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ALTERNATIVE AGRICULTURE PRICING POLICIES IN EGYPT

by
Saad Nassar, Fayoum University, Egypt
Shawky Imam, Zagazig University, Egypt

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1. Introduction

Agricultural prices are of great importance for producers, consumers, and the government. The producers' incomes depend largely upon prices received and consumers' choices are guided by the prices they pay. Furthermore, prices generally reflect the economic conditions of the country regarding boom, depression and other economic circumstances.

The specific nature of agricultural crop or livestock produce has created certain characteristics of agricultural prices. The elasticity of both supply and demand of agricultural crops is relatively small, creating fluctuations in agricultural prices not only from year to year but also within the same year. That is why agricultural producers cannot manage to change, or even to control, the volume of their produce so as to cope with price fluctuations except when deciding what they are going to grow in the new season. In other words, there is always a lag period between price changes and their influences upon production decisions.

The government intervention becomes more and more necessary to remove or at least to control the economic effects of the market, by modifying price levels and directing production so as to achieve some objectives such as an equitable income distribution or a guaranteed constant supply of certain commodities as a part of the food security policy.

2. Aspects and impacts of the price problem

The range for the impacts of the price problem extends from the farm level to the national level. And one of the main aspects of the price problem is that prices are turned against farmers through many channels. Prices have impacts on the cropping pattern, production supply response, costs of production and terms of trade for agricultural products.

2.1 Cropping pattern changes

There are many constraints and factors affecting and determining the cropping pattern in Egypt. The factors include the limited agricultural area and the agricultural fragmentation of the farming system which tends mainly to produce food for the farmer's family and feeds for livestock, in addition to some technical factors and other factors related to the plan and the agricultural policy. It is predictable that all these factors have different effects on the cropping pattern and supply response for price variations.

The evolution of the cropping pattern during the period 1960-1980 indicates the following results:

1. Table 1 shows that there are structural changes in the cropping pattern in both winter and summer seasons, and these changes are statistically significant.
2. Table 2 shows that cotton and rice areas decreased, while wheat, maize and berseem areas increased.

3. The actual areas for cotton, rice, and wheat are less than the planned areas for these crops, while the actual areas for berseem and maize exceed the planned areas as indicated in Table 3.

2.2 Production changes

Prices give incentives to the farmers and encourage them to maximize output from given resources. At the same time the underpricing of the crops farmers grow induces farmers to produce less. Table 4 indicates the evolution of agricultural production during the period 1970-1982. There are two groups having different trends. The first is the decreasing production group which includes rice, sorghum, beans, lentils, cotton, peanuts, sesame, sunflower, tangerines, lemons, apples, and olives. Prices of most of these products are controlled.

The second is the increasing production group which includes wheat, maize, barley, potatoes, sweet potatoes, onions, sugar cane, flaxseed, soybeans, cabbage, tomatoes, oranges, pears, bananas, grapes, dates, meat, milk and wool. Prices of most of these products (livestock products, fruits, and vegetables) are less controlled or uncontrolled. It must be mentioned that the increase in wheat production and area results from high livestock prices driving the demand for wheat straw above that which prevails for wheat as grain for human consumption.

2.3 Terms of trade for agricultural products

Terms of trade for agricultural products could be represented by (1) the ratio of farm gate prices to average total production cost, (2) the gap between farm and retail prices indicated by the ratio of these two prices, and (3) the gap between farm and world prices represented by the ratio of farm gate to export or import prices.

a) The data in Table 5 indicate that the price index has been falling relative to the cost index for wheat, rice, onions, sugar cane, and the former has been rising relative to the latter for cotton, maize, and broad beans. These results have led to a declining price/cost ratio for the first group and to an increasing price/cost ratio for the second group (Table 4). It must be mentioned that one of the reasons for why the farm gate price index is less than cost index is that the costs of production per feddan increase by rates higher than the productivity growth. These rates were 215 %, 235 %, 236 %, 237 %, 256 %, 263 %, and 397 % for cotton, rice, maize, onions, wheat, broad beans, and sugar cane, respectively, in the period 1970 - 1980.

The agricultural wages are the most important factor causing the increase in cost of production. The wages per feddan increased by 357 %, 308 %, 417 %, 359 %, 435 %, 566 %, and 718 % for the same crops, respectively, in the same period.

