

## RESPONSES OF EGYPTIAN FOOD CROPS PRODUCERS TO NEW ECONOMIC POLICIES: CASES OF WHEAT AND RICE

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### **Abstract**

The formerly neglected wheat production is recovering under policies of economic reform and liberalization. The most effective factors are the continuous price raises and the relatively low production costs which should continue, along with attempts to improve yields and reduce costs, if to avoid imports re-expansion. As for rice, its production expansion potentials are constrained by water limitations. However, the ongoing price increases may motivate attempts to reduce both production costs and post-harvest enormous losses. Exports may be promoted as such, hardly threatening satisfaction of domestic needs, at least in the foreseen future.

### **Introduction**

The Egyptian economy has experienced major structural changes during the last 27 years. Such changes began with adoption of the "Open-door" economic system in 1975, up-to the program of economic reform and liberalization issued in 1987. In response, despite the relative protection measures the agricultural sector advantages it experienced noticeable changes, with more expected in the future.

In view of these respects, this study tends to investigate the impacts of the successive and logically sequential economic policy changes upon production of two of the most important food crops in Egypt, sharing together about one-fifth of the total cropped area, namely wheat and rice. Beside one being an importable crop and the other exportable, they are both relatively protected by the government. The principal objective is to predict the future of production for those two major crops according to producers responses, and hence their food security implications.

### **Methodology**

A simultaneous equations method (2SLS) was adopted to test the impacts of policy variables among others, within both crops' econometric models. Dummy variables were used to represent adoption of the open-door economic policy, agreements with the World Bank(WB) and the International Monetary Fund (IMF), and implementation of the "Economic Reform and Liberalization" programs. Such dummy variables were in forms reflecting both timing and level of

application in range between 0 and 3, considering the accumulated impacts of the successive relevant procedures. Officially published secondary data were used in analysis.

## Results

Conversion of the semi-centrally planned Egyptian economy started right after the 1973 war with more close relationships with the West bloc. Such conversion led to successive changes and major actions influencing economic activities, agricultural production included.

The Open-door economic system: Breaking its private relationship with the Eastern Bloc, which lasted for almost 13 years, Egypt attempted a stronger political and trade relationship with the West. Emphasis set on importing both goods and technical expertise encouraged by long-term loans and payment facilities offered by the western countries. On the export side, Egypt began to face markets of strict quality specifications and severe competition. Consequently, while Egypt's food imports rapidly expanded, exports declined or at best stagnated. As evidence, wheat imports almost doubled in two years(1973-75), imports of corn reached 6 times its level of 1970, and sprang to nearly twenty folds in early 1980s. Similar, and even further, dramatic increases occurred for imports of poultry, dairy products and cooking oil, and sugar surpluses converted to a deficit of nearly 750,000 m.t./annum <sup>(1)</sup>. On the other hand, production costs reflected the inflation trend in international prices accelerated by gradual abolishment of the input price subsidies. As such, production costs reached in the late 1970s 2-2.5 times their level of the late 1960s. With drop of the farm-gate real prices, due to inflation, domestic agricultural production suffered a great deal of frustration.

Agreements with the WB and IMF implications: The impacts of the 1973 war and the new economic system fostered drastically increasing domestic consumption and food imports, especially for wheat. Consequently, Egypt's foreign debt sprang up, and so did the budget deficit, due to the subsidies' burden. The first exceeded twenty folds its 1960s level, and the second rose from about \$65 million(1970) to almost \$2065 million(1984-85) <sup>(1)</sup>. Accordingly, agreements took place with WB and IMF to curb demand for consumption and improve production efficiency on basis of economic principles and market price determination. Beside gradual abolishment of price subsidies and national currency devaluation ,such agreements which started in effect by 1977 stimulated wide steps toward privatization. The major implication was wide price leaps given the terminology of "price moving" repeatedly applied in successive years of the 1980s and early 1990s.

