AGRICULTURAL DEVELOPMENT SYSTEMS EGYPT PROJECT

UNIVERSITY OF CALIFORNIA, DAVIS

TOMATO SUPPLY, DEMAND AND MARKET STRUCTURE IN EGYPT

by

Mosaad El-Saeed Ragab – Ain Shams University, Egypt
Richard L. Simmons, North Carolina State University
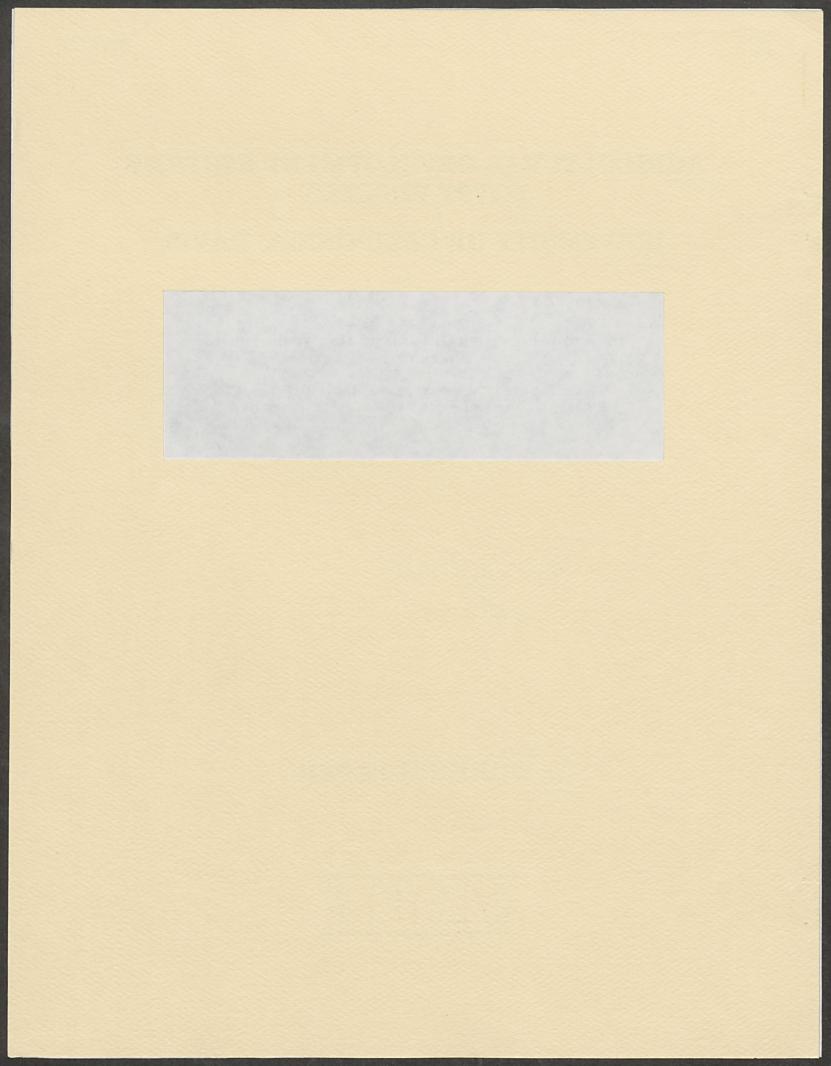
Econ.

WORKING PAPER

ADS/EGYPT

TOMATO SUPPLY, DEMAND AND MARKET STRUCTURE
IN EGYPT
by
Mosaad El-Saeed Ragab - Ain Shams University, Egypt
Richard L. Simmons, North Carolina State University

Economics
Working Paper Series
No. 139

Note: The Research Reports of the Agricultural Development Systems: Egypt Project, University of California, Davis, are preliminary materials circulated to invite discussion and critical comment. These papers may be freely circulated but to protect their tentative character, they are not to be quoted without the permission of the author(s).

April, 1983

Agricultural Development Systems:
Egypt Project
University of California
Davis, Ca 95616

TABLE OF CONTENTS

I. INTRODUCTION

A. Area planted, Yield and Production of Tomatoes

The production of tomatoes utilizes a significant portion of Egypt's resources on a year-round basis. Tomatoes have an important place in the diet of the population in all areas, both rural and urban. The production of tomatoes has more than kept up with the increase in population. From 1965 to 1979 the population increased by 39 percent, but tomatoe production doubled, allowing per capita consumption to increase by 37 percent. (See Table 1.)