The increase in wages is responsible for increasing costs of production by 52 %, 35 %, 41 %, 37 %, 30 %, 36 %, and 48 % for the above mentioned crops, respectively.

b) The increase in the farm gate price index is less than that for the index number for cost of living in the rural areas for cotton, wheat, and rice. The increase is also less than that for the wholesale price index for cotton, wheat and rice. The gap between farm and retail prices remained relatively constant for wheat and maize, but not for rice. The farm gate price for rice became increasingly favorable relative to retail prices, and starting in 1975 they exceeded retail prices.

c) For all crops, the farm gate price index is less than the export or import price index--except for broad beans (where the first exceeds the latter) and for onions (where they are about equal)--indicating some sort of taxation on the agricultural sector.

2.4 Supply response for agricultural crops

Many factors, economic social and political, affect farmers' response and decisions to grow crops. This fact complicates the estimation of supply response to price changes. It is difficult to find the proper price form to get the real relationship.

Tables 6, 7, and 8 indicate that there is no positive relationship between cotton and rice areas and their actual prices in

the previous year, though there is a significant increase in these prices. There is a positive relationship for wheat and maize. A better form, using prices adjusted by the wholesale price index, gave no significant results.

In fact many trials have been done to estimate supply response relationships. For example von Braun used the following model:

$$a_i(t) = {}_i + B_i P_{i\,(t-1)} + B_2 C_{i\,(t-1)} + B_3\, r_{i\,(t)} + {}_1\,(t)$$

with:

$$C_i = \frac{ki \quad P_k \quad A_k}{ki \qquad aki}, \quad K \;\; 1$$

where:

a_i = the area planted with crop i

$P_{i\,(t-1)}$ = deflated previous year's price of the respective crop.

$C_{i\,(t-1)}$ = the area weighted price index of the competitive crops in the respective season.

$r_{i\,(t)}$ = the planned acreage in the respective year.

This model has been modified for some crops, using a weighted wholesale price index for milk and meat as a proxy for the price of fodder crops, net profits of the respective crops, and net profitability ratios between competitive crops and rotations. According to this model, cotton, rice and vegetables show a much higher price elasticity of supply than subsistence and fodder crops. The subsistence crops are not very satisfying in terms of level of determination coefficients. Wheat and maize are both important for yielding fodder as by-products.

Actually, to get reliable estimates for supply response requires variables reflecting price variations compared with cost variations, prices of competing crops, profitability and the time factor. Thus, one such variable might be the monthly rate of return for one L.E. of production costs, adjusting the crop area to represent the marketed supply.

3. Alternatives for price determination

3.1 Cost of production

There are different methods of determining farm prices. One common method is to use production costs as a basis while adding some value as a profit for the farmer. This extra value is either equivalent to the rent value for the land while occupied by the crop or a certain ratio of production costs after discounting the costs of production and the value of the by-products. Afterwards, the net cost of production is used to calculate farm prices on the basis of the average productivity of the crop per feddan. The pricing formula is:

$$P = \frac{C + R - V}{Y}$$

where: P = farm gate price for primary products
C = cost of production per feddan including rent
R = rent per feddan for the duration of the crop
V = value of by-products
Y = yield per feddan of primary products

This method of price calculation has been criticized in that the data of production costs are insufficiently real for all producers. Besides there is no satisfactory reason for supposing their similarity.

This method neglects the demand side despite its remarkable effects upon farm prices. It also does not reflect the impact of technological progress upon the production function, usually resulting in increasing the productivity per feddan and thus reducing the price calculated on the basis of production costs. This does not often correspond to the increasing demand for agricultural commodities. Finally, the method sets a maximum level for the return that is supposed to be obtained.

An alternative cost of production formula for determining prices could be based on cost of production including the rent and adding to these costs a percentage equal to 35 % as net profit for the producer. This ratio tentatively equals the ratio of the rent with respect to costs in a selected base period. We calculate the price as follows:

$$\text{price} = \frac{\text{Cost of production including rent + 35 \% from the total cost-value of by-product}}{\text{average yield per feddan for the main crop}}$$

This method is preferable to the traditional full cost method, since the net revenue for the producer is determined as a percentage of cost of production instead of as a fixed amount represented by the rent. This method is flexible and the revenue changes according to the changes in cost of production. Table 9 (Alternative 1) indicates that the estimated prices by this method are less than the actual prices received by farmers.

Another alternative cost of production pricing method depends on maintaining the ratio between the price and cost of production per unit as that prevailing in base periods. Accordingly, the calculated price equals the index of the cost of production per unit multiplied by the price in the base period. Table 9 (Alternative 2) shows that the calculated prices by this method are less than the actual prices for maize, rice and onion, and exceed the actual prices for cotton, wheat, broad beans and sugar cane.

