's estimates, valued at the spillway of Tarbela Dam, was Rs 15.6 per acre-inch. Tipton and Kalmbach's estimate (also for the SCARP IV area) was Rs 2.6 per acre-inch. These differences arise because of the use of different concepts and methods of measurements under different soil conditions. But whatever the differences, it is clear that what the government charged during that period—ranging from Rs 0.31 per acre-inch for rice to Rs 0.87 for oilseeds—was way below the scarcity value.

2/ Ibid.
to farmers mask considerable variations among farmers and among holding sizes.

2. The distributional impact of water charges is often highly skewed. However, water charges form only a small proportion of the cost of production (as shown in Table 9), so that farmers' ability to pay may not be severely compromised by even a sizable increase in water rates.

3. For the same reason, raising water charges need not reduce farmers' incentives over the long run. Farmers are fully aware of the benefits of irrigation and raising charges is unlikely to affect aggregate production. As with fertilizers, estimates of the price elasticity of demand for water have been less than one in value. 1/

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V. TAXES, SUBSIDIES, AND RESOURCE TRANSFERS

In Pakistan, the role of government in creating infrastructure for agriculture has been extremely important because the proper allocation of water is of paramount importance to agricultural production. While both agricultural output and input prices have been major instruments of government policy, the government also intervenes in agriculture through taxes and financial subsidies.

The government's financial transfers affecting agriculture consist of taxes on, and subsidies to, the sector. Prior to the devaluation of the rupee in 1972, agricultural taxation was light, and no duty was levied on exports. Discrimination against agricultural exports, however, took the form of unfavorable exchange rates in the country's multiple exchange rate "bonus" system. Export duties on rice and cotton were introduced after devaluation and they made up the bulk of all taxes on agriculture in the first half of the 1970s. Profits from the rice and cotton export corporations (RECP and CECP, respectively), established in 1973, also became, with rising prices, major sources of revenue to the government (see Table 11). The decline in international prices for Pakistan's major exports and the need to protect Pakistan's agricultural producers led to the removal of export taxes in FY78. Profits of the export corporations became the predominant sources of export
<table>
<thead>
<tr>
<th></th>
<th>FY75</th>
<th>FY76</th>
<th>FY77</th>
<th>FY78</th>
<th>FY79</th>
<th>FY80</th>
<th>FY81</th>
<th>FY82/b</th>
<th>FY83/c</th>
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</thead>
<tbody>
<tr>
<td><strong>Taxes</strong></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Export Duties:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rice</td>
<td>1,865</td>
<td>1,432</td>
<td>896</td>
<td>814</td>
<td>1,080</td>
<td>1,710</td>
<td>1,606</td>
<td>1,751</td>
<td>1,029</td>
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<tr>
<td>Raw Cotton</td>
<td>333</td>
<td>241</td>
<td>58</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td><strong>Profits of Export Corporations:</strong></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Rice (RECP)</td>
<td>769</td>
<td>591</td>
<td>39</td>
<td>504</td>
<td>789</td>
<td>538</td>
<td>530</td>
<td>377</td>
<td>348</td>
</tr>
<tr>
<td>Cotton (CECP)</td>
<td>-</td>
<td>-</td>
<td>662</td>
<td>185</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>350</td>
<td>-</td>
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<tr>
<td><strong>Land Revenue</strong></td>
<td>228</td>
<td>260</td>
<td>136</td>
<td>125</td>
<td>291</td>
<td>172</td>
<td>226</td>
<td>230</td>
<td>219</td>
</tr>
<tr>
<td><strong>Subsidies</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fertilizer</td>
<td>515</td>
<td>1,043</td>
<td>728</td>
<td>1,147</td>
<td>2,222</td>
<td>3,064</td>
<td>3,119</td>
<td>2,601</td>
<td>2,356</td>
</tr>
<tr>
<td>Plant Protection</td>
<td>326</td>
<td>607</td>
<td>87</td>
<td>617</td>
<td>1,692</td>
<td>2,454</td>
<td>2,457</td>
<td>1,819</td>
<td>1,600</td>
</tr>
<tr>
<td>Tube wells</td>
<td>112</td>
<td>241</td>
<td>421</td>
<td>347</td>
<td>267</td>
<td>218</td>
<td>62</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Wheat Seeds</td>
<td>16</td>
<td>43</td>
<td>48</td>
<td>37</td>
<td>24</td>
<td>22</td>
<td>20</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>Net Irrigation Costs/a</td>
<td>61</td>
<td>146</td>
<td>166</td>
<td>121</td>
<td>231</td>
<td>361</td>
<td>578</td>
<td>750</td>
<td>727</td>
</tr>
<tr>
<td><strong>Net Taxes /d</strong></td>
<td>1,350</td>
<td>389</td>
<td>168</td>
<td>-333</td>
<td>-1,142</td>
<td>-1,374</td>
<td>-1,513</td>
<td>-844</td>
<td>-1,330</td>
</tr>
</tbody>
</table>