Tomato production lagged behind demand in the early 1970's with the result that real prices for tomatoes increased significantly (Table 2), stimulating an increase in acreage planted (Table 3). The real price fell later on in the 1970's for Nili and winter tomatoes, but remained strong for summer tomatoes. The acreage planted in Nili tomatoes decreased in response to the moderation in real prices but acreage of winter tomatoes continued to increase in the face of decreased prices. The continuing increase in winter tomato acreage is something of a puzzle, but may be due to higher yields and better technology, promotion for export purposes, opening up of new land, or perhaps a decrease in relative prices for substitute production enterprises. Wheat and barseem clover are important winter crops that may be competitive with winter tomatoes.

Area, yield and total production by season for the period 1965-79 are given in Table 3. The yields for summer and winter tomatoes appear to have declined in the early 1970's but recovered in the late 1970's.

The production of tomatoes is dispersed widely among the various governorates, as can be seen in Table 4. There appears to be a slight tendency, however, for areas from Cairo south (Upper Egypt) and the Eastern parts of the

Table 1: Annual Estimates of Supply and Disappearance of Tomatoes in Egypt, 1965-81

Year	(1) Production (000 tons)	(2) Waste (000 tons)	(3) Processing	(4) Export	(5) Consumption	(6) Population (millions)	(7) Per Capita Consumption (kgs)
1965	1,242.2	198.7	5.6	3.1	1,034.7	29.4	33.52
1966	1,366.0	218.6	8.1	3.6	1,135.7	30.2	35.79
1967	1,229.8	196.8	9.2	.6	1,023.2	30.9	31.53
1968	1,495.8	239.3	12.5	.5	1,243.5	31.6	37.46
1969	1,547.2	247.6	2.5	.4	1,296.8	32.3	38.21
1970	1,552.9	248.5	6.9	.9	1,296.6	33.1	37.35
1971	1,636.9	261.9	9.2	1.6	1,364.1	33.8	38.41
1972	1,665.4	266.5	6.1	5.1	1,387.8	34.6	38.21
1973	1,575.3	252.0	10.4	4.4	1,308.5	35.4	35.22
1974	1,729.1	276.7	9.8	1.7	1,441.0	36.2	37.93
1975	2,106.7	337.1	14.6	1.9	1,753.2	37.0	45.12
1976	2,066.5	330.6	16.0	2.1	1,717.7	37.8	43.21
1977	1,966.7	314.7	15.2	3.3	1,633.6	38.8	40.04
1978	2,197.4	351.6	32.1	7.1	1,806.6	39.8	43.43
1979	2,420.6	387.3	21.9	3.6	2,007.8	41.0	45.95
1980	2,467.8	394.8					
1981	2,453.6	392.6					

Sources:
    Col. (1): Ministry of Agriculture
    Col. (2): Assumed 16% of Col. (1)
    Col. (3): General Institute of Statistics
    Col. (4): General Institute of Statistics
    Col. (5): Col. (1) minus Cols. (2) - (4)
    Col. (6):
    Col. (7): Col. (5) divided by Col. (6)

2

Table 2: Average Farm Price of Tomatoes by Season, Nominal and Deflated, 1964-1981

Year	Nominal Price			Wholesale Price Index	Real Price		
	Winter	Nili	Summer		Winter	Nili	Summer
	(pounds per ton)				(pounds per ton)		
1964	27.26	21.48	17.29	58.8	46.36	36.53	29.40
1965	21.88	26.53	22.90	63.3	34.57	41.91	36.18
1966	28.38	41.31	25.09	68.9	41.19	59.96	36.41
1967	47.35	24.00	25.55	73.4	64.51	32.70	34.81
1968	33.64	23.78	27.93	71.5	47.05	33.26	39.06
1969	35.25	30.33	21.55	71.2	49.51	42.60	30.27
1970	38.88	29.78	26.30	75.1	51.77	39.65	35.02
1971	32.75	25.00	27.43	75.1	43.61	33.29	36.52
1972	40.07	50.42	28.08	76.1	52.65	66.25	36.90
1973	79.39	57.63	35.83	81.3	97.65	70.89	44.07
1974	88.94	80.33	43.01	93.0	95.63	86.38	46.25
1975	95.84	45.16	32.89	100.0	95.84	45.16	32.89
1976	89.00	63.69	33.32	107.7	82.64	59.14	30.94
1977	90.60	65.88	59.27	118.0	76.78	55.83	50.22
1978	88.52	61.43	61.63	135.2	65.47	45.44	45.58
1979	81.43	68.64	71.43	148.4	54.87	46.25	48.13
1980	86.50	71.55	78.50	180.6	47.90	39.62	43.47
1981	90.57	73.92	84.60	195.0	46.75	37.91	43.38