3.2 Determining prices using supply response

It is necessary for the policy maker to know about the reaction of farmers and their response to price changes. Actually, farmers' behaviour is affected by many factors, social, economic and political. Supply response has some impact on crop pattern, rotation, planned areas, resource allocation, export targets, food security.

Another alternative to the traditional cost of production pricing could set agricultural prices according to supply response relationships. For example, if a certain output goal for a specific crop should be achieved, prices could be set using the following formula:

$$P_i\ (t-1) = (\alpha_i + a_i\ (t) + B_2\ C_i\ (t-1) - B_3\ r_i\ (t)).\ \frac{1}{B_1}$$

where:

$a_i = r_i$ (actual = planned area)

C_i = prices for competitive crops (exogenously given)

For example, to obtain the 1.5 million feddan target for cotton mentioned in the 5 year plan 1978 - 83 with the assumption of stable

prices of the competitive crops, we get

P_{cotton} = L.E. 91.07 (real price index)

This implies that the cotton price would have to be increased by about 16 % in real terms in 1978, as the cotton price index amounted to L.E. 78.6 in that year. Taking the inflation rate of 15.4 % into consideration, a nominal price rise of 33.5 % for the cotton farm gate price would have been necessary to support the 1.5 million feddan target throughout the period. Such a change in cotton price level and thus in the price structure would have its repercussions on the area allocation of the competitive crops. The question to be answered is, which prices are to be set for cotton and rice to achieve the plan (1.5 million feddans set as target for cotton and and permanent berseem, and 1.1 million feddans for rice), and what are the impacts on the areas allocated for other crops if their prices remain constant?

To realize the plan a rise of cotton and rice prices by 18 % and 11 %, respectively, is necessary and a decline of fodder prices by 16 % would be required to reach the lower berseem target fully. Under these circumstances the extension of cotton and rice area would involve sacrificing maize and vegetable areas in the summer season. In the winter season the decreased long berseem acreage would partly be compensated by short berseem grown on the increased cotton area, which leads to a decline of wheat and vegetable areas.

The problem of the acreage response functions estimated independently from each other is that they lead to inconsistent

results for total acreage limits. It might improve the results if a simultaneous estimation for the two different seasons would be chosen and more carefully tested in ex-post projections. The inconsistency problem of the econometric model could be overcome by using a linear programming model.

3.3 Parity price formulas

Another method of calculating prices depends upon the concept of commodity purchasing power. Here, the equations of parity are used, where prices received by farmers are compared with the other prices they have to pay for the inputs and living requirements, so that crops give as much purchasing power in terms of goods and services used in both agricultural production and family living as in the base period.

The parity price formula, as another alternative to the traditional cost of production formula, establishes a price which gives the farmer the same purchasing power for his products as in the selected base period, as follows:

$$\text{Price}_p = \text{index number for cost of living} \times \text{farm gate price in the base period.}$$

Table 9 (Alternative 3) indicates that the parity prices for broad beans, sugar cane and onions exceed the actual prices for these crops, while the parity prices for cotton, wheat, maize and rice are less than their actual prices.

Another parity price formula alternative uses the index number for wholesale prices to get the agricultural parity prices as follows:

$Price_p$ = the index number for wholesale prices x farm gate price in the base period.

Table 9 (Alternative 4) shows that parity prices for cotton maize, rice, broad beans, sugar cane and onion exceed the actual prices for these crops, while the parity price for wheat is less than the actual price.

3.4 Calculated prices based on world prices

It is recommended that the government permit agricultural output prices to move toward world price levels.

Correcting distortions in relative prices received and paid by farmers is the key to making more efficient use of resources in the agricultural sector and to reducing Egypt's growing dependence on imported food supplies. Changing relative prices in the direction of world market prices will produce incentives for farmers to re-allocate resources between crops and livestock sector enterprises. Allowing prices to reflect international opportunity costs will also provide incentives to adopt yield-increasing technologies. According to another pricing formula, depending upon the ratio between the farm gate price and the export or import price in a selected base period, we can get the calculated farm gate price as follows:

$price_c$ = the index number for equivalent export or import price in the corresponding year x farm gate price in the base period.

Table 9 (Alternative 5) indicates that the estimated prices for cotton, wheat, maize, rice, broad beans, and sugar cane exceed the actual prices for these crops, whereas the actual prices for onion exceed its calculated prices.