/a Operations and maintenance costs less water charges.
/b Revised estimates.
/c Budget estimates.
/d Taxes less subsidies.

Source: Planning and Development Division.
taxation. There was virtually no direct tax on agricultural incomes. A land tax was levied, but despite restructuring to increase progressivity in 1975, revenues stagnated throughout the decade. 1/ Water charges were also levied, but revenues from these represented only a fraction of the total operations and maintenance cost of the country's irrigation system.

Subsidies for the import of fertilizers and for the use of pesticides and herbicides are the major subsidies given to agriculture. The rationale for subsidizing inputs is to provide "incentives" to agriculture. Unlike higher commodity prices, it is argued, subsidies do not raise directly food and raw material prices paid by urban consumers and the growing industrial sector; they also ensure that the benefits of government expenditures accrue only to cultivators using inputs to expand production. 2/ On the

---

1/ Farmers on irrigated land were exempt from land taxation if their holdings were less than 11 acres. Farmers with holdings between 25 and 50 acres had rates of assessment increased 50%. Those with more than 50 acres had rates increased 100%. Since the winter of 1982, the government has introduced a new levy called ushr based on the gross value of agricultural production. To make an allowance for production costs, the levy is restricted to 75% of the value of production and is collected from landowners and leaseholders (but not tenants) at a rate of 5% of their share of the produce. Farmers who produce 948 kg of wheat (or its equivalent in value) are exempt. It is too early to make any judgment on the impact of ushr on the transfer of resources from agriculture to other sectors, or on the resources it has raised for the government. See Jetha, N., S. Akhtar, and M.G. Rao, Domestic Resource Mobilization in Pakistan: Selected Issues, World Bank Staff Working Paper No. 632, Washington, 1984.

other hand, subsidies are a burden on scarce public resources. 1/

In the case of fertilizers, the rate of growth in its use has been phenomenal and, along with the use of new seeds, has been primarily responsible for spectacular increases in grain production between 1964 and 1969. Throughout the 1950s and 1960s, Pakistan maintained a "cheap" fertilizer policy with subsidies, during much of this time, amounting to as much as 50%. The subsidy decreased in FY70 to about 30%, but rose thereafter, particularly between FY73 and FY75; this rapid growth can be attributed to at least three factors:

- Farmers' purchase price of fertilizer was kept low after devaluation to minimize the effect of devaluation on domestic prices of basic foods.
- The increase in oil prices after 1973 made fertilizer imports more expensive.
- Fertilizer imports increased rapidly after FY75 as domestic production was unable to meet demand.

Government subsidies for irrigation also increased, particularly after FY76, reflecting the increasing need for maintenance of Pakistan's aging irrigation system.

---

1/ This is particularly true for fertilizers. Evidence from India suggests that 15 years of subsidy ought to be long enough for most farmers to have a good acquaintance with that input. See Shetty, N.S., "Agricultural Innovations: Leaders and Laggards," Development Digest, April 1969.
Despite the increases in input prices, taxes collected from agriculture were substantially larger than financial subsidies provided to the sector up to FY77, resulting in a net transfer of public resources out of agriculture. This situation was reversed after FY78, when total financial subsidies exceeded total tax revenue from agriculture. The decline in net subsidies after FY80 has been due mainly to reduced fertilizer subsidies, although reductions in subsidies for pesticides and irrigation were also contributory factors. With government plans to phase out the fertilizer subsidy by 1985, under the Three Year Public Sector Development Program, and major increases in the price of irrigation water (an increase of 75% in the past four years), the level of subsidies is expected to decline in the next five years.

In addition to financial subsidies, farmers receive an economic subsidy if the prices for their products are higher than those that obtain in the international market. The size of this subsidy to producers is given by the difference between the output value at domestic (procurement) prices and that at world prices. The higher the nominal rate of protection (that is, the ratio between domestic and border prices), the larger is the economic subsidy. 1/ The total subsidy given to producers is the sum of financial and economic subsidies.