Table 3: Area, Yield and Production of Tomatoes in Egypt by Season, 1965-1981

| Year | Area (1,000 feddans) | | | Yield (tons per feddan) | | | Production (1,000 tons) | | | |
	Winter	Nili	Summer	Winter	Nili	Summer	Winter	Nili	Summer	Total
1965	73.5	62.5	54.8	5.55	6.75	7.52	407.6	422.2	412.3	1,242.1
1966	73.7	68.0	61.8	6.03	6.60	7.63	444.8	449.3	471.9	1,366.0
1967	73.5	68.6	68.0	3.66	6.59	7.40	269.2	452.4	508.1	1,229.7
1968	87.7	71.9	74.7	4.95	6.86	7.61	434.1	493.3	568.4	1,495.8
1969	92.3	75.2	73.6	5.05	6.73	7.86	466.6	506.0	574.6	1,547.2
1970	88.8	79.5	69.2	5.41	7.12	7.32	480.1	565.8	506.9	1,552.8
1971	89.2	87.6	70.3	5.39	7.19	7.49	480.6	629.8	526.5	1,636.9
1972	91.0	90.3	74.3	5.48	7.19	6.97	498.4	649.0	508.0	1,655.4
1973	95.0	98.4	82.5	3.68	7.34	6.10	349.2	722.5	503.6	1,675.3
1974	92.3	100.2	87.0	4.49	7.30	6.70	414.2	732.1	582.9	1,729.2
1975	104.2	118.1	102.6	4.88	7.30	6.94	508.7	886.7	711.3	2,106.7
1976	109.0	98.0	101.0	5.32	7.60	7.34	579.9	745.0	741.6	2,066.5
1977	105.6	85.4	102.3	5.66	7.64	7.00	598.0	652.6	716.2	1,966.8
1978	113.1	90.2	107.4	5.88	7.68	7.82	664.7	692.5	840.2	2,197.4
1979	127.7	87.7	113.2	6.31	7.48	8.47	805.8	655.7	959.1	2,420.6
1980	135.9	91.4	104.4	6.12	8.03	8.64	832.4	733.9	901.5	2,467.8
1981	138.2	81.4	105.2	6.13	8.04	9.05	847.1	654.5	952.0	2,453.6

Table 4:   Area, Yield and Production of Tomatoes, by Governorate, by Season, Average 1975-79