3.5 Production-redistribution formula

This formula takes into consideration in establishing agricultural prices the following interconnected magnitudes: production, prices, investments, costs of production, consumption, taxes, subsidies and stocks. Also it takes into consideration the whole set of prices and not only the prices of some particular products. The following steps show how agricultural prices could be determined according to this formula:

a) Suppose that the national plan aims at increasing agricultural production A by Δ A to reach the level A_1.

b) To fulfill this, total investments equal to I should be carried out.

c) From these total investments, the state will carry out the amount I, and the farmers themselves have to carry out the rest $I - I_1 = I_2$.

d) The cost of production of A_1 is equal to T.

e) The plan aims at increasing the consumption C of the agricultural population by Δ C to reach at C_1.

f) Taxes on agriculture amount to S.

g) Subsidies to agriculture amount to d.

h) It is desired to increase the stock of agricultural production K by Δ K.

To achieve this, the general agricultural price level P_i, must be such that:

$$A_1 \times P_1 = I_2 + T + C_1 + S - d + \Delta K \ .$$

Dividing the two sides of the equation by A_1P_o, where P_o is the general agricultural price level in a base period, we obtain the needed current general agricultural price level relative to the general price level in the base period. Given the general agricultural price level price relations between different agricultural products could be shaped as indicated in Tables 10 and 11.

3.6 Statistical tests for price differences for alternatives

It is clear that each alternative gives a set of prices different than those for the others and different from the actual prices. For price policy purposes, it is necessary to test these differences statistically. Table 9 indicates that the actual prices for wheat, cotton and sugar cane are less than the estimated prices, and the difference is statistically significant. The price differences for maize, rice, broad beans and onion are not statistically significant.

It must be mentioned, however, even though the differences are not statistically significant, they may be very significant from the farmers' point of view. Accordingly, one might say that the actual prices for cotton, wheat, maize, rice and sugar cane are less than the estimated (what ought to be) prices, while actual prices for broad beans and onion exceed the estimated prices.

4. Conclusion

The price policy of low agricultural prices discourages farmers from increasing production and results in both inefficient allocation of resources and inequitable income distribution within and between the agricultural sector and other sectors. Price distortions make it unprofitable for farmers to grow cotton, rice, lentils, sesame, lemons, beans. Livestock product prices and consequently feed prices are the most important factors affecting farmers decision to grow fodder crops. High livestock prices drive the demand for wheat straw above that which prevails for wheat as grains. Price distortions push the farming system toward livestock, fruits and vegetables, the uncontrolled price crops.

The results of this study indicate that the actual farm gate prices are less than the estimated or calculated prices for the main crops, for the period 1971-1980. Accordingly, we can conclude the following:

1. Some crops require increased prices because the actual prices are less than the calculated prices. These crops are cotton, wheat, maize, rice and sugar cane.
2. The actual prices for broad beans and onion are greater than the estimated prices.
3. Generally, the government should declare the prices before the agricultural season, i.e., before the farmers decide what to produce. The actual prices

could differ from the predetermined prices according to crop status and the changes in cost of production, demand, export or import prices.

4. It is necessary to distinguish between farm gate prices and consumer prices and not to rely mainly on the farmer to bear the burden of the consumer subsidies. Profitability should be increased for strategic crops for which the government wishes to increase production for their socio-economic importance for society.
5. It must be mentioned that stable prices are not necessarily the proper prices, the latter referring to the extent to which the methods of price control are efficient. The prices suitability has to be tested through its impact on production, consumption, and the real income for social groups.

Price policy has to serve the economic development. The targets of the planned economic development have to be defined at first. After the main targets of the economic development are elaborated, prices are determined which can support the implementation of the economic targets. Changing all prices which obstruct the implementation of any economic target has to be taken into consideration to support the economic development. In this concern prices are considered as an instrument to stimulate the planned structure of production and the application of modern techniques and technology.

Table 1. Area of main crops by season, in feddans

Season and Crops	1970-1972	1978-79	1980-81	1982
A. Winter Crops	4,872	5,046	4,710	4,792
1. Clover	2,779	2,780	2,474	2,540
Wheat	1,297	1,386	1,363	1,400
Broadbean	300	280	282	300
Barley	81	110	94	80
Lentil	60	29	14	10
Onion	34	24	31	38
Fenugreek	27	26	26	15
Flax	25	65	60	52
Others	85	102	92	69
Vegetables	184	244	274	280
B. Summer Crops	5,047	4,967	5,159	5,248
Cotton	1,568	1,193	1,212	1,100
Rice	1,140	1,033	963	1,150
Maize	1,178	1,892	1,907	1,900
Sorghum	461	420	411	400
Sesame	41	30	--	--
Groundnut	38	31	39	40
Others	88	173	28	33
Vegetables	339	483	503	475
Soybeans	--	104	96	150
C. Nili Crops	607	824	332	302
D. Orchards	298	336	377	350
E. Sugar Cane	194	248	254	265
Total Cropped Area	10,774	11,148	10,832	10,957