---

1/ For consumers, the subsidy is measured by the difference between the value of consumption at world prices and that at domestic (market) prices.
The ratios of domestic prices to international prices for the major crops shown in Table 12 indicate that price discrimination has historically been most severe for wheat and for rice, particularly Basmati. But with the procurement prices raised significantly since FY81, domestic prices for these crops have moved somewhat closer to international prices. The extent of nominal protection for cotton was influenced considerably by wide fluctuations in the international price; the recent experience has been a very close alignment between the two prices. The only major crop which was protected was sugar; domestic prices since FY81, whether in export or import parity terms, have been substantially above international prices. Since the extent of nominal protection is as much a function of exogenous price trends as one of domestic price policies, a strategy of aligning domestic prices to international prices will not only minimize the degree but also the variance of price discrimination against protection of major crops.

1/ For the export crops of rice and cotton, incidentals and other unit costs have been added to procurement prices to yield export parity prices. For wheat and sugar, import parity prices have been used.

2/ This does not mean that domestic prices should be allowed to respond to short-term fluctuations in international prices, but rather that they should be aligned to trends in international prices.
Table 12: Ratios of Domestic to International Prices, FY74-FY82/a

(percent)

<table>
<thead>
<tr>
<th>Fiscal year</th>
<th>Rice/c</th>
<th>Cotton/b</th>
<th>Basmati</th>
<th>Irri-6</th>
<th>Wheat/c</th>
<th>Sugar/d</th>
</tr>
</thead>
<tbody>
<tr>
<td>1974</td>
<td>62</td>
<td>46</td>
<td>35</td>
<td>34</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1975</td>
<td>90</td>
<td>41</td>
<td>46</td>
<td>58</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1976</td>
<td>102</td>
<td>61</td>
<td>77</td>
<td>56</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1977</td>
<td>82</td>
<td>99</td>
<td>97</td>
<td>72</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1978</td>
<td>117</td>
<td>93</td>
<td>75</td>
<td>85</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1979</td>
<td>130</td>
<td>72</td>
<td>130</td>
<td>73</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1980</td>
<td>97</td>
<td>56</td>
<td>74</td>
<td>61</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1981</td>
<td>87</td>
<td>70</td>
<td>65</td>
<td>67</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1982</td>
<td>113</td>
<td>66</td>
<td>94</td>
<td>75(102)</td>
<td>163</td>
<td>206</td>
</tr>
<tr>
<td>1983/e</td>
<td>95</td>
<td>68</td>
<td>97</td>
<td>74(98)</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

/a For rice and cotton, domestic prices are compared with equivalent export parity prices. For wheat and sugar, comparisons are with import parity prices; export parity comparisons for FY82 and FY83 are shown in parentheses. International prices for rice, cotton and sugar are the averages of the third and fourth quarter prices in the fiscal year. Those for wheat are the averages of the fourth quarter price in the fiscal year and the first quarter price in the following fiscal year.

/b Based on wholesale price of lint, Karachi market.

/c Based on procurement prices.

/d Based on rationshop sales price.

/e International prices based on World Bank commodities price projections.

Source: World Bank data.
Tables 13-15 show calculations of total subsidy equivalents for wheat and rice between the years 1972 and 1981. In reviewing these calculations, the following observations should be noted:

- In the case of wheat, a part of the marketed produce is procured by government for sale in ration shops at issue prices (assumed to be equal to procurement prices) and the remainder is sold in the open market at wholesale or retail prices.

- In the case of rice, procurement for export is undertaken by RECP and the balance is sold in the open market.

- The calculations take into account producers who are also consumers by considering only marketed output, but do not explicitly recognize middlemen as a group. The latter buy marketed output at around procurement prices and sell at wholesale or retail prices; they are grouped together with consumers.

- No account is taken of the effects of price distortions on demand or supply.

Table 13 shows that if price discrimination is taken into account, producer subsidies for wheat are all negative, although the price appears to

1/ Corresponding estimates for FY72-FY76 were calculated by Gotsch and Brown, op cit. However, these were based upon somewhat different assumptions.

2/ If the issue price is below procurement price, the assumption underestimates the cost to the government of intervening in the market. Past experience shows that the error resulting from this assumption has been insignificant.
have improved from FY74. This is because of the narrowing gap between domestic prices and import parity prices. Despite this, the adverse effects of price discrimination considerably outweighed the favorable impact of financial subsidies to the sector. As recently as FY82, the proportional subsidy equivalent—the value of the subsidy equivalent as a proportion of the value of marketed production in domestic prices—was as high as -43%.