	Area Planted (feddans)				Yield (tons per feddan)			Production (000 tons)			
	Winter	Summer	Nili	Total	Winter	Summer	Nili	Winter	Summer	Nili	Total
Alexandria	2,214	6,345	2,283	10,842	5.47	6.96	5.98	12.31	44.98	13.64	70.93
Bihera	11,986	19,907	9,631	41,524	6.02	7.91	8.56	72.09	136.12	83.20	291.41
Garbia	1,968	14,672	3,654	20,294	4.95	8.00	7.16	9.39	37.34	26.20	72.93
Kafr El Sheikh	8,699	6,359	4,785	19,843	5.44	6.51	6.19	48.19	41.42	29.23	118.84
Dakahlia	2,181	5,545	13,030	20,756	6.99	7.78	7.69	15.27	43.33	100.38	158.98
Damietta	2,182	4,059	4,910	11,151	5.93	6.43	7.56	12.90	26.23	37.41	76.54
Sharkia	16,914	18,697	12,806	48,417	4.64	7.91	7.82	78.26	147.68	99.53	325.47
Ismailia	5,587	2,421	1,631	9,639	6.10	5.97	6.04	36.19	14.44	9.91	60.54
Suez	1,096	266	345	1,707	6.60	5.55	5.95	7.34	1.49	2.09	10.92
Menofia	2,084	4,758	2,525	9,367	6.07	8.34	8.98	12.37	39.67	24.16	76.20
Kalyobia	2,955	12,403	2,999	18,357	5.41	8.16	7.55	16.18	102.76	23.33	142.27
Cairo	135	203	69	407	5.55	7.50	7.50	.74	1.53	.42	2.96
Giza	16,369	6,885	7,971	31,225	5.39	7.77	6.99	88.55	53.43	55.70	197.67
Beni Suef	4,850	3,593	3,615	12,058	4.80	6.12	7.02	23.51	22.24	25.48	71.23
El Fayum	12,674	1,751	17,753	32,178	5.92	7.38	7.94	75.85	12.85	140.60	229.30
Menia	4,862	2,873	1,966	9,701	5.56	7.68	7.84	26.63	22.00	15.44	64.07
Assuit	4,351	2,765	1,286	8,402	5.96	5.89	6.90	25.88	16.30	8.63	50.81
Sohag	2,792	1,085	586	4,463	6.14	6.23	6.99	17.07	6.75	4.09	27.91
Kina	6,206	522	3,614	10,342	7.40	5.56	7.28	42.37	2.86	26.23	71.46
Aswan	1,811	800	197	2,808	5.71	3.26	4.11	10.32	.25	.81	11.38
TOTAL	111,916	115,909	95,656	323,481	5.61	7.51	7.47	631.42	793.67	726.48	2,151.58

Delta to specialize in winter and Nili tomatoes, and the western parts of the Delta (Alexandria and Beheira) to produce predominantly summer tomatoes. Yields for winter tomatoes are lower than summer and Nili plantings in all parts of Egypt, due primarily to lower temperatures.

B. Marketing of Tomatoes

Tomatoes are marketed in city markets throughout Egypt, the two largest markets being Rod El-Faraq market in Cairo and El Nozha market in Alexandria. It is often said that monopolistic elements exist at the wholesale level in these markets which may lead to non-competitive price behavior and excessive margins. No study is presently available to verify or disprove this belief, but the question will be addressed briefly in this study.

II. OBJECTIVES OF STUDY

The objectives of this study are to:

(1) Evaluate trends in supply and demand for tomatoes in Egypt, and

(2) Evaluate the market structure for tomatoes at the wholesale level, as to its competitiveness and pricing performance.

To accomplish the first objective supply and demand functions are statistically estimated from time-series data and used to evaluate the response of production and consumption to price.

Analyses relating to the second objective include a comparison of pricing performance at the two large wholesale vegetable markets in Egypt with the kind of performance expected in a competitive market. Also, the results of a survey of wholesale and retail handlers of tomatoes conducted over the course of an entire marketing year will be presented.

III. STATISTICAL ESTIMATES OF SUPPLY

To help explain the expansion in tomato acreage discussed above it is help-ful to estimate statistical supply response functions which relate area planted to such factors as the farm prices received for tomatoes, yields, and the rela-tive profitability of other production enterprises. In order to explain the methodology used, a discussion of factors affecting production decisions in given below. It is assumed throughout that the farmer acts to optimize the use of his production resources.

Factors Affecting Production Decisions

There are two sets of factors that complicate the specification of a supply model:

(1) The necessity to use unobservable "expected prices" rather than current prices as the relevant decision variable,

and (2) The adjustment process experienced by a farmer in arriving at "desired acreage" from "present acreage," once the decision as to desired acreage is made.

With respect to (1) above, it is generally accepted that farmers base their pro-duction decisions on "expected" future profits. How farmers form expectations as to future prices and costs is not known in detail, but recent historical information probably enters the decision process.

Some studies use a weighted average of recent realized prices to represent the farmers "expected prices," since expected prices are not observable. Some studies use the market price last year as the expected price, under the assump-tion that the most recent realized price is the principal factor a farmer used in forming an expectation of the price he will receive for his product.

This study uses the latter approach--namely the price realized last year as a predetermined variable affecting supply.