Source: Egypt, Strategies for Accelerating Agricultural Development MOA, USAID, USDA, July 1982

Table 2. Time trend for Crop Area (main crops) during the period 1970 - 1981

Crop	Type of Equation	Results b	Results m	Results r
Cotton	linear	1,520.05	-24.98	-.54
	exponential	1,677.75	-.03	-.91
Wheat	linear	1,286.67	7.19	.38
	exponential	1,286.00	.005	.37
Maize	linear	1,523.12	32.85	.77
	exponential	1,524.74	.019	.77
Rice	linear	1,124.29	-9.15	-.58
	exponential	1,123.79	-.008	-.57
Berseem 1960-1978	linear	1,040.26	39.9	.96
	exponential	1,276.40	.025	.89
	power	1,184.27	.145	.96

Table 3. Actual and planned areas for major crops in Egypt during the period 1961 - 1978, in feddans

Crop	Actual	Planned	Difference	%	Z
Cotton					
Average	1,573.90	1,629.10	-55.20	3.40	-0.82
S	206.33	196.81			
Rice					
Average	1,007.06	1,052.72	-45.66	4.34	-0.95
S	162.91	123.11			
Maize					
Average	1,650.78	1,620.28	+30.50	1.88	0.47
S	149.15	231.61			
Wheat					
Average	1,317.00	1,323.94	- 6.54	0.52	-0.16
S	83.33	165.51			
Berseem					
Average	1,456.39	1,402.39	+54.00	3.85	0.8
S	227.97	172.23			

Table 4. Time trend for agricultural production by crop

Crop				1985 Projections
Wheat		$\hat{y}= 1681.37 + 22.03\ x$	$r= 0.505$	$\hat{y}_{1985} = 2033.88$
Rice		$\hat{y}= 2433.5 - 10.85\ x$	$r=-0.31$	$\hat{y}_{1985} = 2259.96$
Maize		$\hat{y}= 2100.2 + 92.62\ x$	$r= 0.75$	$\hat{y}_{1985} = 3582.01$
Barley		$\hat{y}= 89.83 + 2.58\ x$	$r= 0.58$	$\hat{y}_{1985} = 131.06$
Sorghum		$\hat{y}= 906.27 - 23.93\ x$	$r=-0.92$	$\hat{y}_{1985} = 523.45$
Broad Beans		$\hat{y}= 301.71 - 7.35\ x$	$r=-0.65$	$\hat{y}_{1985} = 184.06$
Lentils		$\hat{y}= 63.17 - 4.69\ x$	$r=-0.85$	$\hat{y}_{1985} = 11.91$
Potatoes		$\hat{y}= 399.67 + 65.23\ x$	$r= 0.93$	$\hat{y}_{1985} = 1443.36$
Sweet Potatoes		$\hat{y}= 76.21 + 0.38\ x$	$r= 0.11$	$\hat{y}_{1985} = 82.25$
Onions		$\hat{y}= 528.17 + 8.92\ x$	$r= 0.32$	$\hat{y}_{1985} = 670.94$
Sugar Cane		$\hat{y}= 7356.64 + 84.90\ x$	$r= 0.44$	$\hat{y}_{1985} = 8715.07$
Cotton		$\hat{y}= 482.86 - 2.45\ x$	$r=-0.18$	$\hat{y}_{1985} = 443.73$
Cottonseed		$\hat{y}= 866.09 - 10.94\ x$	$r=-0.08$	$\hat{y}_{1985} = 691.10$
Flaxseed		$\hat{y}= 9.94 + 2.07\ x$	$r= 0.93$	$\hat{y}_{1985} = 43.11$
Soybeans	Linear	$\hat{y}= 32.15 + 10.67\ x$	$r= 0.49$	$\hat{y}_{1985} = 138.61$
	Power	$\hat{y}= 0.244\ x^{2.2}$	$r= 0.86$	$\hat{y}_{1985} = 109.60$
Peanuts		$\hat{y}= 31.23 - 0.03\ x$	$r= 0.04$	$\hat{y}_{1985} = 30.67$
Wool	Linear	$\hat{y}= 2.67 + 0.12\ x$	$r= 0.12$	$\hat{y}_{1985} = 4.52$
	Power	$\hat{y}= 2.66\ x^{0.14}$	$r= 0.73$	$\hat{y}_{1985} = 3.96$