Much the same picture is presented in Table 14, which shows corresponding calculations for Basmati rice. Up to FY76, both government taxation and a very large gap between domestic and international prices contributed to a transfer of resources out of agriculture valued at almost, or more than, the value of production in domestic prices. As with wheat, price discrimination has been reduced by a closer alignment between international prices and export unit cost. For Irri-6 rice, these prices have become almost identical by FY82, so that a positive subsidy equivalent—about 9% of the value of marketed production at domestic prices—was recorded. However, this close alignment between domestic and international prices has resulted mainly from a sharp fall in the latter rather than from an adjustment in the domestic price. Whether future pricing decisions will be more responsive to international price trends remain to be seen.
<table>
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1. Production in thousand metric tons, prices in rupees per unit, values in million rupees, proportions in percent.


3. Based on price of U.S. Red Winter, f.o.b. Gulf ports to which was added estimated freight and other costs to local markets in Pakistan. Import price is for last two quarters of fiscal year.

4. Value of government procurement is quantity procured at procurement price. Value of open market sales is quantity of open market sales at average wholesale price.

5. Quantity marketed at import unit cost, local market.


7. Assumed equal to 1% of fertilizer subsidy and 40% of net irrigation cost. The former is based on fertilizer usage and the latter on irrigated acreage.
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Notes:
- Production in thousand metric tons, prices in rupees per mauld, values in million rupees, proportions in percentage.
- Production assumed equal to 66% of total production. See Ministry of Food and Agriculture, Government of Pakistan, "A Study of Utilization Patterns of Agricultural Commodities, 1977-78," March 1980.
- Procurement price plus incidentals and transportation to Karachi.
- Value of government procurement is quantity procured x procurement price. Value of open market sales is quantity sold on the open market x average wholesale price. Both prices are converted to export unit costs.
- Quantity marketed x export price, f.o.b. Karachi.
- Difference between value of marketed production in domestic prices and in export prices.
- Subsidies are taken to be 7% of total fertilizer subsidy and 8% of net irrigation cost. The former is based on fertilizer consumption, the latter as share on irrigated acreage. Taxes consist of export duties on rice, with Basmati's share being 56%.
<table>
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<td>-64.1</td>
<td>-16.7</td>
<td>-54.6</td>
<td>-50.9</td>
</tr>
</tbody>
</table>

**Notes:**

- Production is in thousand metric tons, prices in rupees per maund, values in million rupees, proportions in percent.
- Subsidies are taken to be 72% of fertilizer subsidy and 82% of net irrigation cost. The former is based on estimated usage and the latter on irrigated acreage. Taxes consist of export duties, with IRRI's share assumed to be 50%.

- Production plus incidentals and transportation charges to Karachi.
- Quantity marketed x export unit cost, f.o.b. Karachi.
- Quantity marketed x export price, f.o.b. Karachi.
- Value of marketed production, domestic prices minus value of marketed production, export prices.
Similar calculations have not been made for cotton and sugarcane. Data required for quantifying total subsidies for cotton are not available; however, the ratios between domestic and international prices for cotton (shown in Table 12) suggest that of the four major crops, cotton may be least subject to the distortionary effects of price policy. Since the domestic price referred to ginned cotton, however, it is by no means obvious that this has benefited cotton growers who sell their produce to ginners. These remarks apply also to sugarcane, which appears to receive the heaviest protection from government pricing.

Two final points need to be noted. First, for all four major crops, incidental unit costs represent sizable components of total domestic prices ranging from 23% to 38%. Clearly, greater administrative efficiency will cut these costs and may lead to higher prices for producers. Second, although discussion of taxes and subsidies does not give a clear picture of resource transfers for the entire agricultural sector, large groups of farmers were subject to price discrimination in excess of direct financial subsidies the government provides to them.
VI. CONCLUSIONS

In the preceding sections, secondary data on agricultural prices and productivity, government taxes, and subsidies were analyzed. The analysis its us to highlight several interesting implications. These are summed below.

