

An Economic Study of Egyptian Rice Competitive Position In Foreign Markets

Monia Bahaa El-Din Hassan, Nagwa Mosad El-Agrody and Karima Awad Mohamed

Department of Agricultural Economy, National Research Centre, Cairo, Egypt.

Abstract: The study showed that the area of cultivated rice significantly increased in Egypt and its yield significantly increased annual rate by 22.88 thousand feddans and 0.67 ton/feddans, respectively. In addition, production cost, farm-gate price, and the net return increased significantly at annual rates of L.E 117.50, 38.70 and 84.20, respectively. Moreover, total consumption and the volume of exports significantly increased significant at annual rates of 196.40 and 54.90 thousand tons, respectively. The study indicated non-stability of both volume and price of Egyptian rice exports during the period 1990-2006, and deduced that Egypt enjoyed a comparative advantage in rice export price over USA, Italy, Australia, Pakistan, and India during the period 2001-2007. The study indicated also that Sudan, Romania, Syria, Libya, and Jordan markets are considered promising markets to which rice exports can be increased, in contrary to Saudi and Turkish markets.

Key words: Production, consumption, exports, non-stability coefficient, price ratio, market share, market penetration coefficient.

INTRODUCTION

Rice is considered one of the main food grains in Egypt and the whole World. It represents the staple food for 3 billion people around the world, especially in the south east regions. In Egypt, rice is considered an important agricultural crop due to the fact that it is the only cereal crop in which Egypt realizes self-sufficiency and a surplus for exports. Also, it represents a source for hard currency earnings that can help financing the economic and social development programs. In addition, rice drives the wheel of some industries such as rice milling and animal feed industries. It is worthily to note that rice exports account for 29.4% of Egypt's total agricultural exports value and about 37% of food exports value estimated by US \$ 1059.5 and 841.4 million, respectively in 2005.

Despite of the distinguished position that of Egyptian rice exports surpass other major agricultural export crops, but there are some international constraints impeding its external trade such as, increased volume of rice exports by competing countries, especially USA and China, in Egyptian rice markets, non-stability of annually exported quantities of Egyptian rice, USA rice support programs raised its competitive ability against Egyptian rice in international markets, and also fierce competition by major exporting countries in Egyptian rice markets during peak export times (January, February, and March).

The research aims to evaluate the current situation of Egyptian rice production, estimate the general regression equation for Egyptian rice exports and rice exports of competing countries, and evaluate Egypt's competitive position in foreign markets.

MATERIALS AND METHODS

Regarding the methodology and sources of Data, the research is based on both descriptive and quantitative analysis conducted using mathematical and statistical methods such as simple regression, in addition to application of some economic indicators such as the non-stability coefficient, competitive price position, market share, and market penetration indicators. The source of data used in research and periodicals published by the Central Agency for Public Mobilization and Statistics (CAPMAS), the Food and Agriculture organization of the United Nations (FAO), the Arab Organization for Agricultural Development, and the Central Administration for Agricultural Economics of the Ministry of Agriculture and Land Reclamation.

RESULTS AND DISCUSSION

Rice Acreage and Productivity per Feddan:

Rice cultivated area fluctuated during the period 1990-2006 between a minimum of 1036 thousand feddan in 1990 and a maximum of 1593 thousand feddan in 2006 Table 1. Data in the table indicate also that rice yield increased from 3.056 tons/feddan in 1990 to 4.234 tons/feddan in 2006, which resulted in increasing the overall production from 3166 thousand tons in 1990 to about 6744 thousand tons in 2006. In addition, estimating the general regression equations for cultivated area, yield, and total production of summer rice during the period 1990-2006 (Table 3) showed that rice acreage increased significantly at annual rate of 26.90 thousand tons, whilst yield increased significantly at annual rate of 0.076 equivalent to 2.1% of the average productivity per feddan, which emphasizes the role of new and improved varieties. Moreover, total production increased significantly at annual rate of 201.29 thousand tons during the same period.

Total Cost per Feddan:

Total cost per feddan increased during the studied period from about L.E 521/feddan in 1990 to about L.E 2658/feddan in 2006, with an average of L.E 1557/feddan during the studied period (Table 1). The general regression equation No. 4 indicates an increasing trend estimated by L.E 117.56 annually, equivalent to 7.55% of the average cost for that period. This increase proved to be significant, which means that 96% of the factors affecting the cost per feddan are explained by the time variable (Table 3).

Net Revenue per Feddan:

Net revenue increased from L.E 641/feddan in 1990 to about L.E 1226.90/feddan in 1996, then declined to L.E 709/feddan in 2001 before increasing to L.E 2029/feddan in 2006 (Table 1). The estimated general regression equation No. 6 indicates that net revenue has been increased at significantly at annual rate of L.E 84.18 equivalent to 78% of the average revenue for that period. It can be noted that despite the percent of change in farm cost is higher than that farm-gate price, the increase in net revenue proved to be significant due to the positive impact of new high yielding varieties on total production and net income.

Rice Consumption and Average Share Per Capita:

Studying the evolution of rice consumption in Egypt during the studied period shows that it increased to 5777 thousand tons in 2006. This increase is estimated by 3715.80 thousand tons representing 180.30% of rice consumption in 1990. The increase in rice consumption can be attributed to the increases in population, wheat prices, and per capita share which rose from 32 kg/year in 1990 to about 44 kg/year in 2006 (Table 2).