Table 4 (cont')

Crop				1985 Projections
Sesame		$\hat{y}= 21.68 - 0.73x$	$r=-0.08$	$\hat{y}_{1985}= 10.01$
Sunflower		$\hat{y}= 22.85 - 1.54x$	$r=-0.13$	$\hat{y}_{1985}= 1.73$
Cabbage		$\hat{y}= 255.27 + 9.88x$	$r= 9.67$	$\hat{y}_{1985}= 413.37$
Tomatoes		$\hat{y}= 1453.83 + 59.23x$	$r= 0.34$	$\hat{y}_{1985}= 2401.53$
Oranges	Linear	$\hat{y}= 637.48 + 25.07x$	$r= 0.04$	$\hat{y}_{1985}= 1038.54$
	Power	$\hat{y}= 613.98 x^{0.147}$	$r= 0.75$	$\hat{y}_{1985}= 932.17$
Tangerines				
	Linear	$\hat{y}= 95.57 - 1.43x$	$r=-0.50$	$\hat{y}_{1985}= 72.74$
	Power	$\hat{y}= 96.18 x^{-0.018}$	$r=-0.55$	$\hat{y}_{1985}= 72.46$
Lemons		$\hat{y}= 70.38 - 1.05x$	$r=-0.39$	$\hat{y}_{1985}= 53.65$
		$\hat{y}= 68.43 x^{-0.014}$	$r=-0.30$	$\hat{y}_{1985}= 54.87$
Apples		$\hat{y}= 34.61 - 0.27x$	$r=-0.33$	$\hat{y}_{1985}= 30.24$
Pears	Linear	$\hat{y}= 8.99 + 3.33x$	$r= 0.34$	$\hat{y}_{1985}= 62.21$
	Power	$\hat{y}= 12.18 x^{0.488}$	$r= 0.83$	$\hat{y}_{1985}= 47.15$
Bananas		$\hat{y}= 89.41 + 3.55x$	$r= 0.90$	$\hat{y}_{1985}= 146.25$
		$\hat{y}= 86.89 x^{0.15}$	$r= 0.89$	$\hat{y}_{1985}= 131.94$
Grapes		$\hat{y}= 101.21 + 17.88x$	$r= 0.94$	$\hat{y}_{1985}= 387.25$
Olives		$\hat{y}= 6.17 - 0.115x$	$r=-0.62$	$\hat{y}_{1985}= 4.32$
Dates		$\hat{y}= 355.45 + 6.28x$	$r= 0.61$	$\hat{y}_{1985}= 455.87$
Meats	Linear	$\hat{y}= 298.88 + 15.56x$	$r= 0.14$	$\hat{y}_{1985}= 547.91$
	Power	$\hat{y}= 289.28 x^{0.186}$	$r= 0.93$	$\hat{y}_{1985}= 484.74$
Milk	Linear	$\hat{y}= 1617.58 + 22.40x$	$r= 0.044$	$\hat{y}_{1985}= 1975.95$
	Power	$\hat{y}= 1593.63 x^{0.06}$	$r= 0.95$	$\hat{y}_{1985}= 1882.15$

Table 5. Terms of Trade for wheat, rice and cotton

	------Wheat------			--------Rice------			------Cotton------		
Year	F_p/AC	F_p/n	F_p/m	F_p/AC	F_p/n	F_p/E	F_p/AC	F_p/n	F_p/E
1970	1.13	.88	1.55	1.34	.72	.77	1.39	.84	1.27
1971	1.07	.79	1.22	1.28	.69	.80	1.36	.84	1.20
1972	1.12	.78	1.13	1.24	.69	.80	1.45	.88	1.33
1973	1.33	.79	1.03	1.26	.81	.47	1.65	.90	1.21
1974	1.36	.81	.45	1.32	.91	.18	1.59	.88	.74
1975	1.26	.83	.65	1.32	1.04	.25	1.38	.86	.78
1976	1.01	.79	.72	1.25	1.09	.51	1.21	.82	.75
1977	1.00	.82	1.02	1.33	1.15	.79	1.49	1.07	1.50
1978	0.98	.75	1.09	1.48	1.13	.82	1.24	.71	1.37
1979	0.79	.82	.83				1.04	.87	1.01
1980		.76							

F_p = Farmgate price

AC = Average total cost of production per unit of production

r = Retail (equivalent) price

m = Import price

E. = Export (equivalent) price

Table 6. Area and prices (current) for main crops in the period 1970 - 1981, in feddans and L.E.