The terms of trade between the agriculture sector and nonagriculture sectors have not significantly deteriorated over the last decade. Indeed, if it is taken into account, the purchasing power of agriculture has slightly improved in absolute terms, even if gradually. Similar improvement is seen when productivity increases are incorporated into the terms-of-trade index. However, the limitations of the terms-of-trade index should be clear; purchasing power of agriculture has worsened if compared with other sectors, partly on account of the more rapid growth of nonagricultural sectors.

The slow growth in productivity remains a major concern, particularly since the experiences of the "green revolution" period in Pakistan (FY71), and those of other countries, have demonstrated that a much higher rate of improvement in productivity can be sustained. This has frequently been discussed in the context of yields making a major contribution to growth in output among the major crops. Empirical evidence, however, no support for this conclusion. In the 1970s, improvement in yields least as important as expansion of acreages in promoting the growth in t. Similarly, in the light of available data, it cannot be convincingly
argued that growth in output in recent years has almost exclusively been accounted for by higher levels of inputs. Nevertheless, the need for measures to raise productivity—such as improving the timeliness and quality of inputs, better management techniques, efficient use of resources, and minimizing distortionary effects of policy measures—is not diminished by these findings.

3. Government's policies on prices for crops and inputs have, in general, been based on the principle of a fair return to farmers. Changes in input prices have, therefore, always been accompanied (or followed) by adjustments in output prices in the same direction. This has contributed to a gradual increase in farmers’ incomes, although empirical evidence in support of this conclusion is, at best, partial and tentative. The observation that farmers are more able to pay for inputs because of improvements in their net returns finds some support in the data on "average leading" farmers in Table 5. However, an important qualification should be noted. Wide variations in farm sizes, in output per farm, and in agricultural incomes make generalizations from the findings for "average leading farmers" hazardous.

4. The argument that sharp increases in fertilizer prices will prove a disincentive to farmers has some validity, especially if farmers perceive that increases in the prices of inputs will exceed any corresponding increases in the prices they get for their crops; this, at best, will be a short-term view. The gradual improvements in agricultural incomes and (still) highly favorable benefit-cost ratios in the use of fertilizer should,
however, point to the continued increase in the use of inputs in the medium or long term.

5. A similar conclusion applies to water charges, and for the same reasons. Having said this, the principle of relating cost recovery to operation-and-maintenance expenditures appears to be no more than an empirically convenient rule of thumb. An economically optimal change can well lead to one which recovers both fixed and variable costs. Major determinants of this optimum are the demand for water and the existence of a budget constraint. 1/

6. The picture of government financial subsidies to agriculture has changed dramatically over the decade. In the early 1970s, the sector was taxed much more than it was subsidized, but the position was reversed after FY76. The future level of net financial subsidies to producers will be affected by two major developments. The first is the movement of domestic prices closer to border prices which will affect the profits of the state

1/ See George, K.D. and J. Shorey, The Allocation of Resources, London, Allen and Unwin, 1978. Where there are constraints on the budget, where user charges are low and the demand for the service is in excess of supply, there is a need to raise the user charges to at least the marginal cost of providing the service. The additional revenue thus garnered can be used to expand the service. It has also been shown that "raising user charges in line with the efficiency rule suggested will result in more of the poor benefiting as compared to the rich." See Thobani, M., Charging User Fees for Social Services: The Case of Education in Malawi, World Bank Staff Working Paper No. 572, Washington, 1983.
trading corporations. The second is the success of the stated policy of reducing the fertilizer subsidy and its eventual elimination after 1985.

7. Increases in the net financial subsidies to agriculture has been used to support arguments that the sector is lightly taxed. As the calculations of economic subsidies have shown, such arguments are extremely misleading. The extent of economic subsidization or taxation depends on the ratio of domestic to international prices. For wheat and rice, domestic prices historically have been substantially below their international levels. For sugarcane, producers have been heavily protected. In the absence of similar calculations for other crops and activities, the picture for the sector as a whole is unclear. However, what can be emphasized is that while massive increases in the fertilizer subsidy have raised the financial burden of the government in the last three years, appropriate price policies that are responsive to changes in international prices are likely to have as salutary an effect as any attempt to reduce financial subsidies or increase taxes.

8. The calculations of subsidy equivalent values are based on a number of simplifying assumptions and should therefore be regarded as indicative. They do nevertheless provide a rudimentary framework for analyzing the effects of government policies on prices and taxes/subsidies on resource transfers.
9. The data presented here do not permit any conclusions to be drawn on the impact of policy interventions on income distribution. However, to the extent that all producers benefit from higher prices, while benefits from subsidized inputs tend to accrue to larger producers, an even stronger case can be made for according price policies the highest priority.