The estimated general regression equation for average share per capita indicates that it increased significantly at annual rate of 0.655 kg/year equivalent to 1.67% of average share per capita for that period. The study deduced that self-sufficiency in rice increased from 153.60% in 1990 to 178.70% in 1997 then declined to 115% in 2006, which can be attributed to the increase in rice consumption despite the increase in rice production.

Table 1: Evolution of rice acreage, production, yield, average cost, farm-gate price and net revenue during the period of 1990-2006.

| Year | Cultivated Area ('000 Feddan) | Total Production ('000 Tons) | Yield(Ton) | Average Cost (L.E/Feddan) | Farm-gate Price (L.E/ton) | Average Net Revenue (L.E/Fed) |
|------|----------------------------------|---------------------------------|------------|------------------------------|------------------------------|----------------------------------|
| 1990 | 1036 | 3166 | 3.056 | 521.00 | 367.0 | 641.1 |
| 1991 | 1080 | 3410 | 3.160 | 694.4 | 435.8 | 719.1 |
| 1992 | 1215 | 3908 | 3.218 | 838.4 | 451.4 | 667.9 |
| 1993 | 1282 | 4159 | 3.245 | 1113.2 | 504.2 | 587.1 |
| 1994 | 1387 | 4582 | 3.326 | 1173.3 | 605.4 | 906.5 |
| 1995 | 1400 | 4788 | 3.420 | 1257.3 | 656.1 | 1064.4 |
| 1996 | 1406 | 4895 | 3.484 | 1307.4 | 702.2 | 1226.9 |
| 1997 | 1550 | 5480 | 3.536 | 1426.8 | 717.9 | 1210.0 |
| 1998 | 1225 | 4450 | 3.633 | 1703.9 | 723.8 | 1023.6 |
| 1999 | 1559 | 5817 | 3.730 | 1750.6 | 730.9 | 1073.56 |
| 2000 | 1569 | 6000 | 3.825 | 1692.3 | 582.6 | 615.3 |
| 2001 | 1340 | 5227 | 3.900 | 1685.2 | 592.2 | 709.00 |
| 2002 | 1547 | 6105 | 3.945 | 1760.00 | 671.5 | 983.00 |
| 2003 | 1508 | 6176 | 4.095 | 2059.00 | 992.0 | 2113 |
| 2004 | 1537 | 6352 | 4.133 | 2373 | 1024 | 1969 |
| 2005 | 1459 | 6124 | 4.199 | 2455 | 1069 | 2149 |
| 2006 | 1593 | 6744 | 4.234 | 2658 | 1077 | 2029 |

Source: Ministry of Agriculture and Land Reclamation, the Central Administration for Agricultural Economics, Statistics Dept. Records, Unpublished Data.

Table 2: Evolution of average share per capita, total consumption, self-sufficiency, and the volume and value of Egyptian rice exports during the period 1990-2006.

| Year | Average Share per Capita Kg/year | Total Consumption('000 tons) | Self-Sufficiency% |
|------|----------------------------------|------------------------------|-------------------|
| 1990 | 31.98 | 2061.4 | 153.6 |
| 1991 | 32.72 | 2214.8 | 154.00 |
| 1992 | 34.30 | 2401.00 | 162.8 |
| 1993 | 36.32 | 2595.3 | 160.3 |
| 1994 | 38.55 | 2792.0 | 164.1 |
| 1995 | 40.82 | 2992.0 | 160.00 |
| 1996 | 40.8 | 3043.7 | 160.8 |
| 1997 | 40.12 | 3066.7 | 178.7 |
| 1998 | 38.81 | 3007.9 | 147.9 |
| 1999 | 39.52 | 3158.14 | 184.2 |
| 2000 | 38.87 | 3231.45 | 185.7 |
| 2001 | 37.80 | 3235.8 | 161.5 |
| 2002 | 42.81 | 3670.09 | 166.3 |
| 2003 | 41.52 | 3670.47 | 168.3 |
| 2004 | 42.16 | 5521.00 | 115.1 |
| 2005 | 45.8 | 5330.9 | 122.1 |
| 2006 | 43.93 | 5777.2 | 114.9 |

Source: The Central Agency for Public Mobilization and Statistics, Foreign Trade Bulletins, Different Issues.
<http://www.fao.org>

Rice Exports:

Study of the evolution in Egyptian rice exports during the period 1990-2006 indicates severe fluctuations. The volume of rice exports reached a minimum of 75.70 thousand tons worth US \$ 18.20 million in 1990, while it reached a maximum of 1112.90 thousand tons worth US \$ 311 million in 2005 (Table 4). In addition, the estimated general regression equation for rice exports indicates a significant rate of increase estimated by 54.70 thousand tons annually representing 12.9% of the average rice exports for that period (Table 3). Moreover, the estimated general regression equation No. 10 indicates that the value of rice exports increased significantly at annual rate of US \$ 14.90 million equivalent to 12.4% of the period's average export value (Table 3).

On the other hand, equation (11) indicates that Egyptian rice export price declined insignificantly at rate of US \$ 1.851 equivalent to 0.6% of the period's average export price. The study revealed that Egyptian rice exports are concentrated in eight countries, namely Syria, Turkey, Lebanon, Sudan, Libya, Saudi Arabia, Jordan, and Romania. The volume of exports to these countries ranged between a minimum of 65% of the total volume of Egyptian rice exports, the value of which represents 68% of the total value of rice exports in 2001, and a maximum of 92% of the total volume of Egyptian rice exports, the value of which represents 92% of the total value of rice exports in 1995 (Table 1 in the Annex).