Year	Cotton		Wheat		Maize		Rice	
	Area	Price	Area	Price	Area	Price	Area	Price
1970	1627	18.19	1304	5.8	1504	4.69	1142	28.41
1971	1525	18.24	1349	5.31	1522	4.68	1137	27.54
1972	1552	19.86	1239	5.26	1531	5.15	1146	26.83
1973	1600	19.51	1248	5.72	1654	6.31	997	28.09
1974	1453	23.62	1370	7.04	1755	7.11	1053	36.00
1975	1346	25.36	1394	7.70	1830	7.12	1053	43.74
1976	1248	32.00	1396	7.07	1891	7.04	1078	50.00
1977	1423	34.39	1207	8.12	1765	10.66	1040	56.18
1978	1205	34.87	1381	9.25	1898	10.00	1031	66.10
1979	1195	46.80	1389	9.60	1882	10.37	1031	65.11
1980	1245	47.24	1325	13.20	1909	17.20	971	11.29
1981	1173		1399		1699		1099	

Using the formula $y=bx^m$ where in y= in b + m lnx and y = area, x = price, the results are:

Crop	b	m	r
Cotton	3296.65	-.269	-.8
Wheat	1069.61	.112	.45
Maize	1077.40	.25	.91
Rice	1400.70	-.08	-.55

Table 7. Area and adjusted prices for main crops during the period 1970 - 1981, in feddans and L.E.

Year	Cotton		Wheat		Maize		Rice	
	Area	adj. Price	Area	adj. Price	Area	adj. Price	Area	adj. Price
1970	1627	16.03	1304	5.11	1504	4.13	1142	25.03
1971	1525	15.47	1349	4.50	1522	3.97	1137	23.36
1972	1552	16.88	1239	4.47	1531	4.38	1146	22.81
1973	1600	14.87	1248	4.36	1654	4.81	997	21.35
1974	1453	15.79	1370	4.71	1755	4.75	1053	24.06
1975	1346	15.10	1394	4.59	1830	4.24	1053	26.05
1976	1248	17.04	1396	3.76	1891	3.75	1078	26.62
1977	1423	16.64	1207	3.93	1765	5.16	1040	27.18
1978	1205	14.89	1381	3.95	1898	4.27	1031	28.22
1979	1195	18.82	1389	3.86	1882	4.17	1030	26.18
1980	1245		1325	4.24	1909	5.53	971	
1981	1173		1399		1699		1099	

- using the following formula : $y = bx^m$ where in $y = \ln b + m \ln x$
- the results are:

Crop	b	c	r
Cotton	1605.60	-0.057	0.038
Wheat	1113.60	.12	.22
Maize	1051.00	.35	.39
Rice	1575.00	-.125	-.211

Table 8. Supply elasticities (acreage response of price changes) for the main crops.

Crops	Own price	Competitive price Weighted index	Cotton	Wheat	bye products use Meat and mild Price index	Area Planned
Cotton	0.77	-1.43				0.49
Rice	0.53	-0.27				0.81
Maize	0.44		-0.75		0.69	
Wheat	0.22		-0.60			
Long berseem	0.02		-0.79	-0.16		0.64
Short berseem	0.01					0.61 (1)
Vegetable	0.69		-0.31			

(1) Actual Cotton acreage, because short berseem is the most important crop grown before cotton.

Table 9. Statistical tests for the difference between actual and Calculated prices by different methods (Means for the period 1971-1980)