The dependent variable in this study is acreage planted. Since yields and total production are partly affected by weather, and are thus partly out of the farmer's control, they would not represent the farmers production decision as closely as acreage planted, which is under his control.

With regard to (2), once having decided the desired acreage corresponding, to his expected price, a farmer may be unable or unwilling to achieve the desired production goal within one planting season,[1] but may move only partway to that value during one planting season, particularly if large changes in acreage are indicated and investment capital is limited.

Symbolically, if Y^*_t is desired acreage in year t, and Y_t is actual acreage planted, the following relationship would hold:

$$(1) \quad Y_t - Y_{t-1} = \gamma (Y^*_{t-1} - Y_{t-1})$$

where γ is the "coefficient of adjustment," which indicates the rapidity with which the farmer can achieve a desired acreage in year t from an actual acreage in year t-1. If $\gamma = 1$ the farmer can adjust completely within one season and $Y_t = Y^*_{t-1}$. It is presumed that $0 < \gamma < 1$. The smaller is γ the longer it takes to adjust.

Equation (1) can be written

$$(2) \quad Y_t = \gamma Y^*_{t-1} + (1 - \gamma) Y_{t-1}$$

---

[1]Such things as scarcity of production resources or investment capital may preclude immediate achievement of goals.

It is supposed that Y^*_{t-1} depends on a number of other variables which affects desired acreage, such as expected price, cost, input supplies, etc.

Thus

(3) $\quad Y^*_{t-1} = a + b_1 X_1 + b_2 X_2 + \ldots + b_n X_n$

Substituting equation (3) into equation (2) we get:

$Y_t = \gamma a + \gamma b_1 X_1 + \gamma b_2 X_2 + \ldots + \gamma b_n X_n + (1 - \gamma) Y_{t-1}$

In other words Y_t can be expressed as a function of several decision variables and acreage in period t - 1.

This equation can be rewritten and estimated in the following form:

$Y_t = a' b_1' X_1 + b_2' X_2 + \ldots + b_5 Y_{t-1}$

where $b_i' = \gamma b_i$

$\qquad a' = \gamma a$

and $\quad b_5 = 1 - \gamma$

Note that γ, the adjustment coefficient, can be obtained as $1 - b_5$. Having solved for γ the direct elasticities of the other variables are $\dfrac{b_i'}{\gamma}$.

Statistical Model

With this theoretical framework as a background, the following statistical model was used individually for the winter, summer and Nili seasons.

$AREA_t = a + b_{ij} PRICE_{t-1} + b_2 AREA_{t-1} + b_3 YIELD_{t-1} + b_4 PRISUB_{t-1}$

where

$AREA_t$ = area planted in thousands of feddans, year t

$PRICE_{t-1}$ = average farm price for tomatoes, L.E. per ton, deflated by the wholesale price index, in year t-1,

$AREA_{t-1}$ = area planted in year t-1

$YIELD_{t-1}$ = yield in tons per feddan, in year t-1

and $PRISUB_{t-1}$ = average farm price of alternative crops, deflated by the wholesale price index in year t-1

The data used in (Tables 2 and 3) cover the period 1964-1980. Results of the statistical analysis are given in Table 5.

Table 5: Estimated Supply Response Coefficients for Winter, Summer and Nili Tomatoes

Season	Intercept	$PRICE_{t-1}$	$AREA_{t-1}$	$PRISUB_{t-1}$	$YIELD_{t-1}$	R^2
Winter	12.987 (1.7651)	.0787 (1.54)	0.7984 (7.73)	---	---	.87
Summer	-0.521 (-.0663)	0.5102 (2.0566)	0.8066 (10.0469)	---	---	.95
Nili	-100.061 (-1.322)	0.4664 (3.364)	0.7668 (4.987)	-0.3298 (-1.641)	14.7555 (1.584)	.84

Figures in parantheses represent t-ratios.

For Nili tomatoes the average farm price of potatoes, cucumbers and squash (cabbage?) deflated by the wholesale price index was used as an indicator of alternative production enterprises. This variable was significant at the 87 percent level, and indicates that if the average annual real price of these three substitute enterprises decreases by 1 LE per ton in year t the acreage in Nili tomatoes would increase by 330 feddans the following year. The yield coefficient for Nili tomatoes indicates that for each increase of 1 ton per feddan

the area planted would increase in the next year by 14,000 feddans, although the yield effect is only significant at the 86 percent confidence level. The price coefficient indicates that for each increase in average annual farm price of tomatoes of 1 LE per ton the area planted the next year would increase by 466 feddans.