Table 3: General regression equation for rice crop variables in Egypt during the period (1990-2006).

| No. | Variable | Unit | Equation | R ² | Sig. | Annual Average | Rate of Change % |
|-----|--------------------------|----------|---|----------------|------|----------------|------------------|
| 1 | Area | '000 Fed | $\hat{Y}_t = 1151.806 + 26.877X_t$ (4.81) | 0.61 | ** | 1393.7 | 2.45 |
| 2 | Yield | Ton | $\hat{Y}_t = 2.966 + 0.0763X_t$ (4.872) | 0.99 | ** | 3.655 | 2.09 |
| 3 | Total Production | '000 Fed | $\hat{Y}_t = 3324.14 + 201.29X_t$ (10.986) | 0.89 | ** | 5145.18 | 3.91 |
| 4 | Farm Costs | L.E | $\hat{Y}_t = 496.38 + 117.557X_t$ (7.351) | 0.96 | ** | 1556.99 | 7.55 |
| 5 | Farm-gate Price | L.E | $\hat{Y}_t = 350.908 + 38.713X_t$ (7.281) | 0.78 | ** | 700.18 | 5.53 |
| 6 | Net Revenue | L.E | $\hat{Y}_t = 399.216 + 84.177X_t$ (4.604) | 0.59 | ** | 1158.10 | 7.27 |
| 7 | Average Per Capita Share | kg | $\hat{Y}_t = 33.405 + 0.655X_t$ (6.661) | 0.75 | ** | 39.22 | 1.67 |

Table 3: Continuation

| | | | | | | | |
|----|-------------------|---------------|--|------|----|---------|-------|
| 8 | Total Consumption | '000 Ton | $\hat{Y}_t = 1625.896 + 196.433X_t$ (7.621) | 0.80 | ** | 3398.23 | 5.78 |
| 9 | Exports Volume | '000 Ton | $\hat{Y}_t = -70.401 + 54.86X_t$ (8.09) | 0.81 | ** | 423.41 | 12.92 |
| 10 | Exports Value | US \$ Million | $\hat{Y}_t = -13.723 + 14.929X_t$ (6.692) | 0.75 | ** | 120.64 | 12.39 |
| 11 | Export Price | US \$ Million | $\hat{Y}_t = -309.112 + 1.858X_t$ (0.697) | 0.17 | ** | 292.4 | 0.60 |

* Significant at 0.05 Level of Confidence; ** Significant at 0.01 Level of Confidence
Source: Calculated from Tables (1) and (2) in the Annex.

\hat{Y}_t = The Estimated Value of the Studied Variable.
 X_t = The Time Variable, where t = 1, 2, ..., 17.

Table 1: Main Importing Countries of Egyptian Rice (Value in Million US\$, and Quantity in Thousand Tons).

| | | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|----------|---------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|--------|--------|
| Syria | Q | 94.57 | 60.14 | 48.69 | 41.67 | 46.71 | 62.67 | 88.30 | 128.31 | 83.01 | 124.02 | 192.90 | 183.601 | 193.75 | 204.33 |
| | V | 32.97 | 22.32 | 18.71 | 13.35 | 15.96 | 19.04 | 25.84 | 28.78 | 21.59 | 33.24 | 56.03 | 62.71 | 71.36 | 73.11 |
| Turkey | Q | 64.36 | 10.68 | 23.93 | 46.62 | 107.08 | 64.54 | 63.95 | 93.63 | 75.93 | 126.87 | 84.48 | 123.25 | 129.63 | 155.97 |
| | V | 19.91 | 3.87 | 7.91 | 18.09 | 35.54 | 21.27 | 18.09 | 18.88 | 15.60 | 29.45 | 24.60 | 35.10 | 38.77 | 54.39 |
| Lebanon | Q | 13.09 | 6.95 | 11.48 | 13.67 | 15.52 | 10.15 | 8.74 | 13.63 | 11.97 | 19.74 | 26.35 | 31.07 | 15.77 | 22.08 |
| | V | 3.95 | 2.59 | 4.68 | 5.21 | 6.01 | 3.15 | 2.38 | 2.92 | 3.47 | 5.61 | 8.03 | 9.82 | 5.60 | 7.91 |
| Sudan | Q | 10.29 | 13.25 | 26.55 | 13.24 | 33.48 | 11.85 | 23.03 | 37.96 | 32.01 | 30.01 | 47.61 | 47.27 | 52.06 | 47.42 |
| | V | 3.65 | 4.54 | 5.90 | 5.06 | 9.27 | 3.44 | 6.41 | 7.07 | 7.03 | 6.23 | 11.42 | 16.79 | 13.78 | 12.33 |
| Libya | Q | 7.32 | 21.00 | 15.5 | 1.75 | 16.54 | 1.28 | 71.86 | 50.92 | 32.27 | 73.87 | 38.65 | 137.35 | 83.31 | 158.74 |
| | V | 2.39 | 8.85 | 6.26 | 0.82 | 6.28 | 0.28 | 24.47 | 13.97 | 9.54 | 26.36 | 11.08 | 43.78 | 28.40 | 71.93 |
| Arabia | Q | 5.98 | 4.61 | 12.44 | 1.41 | 11.32 | 4.82 | 11.44 | 12.46 | 12.83 | 11.99 | 35.71 | 39.09 | 21.83 | 60.04 |
| | V | 1.62 | 1.78 | 5.18 | 1.06 | 6.31 | 1.63 | 3.17 | 2.99 | 3.44 | 3.15 | 8.80 | 9.54 | 7.50 | 18.07 |
| Jordan | Q | 3.26 | 7.2 | 53.62 | 4.52 | 26.75 | 23.04 | 10.88 | 22.35 | 51.85 | 43.47 | 50.58 | 50.03 | 115.08 | 116.58 |
| | V | 0.902 | 3.24 | 24.03 | 2.08 | 8.88 | 8.37 | 3.28 | 4.87 | 12.48 | 11.63 | 12.84 | 12.32 | 25.59 | 26.45 |
| Romania | Q | 0.493 | 20.39 | 46.94 | 39.29 | 60.37 | 55.64 | 38.85 | 65.08 | 64.80 | 48.54 | 64.57 | 70.87 | 38.62 | 29.79 |
| | V | 0.099 | 4.92 | 11.67 | 12.10 | 18.41 | 12.51 | 7.56 | 11.38 | 11.68 | 10.29 | 16.04 | 17.79 | 11.07 | 9.62 |
| Quantity | Total | 199.38 | 144.22 | 239.15 | 162.15 | 317.77 | 233.98 | 317.04 | 424.34 | 364.65 | 478.5 | 540.95 | 705.53 | 650.05 | 794.95 |
| | % from Rice Exports | 86.83 | 92.0 | 73.44 | 80.55 | 75.42 | 76.25 | 88.06 | 65.25 | 80.95 | 83.61 | 67.32 | 69.35 | 70.87 | 70.76 |
| Value | Total | 65.49 | 52.11 | 84.33 | 57.76 | 106.68 | 69.69 | 91.21 | 90.84 | 84.83 | 126.06 | 148.83 | 207.86 | 202.06 | 273.81 |
| | % from Rice Exports | 88.7 | 91.86 | 72.58 | 81.05 | 79.38 | 79.60 | 88.09 | 68.35 | 82.08 | 85.16 | 66.89 | 70.62 | 70.34 | 68.92 |