Crop	Cotton	Wheat	Maize	Rice	Broad Beans	Sugar Cane	Onion
Actual price	30.19	7.83	8.56	47.73	16.08	7.73	27.26
S	10.75	2.42	3.69	19.19	7.03	4.06	10.67
Cost method	25.30	5.77	6.97	42.06	10.86	5.70	23.34
S	7.66	2.29	2.82	16.54	5.36	3.39	11.07
Z	1.17	1.86	1.08	0.71	1.87	1.21	0.81
Test of significance (at % t= 1.823)	n.s.	s	n.s.	n.s.	s	n.s.	n.s.
Alternative 1	27.10	5.98	7.57	47.16	10.99	6.40	27.52
S	8.82	2.32	3.13	18.91	5.70	3.96	13.17
Z	.70	1.75	.65	0.07	1.78	.74	-.05
Test	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Alternative 2	24.23	7.56	9.28	50.88	10.79	6.40	28.12
S	8.0	3.62	3.85	20.81	5.57	4.02	13.46
Z	1.41	0.20	-.43	-.35	.73	.74	-.16
Test	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.	n.s.
Alternative 3	32.65	10.73	9.89	57.69	15.96	5.46	24.29
S	11.32	3.72	3.43	20.00	5.53	1.89	8.42
Z	-.50	-2.07	-.83	-1.14	.01	1.60	.69
Test	n.s.	s	n.s.	n.s.	n.s.	n.s.	n.s.
Alternative 4	28.32	8.77	7.94	47.34	14.12	4.52	20.41
S	8.75	2.71	2.45	14.63	4.36	1.40	6.31
Z	.43	-.82	.44	.05	.75	2.36	1.75
Test	n.s.	n.s.	n.s.	n.s.	n.s.	s	n.s.
Alternative 5	45.12	12.19	10.72	58.91	17.43	13.22	21.89
S	19.21	6.45	4.96	32.64	3.11	4.97	9.23
Z	-2.14	-2.00	-1.10	-.93	-.56	-2.71	1.20
Test	s	s	n.s.	n.s.	n.s.	s	n.s.
Actual price	50.70	12.17	13.64	82.04	29.50	66.55	50.52
S	6.377	2.2862	3.430	16.464	7.596	12.135	7.687
Product x redistribution	58.00	13.92	15.55	93.45	33.74	76.12	57.81
S	8.285	2.6406	3.698	19.94	8.970	13.926	9.48
Z	-1.21	-.868	-.656	-.764	-.625	-.897	-1.035

Table 10. Value and Cost of Production, Consumption, Investment, and Subsidies, 1978 - 1981

Item	1978	1979	1980	1981	1986-1987
Production	3,249,844	3,679,382	4,473,890	5,073,473	6,439,300
plant	2,402,455	2,545,405	3,061,221	3,433,187	
%	73.93	69.18	68.42	67.67	
animal	847,389	1,133,977	1,412,669	1,640,286	
%	26.07	30.82	31.58	32.33	
Cost of production	1,061,024	983,427	1,113,399	1,470,499	
Consumption/f	2,924,860	3,311,444	4,026,501	4,715,300	5,807,000
Investment	191,300	268,000	263,353	298,647	740,000
Subsidies	105,225	119,133	144,858	183,164	
VP_E	4,071,959	4,443,738	5,258,395	6,301,282	
%	125.3	120.8	117.5	124.2	
$\triangle VP_E$	822,115	764,456	784,505	1,227,809	
$\triangle$ VP-Crops	607,790	528,851	536,758	830,858	

Table 11 Actual Prices and estimated prices, L.E.
Using production and redistribution formula

Crop	1978 actual	1978 estimated	1979 actual	1979 estimated	1980 actual	1980 estimated	1981 actual	1981 estimated
Wheat			9.55	10.95	13.20	14.79	13.76	16.01
%			3.22		3.53		3.50	
Δ Vpc			17,029		18,947.6		29,080.0	
Maize			10.44	11.94	17.26	19.33	13.21	15.38
%			5.96		8.90		6.15	
Δ Vpc			31,519.5		47,771.5		51,097.8	
Rice			65.90	75.37	81.41	91.18	98.81	114.99
%			4.5		4.34		4.35	
Δ Vpc			23,798.3		23,295.3		36,142.3	
Broad Beans			21.32	24.38	30.86	34.58	36.33	42.26
%			.88		.95		.96	
Δ Vpc			4,653.9		5,099.2		7,976.2	
Lentils			40.97	48.25	47.03	52.26	67.29	78.40
%			.06		.04		.04	
Δ Vpc			417.3		214.7		332.3	
Cotton			46.81	53.54	47.23	52.90	58.06	67.56
%			10.40		9.44		9.63	
Δ Vpc			55,000		50,669.9		80,011.6	
Flax			29.92	34.36	31.34	35.01	33.07	38.32
%			.15		.12		.09	
Δ Vpc			793.3		644.1		747.8	
Groundnuts			20.77	23.71	23.72	26.55	30.33	36.41
%			.20		.18		.21	
Δ Vpc			1,057.7		966.2		1,744.8	
Sesame			52.59	60.33	72.48	81.36	74.58	86.66
%			.15		.22		.20	
Δ Vpc			793.3		1,180.9		1,661.7	
Onions			57.16	65.44	42.10	47.20	52.31	60.80
%			.63		.36		.35	
Δ Vpc			3,331.8		1,932.3		2,908.0	

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