Programs of Economic Reform and Liberalization implications: This set of programs were introduced in 1987, based on economic activities liberalization(privatization) and the compatible structural adjustments. As such, farmers became free to decide their production patterns, and sell their products to whom and whenever they chose. For nearly three decades before, farmers have been used to depend on the government in directing them to production of major crops and

provide them with subsidized inputs in effect. But under the new programs farmers have to face private input markets of prices reflecting the constantly increasing international prices. However, the government had to keep some degree of intervention in favor of production of certain strategic crops such as wheat, cotton, maize, sugarcane and rice. Guaranteed floor-prices were set by the government in this respect. On the other hand, the new laws of land rent in favor of landowners represented another cost burden on producers(tenants), even if partly compensated by the increasing farm-gate prices due to privatization. It is also worth mentioned that privatization encouraged accelerated foreign technology transfer, which had positive results in crops' yields improvement, along with domestic scientific research.

Wheat and rice econometric models And policy impacts:

Table(1) represents the simple correlation coefficients between the two crops' major economic variables and the dummy variables representing the three mentioned policy actions.

Table(1)- Simple correlation coefficients\_estimates between economic variables of wheat and rice and the policy dummy variables (1990-99)

Variables	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	Variables	D <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>
WAREA	.24	.80	.95	RAREA	-.09	-.43	.71
WYLD	.43	.90	.86	RYLD	.42	.88	.95
WFPR	.43	.94	.95	RFPR	.44	.92	.94
WCOST	.43	.90	.95	RCOST	.44	.90	.95
WIMP	.72	.47	.14	REXP	-.73	.16	.03
WIMPR	.60	.90	.79	REXP	.41	.87	.95
WCON	.73	.87	.61	RCON	.36	.82	.85

WAREA= wheat area, WYLD= wheat yield, WFPR= wheat farm-gate price, WCOST= wheat prod. Cost, WIMP= Wheat imports, WIMPR= wheat import unit value, WCON= wheat consumption, RAREA= rice area, RYLD= rice yield, RFPR= rice farm-gate price, RCOST= rice prod. cost, REXP= rice exports, REXPR= rice export unit value, RCON= rice consumption, D<sub>1</sub>= open-door economic system, D<sub>2</sub>= WB and IMF agreements + D<sub>1</sub>, D<sub>3</sub>= Economic Reform Programs + D<sub>1</sub>+ D<sub>2</sub>.

Source: Study analysis.

As shown in table (1), the most effective impact occurred for the collective policy actions ( $D_3$ ) followed by  $D_2$  and  $D_1$ , as logically expected. Contrary to all other variables, wheat imports volume was positively affected and rice exports negatively affected by the system conversion in 1975 ( $D_1$ ).

Wheat econometric model: Equations (1-5) represent the structural model for wheat production economics.

$$\text{WAREA}_i = 1297.26 + 2.25 \text{CCOST}_i - 0.78 \text{WCOST}_i + 263.25 D_{3t} \quad R^2 = 0.94 \quad (1)$$

(0.56)                      (0.23)                      (61.13)

$$\text{WYLD}_i = 9.03 + 1.95 D_{2t} + 0.78 D_{3t} \quad R^2 = 0.85 \quad (2)$$

(0.47)                                      (0.35)

$$\text{WPROD}_i = \text{WAREA}_i \cdot \text{WYLD}_i \quad (3)$$

$$\text{WFPR}_i = 10.84 + 0.38 \text{WCOST}_i + 92.36 D_{2t} \quad R^2 = 0.95 \quad (4)$$

(0. )                                      (32.46)

$$\text{WCOST}_i = 88.44 + 125.74 D_{2t} + 184.30 D_{3t} \quad R^2 = 0.93 \quad (5)$$

(39.85)                      (29.72)

Where: WAREA= Wheat acreage (1000 feddans).

WYLD = Wheat yield (ardab/feddan).

WPROD= Wheat total production (1000 mt.).