Source: <http://www.capmas.gov.eg/>; <http://www.aoad.org>.

Table 2: Quantities and prices of rice exports by main competing countries during the period 1990-2007. (price in US \$ and quantity in thousand tons).

| | | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|-----------|---|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| USA | Q | 1873 | 1592 | 1669 | 1906 | 1997 | 2267 | 1786 | 1467 | 1446 | 1478 | 1360 | 1449 | 1665 | 1900 | 1675 | 4433 | 3849 | 3495 |
| | V | 346 | 358 | 361 | 310 | 381 | 333 | 402 | 422 | 412 | 376 | 356 | 307 | 270 | 299 | 412 | 291 | 334 | 399 |
| Vietnam | Q | 1624 | 1033 | 1946 | 1722 | 1983 | 1988 | 3003 | 3575 | 3730 | 4508 | 4377 | 3729 | 3241 | 3813 | 4087 | 3040 | 4642 | 3841 |
| | V | 188 | 226 | 215 | 211 | 214 | 267 | 285 | 244 | 273 | 227 | 154 | 168 | 224 | 189 | 232 | 463 | 275 | 369 |
| Pakistan | Q | 744 | 1205 | 1512 | 1073 | 984 | 1852 | 1601 | 1767 | 1791 | 2016 | 2424 | 1684 | 1820 | 1817 | 3475 | 3546 | 2702 | 2702 |
| | V | 325 | 286 | 272 | 310 | 246 | 250 | 321 | 1116 | 288 | 330 | 264 | 215 | 273 | 309 | 344 | 316 | 325 | 424 |
| India | Q | 505 | 678 | 580 | 768 | 890 | 4894 | 2505 | 4888 | 1842 | 1527 | 2142 | 2142 | 4969 | 3372 | 4665 | 4088 | 4748 | 4418 |
| | V | 511 | 457 | 638 | 536 | 434 | 288 | 354 | 184 | 810 | 122 | 305 | 325 | 242 | 264 | 310 | 345 | 327 | 336 |
| China | Q | 405 | 817 | 1029 | 1457 | 970 | 234 | 251 | 943 | 3682 | 2658 | 2884 | 1923 | 1951 | 2457 | 772 | 672 | 1237 | 1326 |
| | V | 242 | 223 | 225 | 176 | 291 | 235 | 354 | 265 | 530 | 233 | 183 | 166 | 180 | 183 | 236 | 334 | 330 | 361 |
| Italy | Q | 424 | 538 | 602 | 407 | 465 | 417 | 464 | 520 | 504 | 560 | 575 | 484 | 514 | 499 | 555 | 856 | 720 | 731 |
| | V | 623 | 561 | 611 | 658 | 703 | 729 | 793 | 615 | 605 | 564 | 480 | 469 | 484 | 583 | 585 | 532 | 607 | 738 |
| Australia | Q | 176 | 211 | 442 | 414 | 556 | 508 | 432 | 576 | 481 | 573 | 539 | 499 | 129 | 100 | 22 | 52 | 320 | 192 |
| | V | 364 | 327 | 345 | 345 | 387 | 403 | 424 | 438 | 410 | 408 | 380 | 309 | 310 | 420 | 545 | 603 | 513 | 615 |

Source: <http://www.fao.org>

The estimated general regression equations for the volume and the value of Egyptian rice exports to the main importing countries indicate that they have increased significantly at rate annual during the studied period 1994-2007 except for Romania (Table 5).