10. Finally, the calculations in the tables and annexes highlight the pitfalls of relying upon findings of other studies. Despite the scarcity of data, the existing data base should be able to support much more quantitative and qualitative analysis of major sources than exist at present.
### Table A.1: The Growth of the Agricultural Sector in Pakistan, FY70-FY81

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Agriculture in GDP Constant Factor Prices</th>
<th>Agriculture as % share of Total GDP</th>
<th>Total GDP Constant Factor Prices % Change</th>
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<tr>
<td></td>
<td>Million 1960 Rupees</td>
<td>% Change</td>
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Source: Planning and Development Division.
<table>
<thead>
<tr>
<th>Fiscal Year</th>
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<th>Raw Materials Manufactures</th>
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<td>123.24</td>
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<td>118.41</td>
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<td>1981</td>
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<td>113.14</td>
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Source: Pakistan Economic Survey.
### Table A.3: REAL TOTAL AND AGRICULTURAL GDP PER CAPITA, FY60-FY82

(1960 Rupees)

<table>
<thead>
<tr>
<th>Fiscal year</th>
<th>Value (Rs)</th>
<th>Index (FY60=100)</th>
<th>Ratio of Per Capita Agricultural to Total GDP</th>
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<td>Total Agriculture</td>
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<tr>
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<td>381</td>
<td>166</td>
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</tr>
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<td>424</td>
<td>175</td>
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<tr>
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<td>179</td>
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<td>1965</td>
<td>471</td>
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<td>1970</td>
<td>527</td>
<td>198</td>
<td>141</td>
</tr>
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<td>518</td>
<td>199</td>
<td>139</td>
</tr>
<tr>
<td>1972</td>
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<td>196</td>
<td>144</td>
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<td>648</td>
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<td>174</td>
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Source: National Accounts of Pakistan.
<table>
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<tr>
<th>Fiscal year</th>
<th>Fertilizer</th>
<th>Seed</th>
<th>Water/a</th>
<th>Transportation Charges</th>
<th>Pesticides</th>
<th>All Inputs/b</th>
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<td>1970</td>
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<td>125</td>
<td>200</td>
<td>128</td>
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<td>1971</td>
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<td>128</td>
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<td>257</td>
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<td>143</td>
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<td>179</td>
<td>219</td>
<td>168</td>
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<td>201</td>
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<td>296</td>
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<td>260</td>
<td>291</td>
<td>265</td>
<td>276</td>
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<td>279</td>
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<tr>
<td>1977</td>
<td>262</td>
<td>322</td>
<td>268</td>
<td>301</td>
<td>326</td>
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<tr>
<td>1978</td>
<td>252</td>
<td>355</td>
<td>300</td>
<td>337</td>
<td>336</td>
<td>312</td>
</tr>
<tr>
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<td>237</td>
<td>373</td>
<td>298</td>
<td>364</td>
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<tr>
<td>1980</td>
<td>255</td>
<td>386</td>
<td>320</td>
<td>383</td>
<td>500</td>
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<td>1981</td>
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<td>432</td>
<td>371</td>
<td>418</td>
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<tr>
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<td>428</td>
<td>477</td>
<td>454</td>
<td>477</td>
<td>600</td>
<td>466</td>
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</tbody>
</table>

/a Based on data on irrigation revenues in the Punjab. These revenues account for some two-thirds of total irrigation revenues collected by the provincial governments. Data on the value of irrigation water in the national accounts included land revenue, and could not be used. All other input prices are based on value of inputs data in the national accounts.

/b Adjusted for /a.

Source: National Accounts of Pakistan; Government of Punjab.
Table A.5: PROCUREMENT AND MINIMUM PRICES FOR AGRICULTURAL COMMODITIES
AND SALE PRICES OF FERTILIZERS, FY70-FY82/a