WFPR = Wheat average farm-gate price (L.E./ardab).

WCOST = Wheat total production cost (L.E./feddan).

CCOST = Cotton total production cost (L.E./feddan).

$D_1$  = dummy variable (0,1) for adoption of the Open-door system.

$D_2$  = dummy variable (0,1,2) for agreements with WB,IMF +  $D_1$ .

$D_3$  = dummy variable (0,1,2,3) for the Economic Reform policy +  $D_1 + D_2$

$t$  = 1,2,.....,30 for (1970-99).

Figures between brackets are coefficients' standard errors.

Although acreages are normally affected by farm-gate prices and/or production costs with a single year lag, in case of Egyptian wheat value indications of both variables for the new season are apparent before area determination. Hence, through step-wise regression efficient estimation choosed simultaneous impacts of both costs and prices. Moreover,

cotton was assumed competitive to wheat though grown in different seasons as the first requires early preparation allowing not wheat production in the same area.

Wheat reduced form model: based on equations(1-4) ,the reduced form model is as following:

$$\text{WAREA}_t = 1228.28 + 2.25 \text{CCOST}_t - 98.08 D_{2t} + 119.25 D_{3t} \quad (6)$$

$$\text{WPROD}_t = 11091.37 + 20.32 \text{CCOST}_t + 1509.47 D_{2t} + 1174.90 D_{3t} + \text{CCOST}_t (4.39 D_{2t} + 1.76 D_{3t}) + 2156.53 D_{2t} D_{3t} - 191.26 D_{2t}^2 + 93.21 D_{3t}^2 \quad (7)$$

$$\text{WFPRT}_t = 44.45 + 140.14 D_{2t} + 70.03 D_{3t} \quad (8)$$

As shown in all former equations, the exogenous explanatory variables are cotton production costs and the two dummies  $D_2$  ,  $D_3$  only. It is also noted that  $D_2$  influenced area negatively though affecting farm prices positively.

Rice econometric model: The structural model for rice production is presented by equations (9-14).

$$\text{RAREA}_t = 944.07 + 0.60 \text{REXP}_{t-1} - 124.13 D_{1t} \quad R^2 = 0.65 \quad (9)$$

(0.11)                      (46.55)

$$\text{RYLD}_t = 2.28 + 0.13 D_{2t} + 0.27 D_{3t} \quad R^2 = 0.92 \quad (10)$$

(0.03)                      (0.05)

$$\text{RPROD}_t = \text{RAREA}_t \cdot \text{RYLD}_t \quad (11)$$

$$\text{REPR}_t = 8.59 + 0.44 \text{RCOST}_t + 44.26 D_{2t} \quad R^2 = 0.97 \quad (12)$$

(0.05)                      (20.73)

$$\text{RCOST}_t = 107.62 + 155.91 D_{2t} + 215.00 D_{3t} \quad R^2 = 0.92 \quad (13)$$

(47.03)                      (35.07)

$$\text{REXP}_t = 105.46 + 119.78 D_{1t} + 300.42 D_{3t} \quad R^2 = 0.92 \quad (14)$$

(52.98)                      (19.48)

Where  $\text{RAREA}$  = Rice area (1000 feddans).

$\text{RYLD}$  = Rice yield (mt./feddan).

$\text{RPROD}$  = Rice total production (1000mt.).

$\text{RFPR}$  = Rice average farm-gate price (L.E./mt.).

$\text{RCOST}$  = Rice total production costs (L.E./feddan).

$\text{REXP}$  = Rice average export unit value (L.E./mt.).

$D_1$  ,  $D_2$  ,  $D_3$  are as previously noted.

$t$  = 1,2,.....,30 for (1970-99).

Figures between brackets are coefficients' standard errors.

As a main difference from the wheat case, the area lag response to the last year export price level is revealed statistically significant, along with the negative impact of the open-door system( $D_1$ ). Thus, although both variables were responsible for only 65% of the area change.