Rice Exports of Competing Countries:

USA, Vietnam, Pakistan, India, China, Italy, and Australia are considered the main competitors for Egypt in the field of rice exports. Table (2) in the Annex indicates that total rice exports of these countries reached 16705 thousand tons in 2007, whereas Egyptian rice exports reached 585.80 thousand tons representing 3.5% of the total exports of the previously mentioned competing countries in 2007. Table (6) in the Annex illustrates the estimated general regression equations for the volumes and prices of competing countries' rice exports over the period 1990-2007. The estimated equations indicate a statistically insignificant annual increase in China's volume of rice exports, and an insignificant annual decline in USA, Italy and Australia's volume of rice exports. In addition, the estimated equations for Vietnam, Pakistan, and India indicate statistically significant annual increases in the volume of their rice exports. Regarding rice export prices, the estimated equations

indicate that Pakistan and Australia's export prices have been increased insignificantly at annual rates of US \$ 0.3 and 4.8 per ton, respectively, whilst USA, Vietnam, India, China and Italy's export prices have declined at insignificant annual rates during the studied period.

The previously mentioned findings indicate an inverse relationship between the volume and price of exports for each of Vietnam, India, China, and Australia, which complies to the logic of economic theory. On the contrary some findings indicate a direct relationship between the volume and price of rice exports for USA, Pakistan and Italy, which can be explained by the impact of quality on price, especially for the high quality of American rice.

Export Performance Indicators for Egyptian Rice:

This part of the study concentrates on some export performance indicators for Egyptian rice such as the non-stability coefficient, the competitive price position, market share, and market penetration indicators.

1. Non-stability Coefficient:

Agricultural exports are subject to price fluctuations and low elasticity of demand in foreign markets. Therefore, the desired level of agricultural exports cannot be achieved by realizing suitable revenue at some specific period of time only, but also by realizing the stability of that revenue. The non-stability coefficient is calculated using the following formula:

$$\text{Non-stability Coefficient} = 100 \times \left(\frac{y - \hat{y}}{\hat{y}} \right)$$

Where y = the real value of rice exports quantity or price.

\hat{y} = the estimated value of rice exports quantity or price.

Based on this method, the optimum stability of agricultural exports is reached when the non-stability coefficient is equal to zero.

Table (4) shows that the volume of rice exports (in thousand tons) were unstable over the studied period 1990-2007, where the estimated non-stability coefficient for the quantity surpassed zero in all the years of the studied period. It ranged between a minimum of 1.95 in 2006 and a maximum of 60.8 in 1995, and reached 31.4 as the period's average.

Table 4: Evolution of the volume and value of Egyptian rice exports over the period 1990-2007.

| Year | Volume of Exports'000 Tons | Value of Exports'000 Tons | Export PriceUS \$/Ton | Non-stability Coefficient | |
|------|----------------------------|---------------------------|-----------------------|---------------------------|------------------|
| | | | | Volume of Exports | Value of Exports |
| 1990 | 75.7 | 18.2 | 240.4 | 39.6- | 21.76- |
| 1991 | 151.0 | 38.7 | 256.3 | 16.2- | 16.1- |
| 1992 | 187.5 | 57.3 | 305.6 | 20.2- | 0.678 |
| 1993 | 144.1 | 40.1 | 278.3 | 50.3- | 7.75- |
| 1994 | 247.2 | 78.6 | 318.0 | 28.3- | 6.1 |
| 1995 | 156.8 | 65.7 | 419 | 60.8- | 40.62 |
| 1996 | 327.9 | 117.7 | 359 | 27.8- | 21.24 |
| 1997 | 202.6 | 71.4 | 352.4 | 60.2- | 19.76 |
| 1998 | 428.9 | 135.2 | 315.2 | 24.0- | 7.43 |
| 1999 | 306.7 | 87.5 | 285.3 | 50.5- | 1.8- |
| 2000 | 389.9 | 112.2 | 287.8 | 42.14 | 0.30- |
| 2001 | 650.3 | 133.0 | 204.5 | 10.8- | 28.7- |
| 2002 | 452.5 | 103.4 | 228.5 | 42.2- | 12.13- |
| 2003 | 572.3 | 143.3 | 250.4 | 31.7- | 1.95- |
| 2004 | 807.0 | 224.0 | 277.6 | 9.7- | 1.3- |
| 2005 | 1112.9 | 311.0 | 279.5 | 17.4 | 0.05- |
| 2006 | 983.4 | 313.5 | 318.8 | 1.95 | 14.87 |
| 2007 | 1224 | 400.00 | 326.8 | 31.40 | 11.91 |

Source: The Arab Organization for Agricultural Development, Statistical Yearbook, Different Issues.