<table>
<thead>
<tr>
<th>Fiscal year</th>
<th>Wheat</th>
<th>Rice</th>
<th>Basmati</th>
<th>Irri-6</th>
<th>Cotton (Seed Cotton)/b</th>
<th>Sugarcane/c</th>
<th>Fertilizer (Urea)/d</th>
</tr>
</thead>
<tbody>
<tr>
<td>1970</td>
<td>17.00</td>
<td></td>
<td>35.00</td>
<td>21.00</td>
<td>-</td>
<td>2.75</td>
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</tr>
<tr>
<td>1971</td>
<td>17.00</td>
<td></td>
<td>32.00</td>
<td>21.00</td>
<td>-</td>
<td>2.75</td>
<td>630.00</td>
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<td>1972</td>
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<td></td>
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<td>21.00</td>
<td>-</td>
<td>2.50</td>
<td>777.00</td>
</tr>
<tr>
<td>1973</td>
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<td></td>
<td>46.00</td>
<td>21.00</td>
<td>-</td>
<td>4.25</td>
<td>1,100.00</td>
</tr>
<tr>
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<td></td>
<td>62.00</td>
<td>27.00</td>
<td>-</td>
<td>4.52</td>
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<td></td>
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<td>-</td>
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<td>1,660.00</td>
</tr>
<tr>
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<td></td>
<td>90.00</td>
<td>40.00</td>
<td>-</td>
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<tr>
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<td></td>
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<td>49.00</td>
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/a Crop prices in rupees per maund, fertilizer price in rupees per long ton.
/b Local varieties.
/c Factory gate, Punjab.
/d Domestic. Prices for domestic and imported fertilizers are the same from FY76.

Source: Ministry of Finance, Planning and Economic Affairs.
### Table A.6: The Growth in Agricultural Productivity, FY60-FY81

<table>
<thead>
<tr>
<th>Fiscal year</th>
<th>Yield Index (FY60=100)</th>
<th>Total Factor Productivity Index/a</th>
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<td>Wheat</td>
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</tr>
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<td>100.0</td>
</tr>
<tr>
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<td>1981</td>
<td>204.1</td>
<td>165.1</td>
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/a The ratio of the index of agricultural value added to the aggregate input index. The latter is a weighted average of land, labor and capital indices. See Wizarat, S., "Technical Change in Pakistan's Agriculture: 1953-54 to 1977/78," Research Report No. 120, Pakistan Institute of Development Economics, Feb. 1981.

Source: Ministry of Food, Agriculture and Cooperatives.
Table A.7: RATIOS OF CROP PRICE INDICES TO AGRICULTURAL INPUT PRICE INDICES, FY71-FY82

(F:60 = 100)

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<td>1.26</td>
<td>0.62</td>
<td>1.00</td>
<td>1.04</td>
</tr>
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| **Fertilizer** |      |       |        |           |             |           |
| 1971    | 0.61 | 0.51  | 0.74   | 0.24      | 0.84        | 0.75      |
| 1972    | 0.62 | 0.57  | 0.79   | 0.35      | 0.59        | 0.61      |
| 1973    | 1.32 | 0.82  | 1.23   | 0.55      | 0.86        | 0.93      |
| 1974    | 1.53 | 0.88  | 1.21   | 0.52      | 0.94        | 0.97      |
| 1975    | 0.96 | 1.06  | 0.83   | 0.44      | 0.91        | 0.94      |
| 1976    | 1.21 | 1.13  | 1.18   | 0.64      | 1.08        | 1.13      |
| 1977    | 1.36 | 1.14  | 1.66   | 0.69      | 1.16        | 1.23      |
| 1978    | 1.32 | 1.52  | 1.67   | 0.70      | 1.37        | 1.42      |
| 1979    | 1.49 | 1.58  | 2.45   | 0.76      | 1.58        | 1.62      |
| 1980    | 1.45 | 1.51  | 2.02   | 0.81      | 1.52        | 1.56      |
| 1981    | 1.25 | 1.17  | 1.67   | 0.77      | 1.25        | 1.30      |
| 1982    | 1.13 | 1.09  | 1.40   | 0.69      | 1.11        | 1.16      |
### Table A.7 (page 2)

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**Notes:**
1. Price deflators for crops are for gross output.
2. Input deflators for seed, fertilizer and water are for major crops only. Deflators for individual crops are not available.
3. Includes both major and minor crops. Inputs are seed, fertilizer, pesticides, water, transport charges, wastage.

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In the ten years since its publication, the first edition has been accepted widely as a standard reference and text. The methodology reflects the best of contemporary practice in government agencies and international development institutions concerned with investing in agriculture and is accessible to a broad readership of agricultural planners, engineers, and analysts.

This revision adds a wealth of recent project data; expanded treatment of farm budgets and the efficiency prices used to calculate the effects of an investment on national income; a glossary of technical terms; expanded appendices on preparing an agricultural project report and using discounting tables; and an expanded, completely annotated bibliography.

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