Rice reduced form model: Equations (15-18) represent the deduced reduced form.

$$RAREA = 1007.35 + 71.87 D_{1t-1} - 124.13 D_{1t} + 300.42 D_{3t-1} \quad (15)$$

or, after solving the auto-correlative scheme:

$$RAREA = 976.32 - 31.03 D_{1t-1} + 300.42 D_{3t-1} \quad (16)$$

$$RFPR = 55.94 = 112.86 D_{2t} + 215.00 D_{3t} \quad (17)$$

$$RPROD = 2226.01 - 70.75 D_{1t-1} + 126.92 D_{2t} + 948.57 D_{3t} - D_{1t-1} (4.03D_{2t} + 8.38D_{3t}) + 39.06 D_{2t} D_{3t} + 81.11 D_{3t}^2 \quad (18)$$

Once again, policy variables alone represent the exogenous variables influencing the economics of rice production, as revealed in equations (15-18).

## Discussion

Wheat production determinants:

(0. ) Both the structural and reduced form models indicate the impacts of production costs of either the crop itself or its main competitor(cotton) on the area of wheat in an economically logic manner. This result conforms with the major characteristic of most Egyptian farmers, as having limited budget resources, and are as such more responsive to costs they bear rather than revenues they later get. This explains also the negative impact of the implications of the agreements with the WB ( $D_2$ ), which resulted in raising both prices and costs of wheat, but the last was more effective. However, as production costs continue increasing under liberalization, the government has become keen to insert a chain of farm-gate price markups to encourage producers. Accordingly, with higher both level and growth rate of cotton costs, a positive net impact of the economic reform policy ( $D_2$ ) was revealed. On the other hand, the eighties and nineties advantaged active scientific research and technology transfer exerting positive impact on yields for the period denoted by  $D_3$ . Conversely, production costs are experiencing a growth rate accelerated during the economic reform, influencing area negatively, counteracting as such the other positive impacts.

(0. )

(0. ) Rice production determinants:

(0. ) Different from wheat, rice cultivated area was affected by prices rather than production costs, export price(with one year lag)in particular. However, the exports diminishing trend starting 1975, partially due to rising export

prices with a correlation coefficient estimated by the study at about  $-0.34$ , negatively reflected upon rice area, as indicated by equation 16. Conversely, the years of liberalization and economic reform exerted a rapid rise in both exports and domestic prices which encouraged, accompanied by yield improvement, producers to expand rice production. Even though exports represent no more than 7% of total production, farmers decisions with respect to rice production strongly responded to export fluctuations via foreign demand expectations.

### Conclusions

Conditions during the early years of the Egyptian economy conversion toward the West led to loss of interest in domestic production. Consequently, agriculture's share of gross public investments dropped from about 27% at the beginning of the 1970s to almost one-half. Production of both wheat and rice was most influenced, and wheat imports rose and rice exports diminished in response. However, the resulted boasting both foreign debt and public budget deficit obliged redirecting attention toward domestic production. As such, procedures were taken to reactivate land reclamation as well as raising farm-gate prices closer to international levels. Such actions seem to be effective measures treating negative side effects of the economic reform policy.

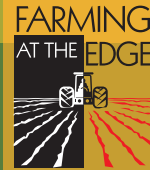
Nevertheless, expansion of wheat production depends on its production costs being lower than that of competitive crops, a matter holding so far. However, to compete with the budget exhausting wheat imports, farm-gate price constant raising should be maintained, at least till other measures of cost reduction and yields promotion show more progress.

Considering rice, productivity has most likely reached a visible ceiling, as the Egyptian yield level became the highest worldwide. However, there is still a room for reducing post-harvest losses as well as production costs. Such attempts would be highly motivated by the constantly increasing price both locally and internationally. But on the other hand, rice domestic production expansion is not governmentally desired as representing a growing stress upon the limited water resources. Accordingly, the government may undertake in the near future measures discouraging farmers tendencies toward more rice production.

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