* Calculated using the percent average deviation based on the following formula (Massel, 1990):

$$\text{Non-stability Coefficient} = 100 \times \left(\frac{y - \hat{y}}{\hat{y}} \right)$$

Where \hat{y} = the estimated value; y = the real value

Table 5: The estimated general regression equations for the volume and value of Egyptian rice exports to importing countries during the period 1994-2007.

| No. | Country | | Equation | R ² | Sig. | F | Rate of Change % |
|-----|--------------|---|--|----------------|------|--------|------------------|
| 1 | Syria | Q | $\hat{Y}_{t1} = 17.654 + 12.435X_t$ (5.896) | 0.74 | ** | 34.763 | 11.2 |
| | | V | $\hat{Y}_{t2} = 4.814 + 4.073X_t$ (4.721) | 0.65 | ** | 22.291 | 11.5 |
| 2 | Turkey | Q | $\hat{Y}_{t1} = 20.654 + 8.398X_t$ (5.308) | 0.70 | ** | 28.172 | 10.04 |
| | | V | $\hat{Y}_{t2} = 6.66 + 2.364X_t$ (3.888) | 0.58 | * | 15.117 | 9.69 |
| 3 | Lebanon | Q | $\hat{Y}_{t1} = 7.316 + 1.22X_t$ (3.250) | 0.47 | * | 10.62 | 7.8 |
| | | V | $\hat{Y}_{t2} = 2.621 + 0.33X_t$ (2.666) | 0.37 | * | 7.106 | 6.5 |
| 4 | Sudan | Q | $\hat{Y}_{t1} = 5.669 + 3.521X_t$ (5.178) | 0.69 | * | 26.81 | 11.00 |
| | | V | $\hat{Y}_{t2} = 2.242 + 0.776X_t$ (4.60) | 0.64 | * | 21.164 | 9.6 |
| 5 | Libya | Q | $\hat{Y}_{t1} = -21.256 + 9.599X_t$ (4.835) | 0.66 | * | 23.379 | 18.9 |
| | | V | $\hat{Y}_{t2} = -8.964 + 3.618X_t$ (4.066) | 0.58 | * | 16.530 | 19.9 |
| 6 | Saudi Arabia | Q | $\hat{Y}_{t1} = -5.514 + 3.078X_t$ (4.348) | 0.61 | * | 18.909 | 17.5 |
| | | V | $\hat{Y}_{t2} = -8.31 + 0.811X_t$ (3.705) | 0.53 | * | 13.731 | 15.4 |
| 7 | Jordan | Q | $\hat{Y}_{t1} = -10.245 + 6.882X_t$ (4.441) | 0.62 | * | 19.723 | 16.6 |
| | | V | $\hat{Y}_{t2} = 1.725 + 1.265X_t$ (2.666) | 0.37 | - | 19.723 | 11.30 |
| 8 | Romania | Q | $\hat{Y}_{t1} = 30.056 + 2.128X_t$ (1.737) | 0.20 | - | 3.017 | 4.6 |
| | | V | $\hat{Y}_{t2} = 7.211 + 516X_t$ (1.738) | 0.20 | - | 3.022 | 4.7 |

* Significant at 0.05 Level of Confidence; ** Significant at 0.01 Level of Confidence

Source: Calculated from Table (1) in the Annex.

\hat{Y}_{t1} = The Estimated Volume of Egyptian Rice Exports to Importing Countries.

\hat{Y}_{t2} = The Estimated Value of Egyptian Rice Exports to Importing Countries.

X_t = The Time Variable, where t = 1, 2,, 14.

Table 6: The estimated general regression equations for the volume and price of rice of competing countries during the period 1990-2004.

| No. | Country | | Equation | R ² | Sig. | F | Rate of Change% |
|-----|-----------|---|--|----------------|------|--------|-----------------|
| 1 | USA | Q | $\hat{Y}_1 = -1581 + 18.625X_t$ (1.262) | 0.11 | ** | 1.59 | |
| | | V | $\hat{Y}_{12} = 365.99 - 1.207X_t$ (0.426) | 0.014 | | 0.182 | 0.34 |
| 2 | Vietnam | Q | $\hat{Y}_1 = 1203.752 + 209.189X_t$ (6.199) | 0.75 | ** | 38.425 | 7.41 |
| | | V | $\hat{Y}_{12} = 230.114 - 1.139X_t$ (0.497-) | 0.019 | - | 0.247 | 0.52 |
| 3 | Pakistan | Q | $\hat{Y}_1 = 1015.476 + 74.907X_t$ (4.05) | 0.56 | * | 16.404 | 4.64 |
| | | V | $\hat{Y}_{12} = 341.067 - 0.275X_t$ (0.02) | - | - | - | 0.08 |
| 4 | India | Q | $\hat{Y}_1 = 450.638 + 246.729X_t$ (3.035) | 0.42 | * | 9.209 | 10.2 |
| | | V | $\hat{Y}_{12} = 546.819 - 20.186X_t$ (2.066-) | 0.28 | - | 4.269 | 5.24 |
| 5 | China | Q | $\hat{Y}_1 = 554.962 + 117.621X_t$ (2.08) | 0.25 | - | 4.334 | 7.9 |
| | | V | $\hat{Y}_{12} = 268.105 + 2.496X_t$ (0.439) | 0.015 | - | 0.192 | 1.0 |
| 6 | Italy | Q | $\hat{Y}_{11} = 317.524 + 2.107X_t$ (0.878-) | 0.06 | - | 0.771 | 0.7 |
| | | V | $\hat{Y}_{12} = 268.105 - 2.496X_t$ (-0.439) | 0.015 | - | 0.192 | 1.00 |
| 7 | Australia | Q | $\hat{Y}_{11} = 458.371 - 0.146X_t$ (0.873-) | 0.055 | - | 0.673 | 2.7 |
| | | V | $\hat{Y}_{12} = 351.219 + 4.789X_t$ (1.395) | 0.13 | - | 1.947 | 1.23 |

* Significant at 0.05 Level of Confidence; ** Significant at 0.01 Level of Confidence

Source: Calculated from Table (2) in the Annex.

\hat{Y}_{11} = The Estimated Volume of Egyptian Rice Exports to a Specific Country.

\hat{Y}_{12} = The Estimated Value of Egyptian Rice Exports to a Specific Country.

X_t = The Time Variable, where t = 1, 2, ..., 18.

As for the non-stability coefficient for rice export price in US \$ per ton, its value surpassed zero for all the studied years indicating the instability of price over these years. However, it approached zero in 2005 where it reached 0.05. In addition, the period's average value of the non-stability coefficient reached 11.91.

2. Competitive Price Position Indicator:

The relative price is considered the most important factor affecting the competitive position of commodities in international markets. However, this depends on the demand's sensitivity for price changes. This indicator can be estimated by finding the ratio between the Egyptian export price of a certain commodity and the same commodity's export price in competing countries. If the result is less than 1, this indicates that Egypt has a comparative price advantage in exporting this crop.

Table (7) indicates that Egypt has a comparative price advantage in exporting rice over USA, Italy, Australia, Pakistan and India, where the ratio of Egyptian export price per ton relative to rice export price in each of these countries was less than 1 during the studied period (2001-2007), except that it reached 0.98 relative to Pakistan's rice export price in 2006, and about 0.97 relative to India's rice export price in the same year.

The calculated period's averages reveal that Egyptian rice export price per ton represented 80% of USA's export price, 46% of Italy's export price, 57%, 84%, and 85% of Australia, Pakistan, and India's export prices, respectively. As for Vietnam and China's rice export prices, the calculated relative price ratio was greater than 1 during the period 2001-2007. Moreover, the calculated period's averages reveal that Egyptian rice export price per ton represented 1.03% and 1.08% of Vietnam and China's export price, respectively, which means that Egypt does not have a comparative price advantage in rice exports where Vietnam and China are concerned.

3. Market Share Indicator:

This indicator expresses the percent of the quantity exported from a certain commodity by a particular country to a specific market relative to the total market imports from that commodity. The higher the value of this indicator, the higher the competitive position of that country.

$$\text{Market Share} = \frac{\text{Quantity Exported from a Certain Commodity by a Particular Country to a Specific Market}}{\text{Total Market Imports from that Commodity}} \times 100$$

Data in Table (1) in the Annex indicate that Syria, Lebanon, Sudan, Libya, Saudi Arabia, Jordan, and Romania's average imports during the period 1994-2007 amounted to 111, 84, 16, 32, 51, 18, 41, and 46 thousand tons, respectively representing about 21.5%, 16.3%, 3.1%, 6.2%, 9.9%, 3.5%, 7.9%, and 8.9% of average rice exports during the same period.

Table (8) shows that the market share of Egyptian rice reached its highest level in the Sudanese market where it reached 85% as average of the period 2001-2007. In addition, it reached a maximum of 96.1% in the Sudanese market in 2004, whilst reached a minimum of 77.2% in 2001 in the same market. Table (8) also indicated Romania and Syria second and third ranked where Egypt's share in these markets reached 73.6% and 63.5%, respectively. As for Jordan Libya, and Turkey, they ranked fourth, fifth, and sixth where Egypt's share in these markets reached 49.2% 48.3%, and 42.2% respectively as averages of the studied period. Lebanon ranked seventh where Egypt's share in the Lebanese market reached 41.4%. Finally, Saudi Arabia rank was the eighth where Egypt's share in the Saudi market reached 2.4% as average of the same period.

- Market Penetration Ratio:

This is one of the most commonly used measures of competitiveness. It is the ratio between a particular country's imports from a specific commodity and its apparent consumption from that commodity. It can be calculated using the following formula:

$$\text{Market Penetration Ratio} = \frac{\text{Market Imports from the Egyptian Commodity}}{\text{Total Market Imports from the Commodity+the Country's Total Production form that Commodity Export form the Commodity}} \times 100$$

the higher the calculated value the wider the market, and the easier it can be penetrated.

Table 7: Competitive price position indicator for Egyptian rice relative to rice export price in some competing countries during the period 2001-2007.

| Year | Price per Ton of Egyptian Rice Relative to the Price of Competing Countries | | | | | | |
|---------|---|-------|-----------|----------|-------|---------|-------|
| | USA | Italy | Australia | Pakistan | India | Vietnam | China |
| 2001 | 0.67 | 0.44 | 0.66 | 0.95 | 0.63 | 1.22 | 1.23 |
| 2002 | 0.85 | 0.47 | 0.74 | 0.84 | 0.95 | 1.02 | 1.27 |
| 2003 | 0.84 | 0.43 | 0.60 | 0.81 | 0.95 | 1.32 | 1.37 |
| 2004 | 0.67 | 0.47 | 0.51 | 0.81 | 0.90 | 1.20 | 1.18 |
| 2005 | 0.96 | 0.53 | 0.46 | 0.88 | 0.81 | 0.60 | 0.84 |
| 2006 | 0.95 | 0.53 | 0.62 | 0.98 | 0.97 | 1.16 | 0.97 |
| 2007 | 0.64 | 0.35 | 0.42 | 0.60 | 0.76 | 0.69 | 0.71 |
| Average | 0.80 | 0.46 | 0.57 | 0.84 | 0.85 | 1.03 | 1.08 |

Source: Calculated from Tables (4) and (2) in the Annex.

Table 8: Market Share Indicator for the Volume of Egyptian Rice Exports to Main Importing Countries Over the Period 2001-2007.

| Year | Market Share Indicator for the Main Importers of Egyptian Rice | | | | | | | |
|---------|--|--------|---------|-------|-------|--------------|--------|---------|
| | Syria | Turkey | Lebanon | Sudan | Libya | Saudi Arabia | Jordan | Romania |
| 2001 | 45.5 | 38.4 | 29.8 | 77.2 | 40.8 | 1.63 | 19.5 | 86.5 |
| 2002 | 45.9 | 22.0 | 26.2 | 82.4 | 34.9 | 1.9 | 49.5 | 84.5 |
| 2003 | 64.2 | 30.8 | 38.2 | 80.0 | 68.3 | 1.8 | 34.1 | 66.6 |
| 2004 | 81.2 | 21.4 | 51.2 | 96.1 | 31.0 | 3.00 | 37.2 | 85.8 |
| 2005 | 69.2 | 40.7 | 80.9 | 86.5 | 43.6 | 3.9 | 38.4 | 88.8 |
| 2006 | 74.2 | 50.2 | 32.0 | 88.2 | 70.0 | 2.25 | 83.2 | 47.8 |
| 2007 | 64.5 | 92.2 | 31.2 | 84.3 | 49.8 | 2.43 | 82.5 | 55.2 |
| Average | 63.5 | 42.2 | 41.4 | 85.0 | 48.3 | 2.4 | 49.2 | 73.6 |

Source: Calculated from Tables (4) and (2) in the Annex.

Table 9: Market Penetration Rate for Egyptian Rice Exports to Main Importing Countries during the Period 2001-2007.

| Indicator Year | Market Penetration Ratio | | | | | | | |
|----------------|--------------------------|--------|---------|-------|-------|--------------|--------|---------|
| | Syria | Turkey | Lebanon | Sudan | Libya | Saudi Arabia | Jordan | Romania |
| 2001 | 0.46 | 0.28 | 0.30 | 0.66 | 0.41 | 0.016 | 0.20 | 0.85 |
| 2002 | 0.46 | 0.11 | 0.26 | 0.70 | 0.35 | 0.019 | 0.50 | 0.84 |
| 2003 | 0.64 | 0.21 | 0.18 | 0.56 | 0.68 | 0.018 | 0.34 | 0.66 |
| 2004 | 0.81 | 0.10 | 0.51 | 0.68 | 0.31 | 0.03 | 0.37 | 0.80 |
| 2005 | 0.69 | 0.11 | 0.81 | 0.64 | 0.44 | 0.039 | 38 | 0.88 |
| 2006 | 0.74 | 0.40 | 0.32 | 0.94 | 0.70 | 0.020 | 0.83 | 0.49 |
| 2007 | 0.65 | 0.82 | 0.31 | 0.84 | 0.50 | 0.024 | 0.83 | 0.50 |
| Average | 0.64 | 0.32 | 0.38 | 0.72 | 0.48 | 0.024 | 0.46 | 0.71 |

Source: Calculated from Table (1) in the Annex.

Table (9) indicates that the highest market penetration value during the period 2001-2007 has been achieved in the Sudanese and Romanian markets where the period's average reached 0.72 and 0.71, respectively, followed by the Syrian market that ranked third with a period's average estimated by 0.64, then the Libyan and Jordanian markets that ranked fourth and fifth with period's averages estimated by 0.48 and 0.46, respectively. As for the Turkish, Lebanese and Saudi markets, it is noted that the values of their market penetration ratio have been low over that period where they reached 0.32, 0.38, and 0.024 indicating the difficulty to penetrate these markets, and the fierce competition Egyptian rice exports face in such markets.

Linking between the Market Share Indicator and Market Penetration Ratio for Egyptian Rice:

The previous analysis reveals that Sudan ranks first in terms of market penetration ratio and market share indicator. Such result means that Egypt has potentiality in increasing its rice exports to this promising market. The Romanian market ranked second in terms of market penetration ratio and market share indicator indicating that Egyptian rice exports to this market can be promoted in the coming period. In addition, the Syrian market ranked third in terms of market penetration ratio and market share indicator indicating that Egyptian rice exports to this market can be further promoted. As regards the Libyan and Jordanian markets, they both occupied a middle position in terms of both indicators indicating the possibility of increasing Egyptian rice exports to both markets. Finally, the Saudi market ranked last in terms of market penetration ratio and market share indicator indicating that Egyptian rice exports to this market cannot be further promoted due to the fact that Saudi consumers prefer long-grain Thai rice over other rice varieties.

Recommendations:

1. Devoting more attention to cultivating improved high-yielding rice varieties.
2. Designing plans that aim at promoting Egyptian rice exports in the framework of integrated production and exporting plans that depend on actual data and information on global demand for Egyptian rice.
3. Planning to achieving export-oriented production, i.e., producing for the purpose of exporting rather than just exporting the surplus.
4. Striving to lower Egyptian rice export prices in markets that can be penetrated so as to raise the Egypt's competitiveness in these markets, and focusing on increasing the volume of exports to Sudan, Roman, Syria, Libya, and Jordan markets since these are the markets to which Egypt can expand in rice exports.

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