For summer tomatoes yield and the price of substitutes (cucumbers and eggplant) did not result statistically significant. Possibly other field crops such as rice and cotton affect tomato plantings more than do the minor vegetables included in this analysis. The analysis should be extended to consider other production alternatives. The two variables $PRICE_{t-1}$ and $AREA_{t-1}$ explained 95 percent of the variation in area planted in summer tomatoes in year t.

The analysis of area planted in winter tomatoes was not satisfactory in that the price coefficient did not differ significantly from zero. Several alternative formulations were tried. As a substitute crop the average price of several vegetables was included but with little success. Wheat was also tried as a substitute crop but did not explain a significant amount of variation of winter tomatoes area and was therefore statistically insignificant. It might be fruitful to try berseem clover as a substitute crop, since a large proportion of the land is devoted to berseem in the winter. The basic problem in analyzing the area of winter tomatoes is that acreage continued to increase for several years in the face of rapidly falling real prices for tomatoes. The determination of the reasons for this seemingly non-economic behavior will require further research.

Supply Elasticities

Short run elasticities of area planted with respect to price was 0.23 for summer and 0.26 for Nili tomatoes. Long run supply elasticities (after full

adjustment) were 1.19 for summer and 1.15 for Nili.

The Wholesale Demand For Tomatoes

The Rod El-Faraq market in Cairo is the principle wholesale vegetable market, receiving an estimated 60-70 percent of all fresh vegetables entering the city. Monthly quantities of tomatoes and monthly average prices for this market are given in Table 6. Similar data for the El Nozha market in Alexandria are given in Table 7.

The two markets have a similar pattern of seasonal variation in prices and quantities, as can be seen in Table 8. Supplies are low in March and April with corresponding high prices. Supplies increase substantially in May, however.

· The substantial variation in prices and quantities over the year provides the possibility of the estimation of structural demand functions. Estimates of price elasticities would be useful for predicting the price effects of future supply changes.

The specification of an economic and statistical model to represent the demand function for each of these markets derives from the belief that the quantities of tomatoes entering the market are predetermined. That is, farmers market their tomatoes as they ripen according to a planting schedule determined several months in advance. When the tomatoes ripen they are harvested and sent to market to bring whatever price they can command. Having arrived at the market the price adjusts to whatever level is necessary to clear the market each day. It is hypothesized that supplies are not affected by price at the moment prices are determined.

Given this description of how prices are determined (a short-run price determination model) the model is specified as follows:

Table 6: Quantities of Tomatoes Received and Average Prices at the Rod El-Faraq Market, by Months, 1974-80

	1974	1975	1976	1977	1978	1979	1980
	Quantities Received (metric tons)						
Jan.	14,188	14,057	18,096	12,631	17,749	18,787	21,021
Feb.	12,840	15,241	15,756	14,381	20,911	15,085	16,926
Mar.	12,138	11,992	14,717	13,691	15,901	13,204	12,365
Apr.	6,859	7,162	7,743	13,958	13,662	12,541	6,022
May	24,174	20,884	18,710	22,832	25,049	14,746	19,734
June	19,275	18,851	12,133	12,717	15,691	14,861	17,375
July	19,926	20,998	15,593	9,482	18,149	23,123	15,060
Aug.	21,874	23,626	20,646	13,756	16,121	19,425	17,278
Sept.	19,866	19,610	16,205	10,694	19,846	12,746	16,307
Oct.	24,643	19,406	22,014	13,322	24,607	12,556	12,941
Nov.	20,340	19,540	18,378	16,834	17,705	19,588	19,756
Dec.	13,242	22,436	10,382	17,466	20,126	16,745	16,447
	Average Prices (LE per ton)						
Jan.	56	52	32	62	61	51	82
Feb.	59	52	40	71	30	66	78
Mar.	64	57	62	68	53	96	113
Apr.	89	103	95	74	110	102	197
May	35	38	60	42	49	66	106
June	34	24	54	46	58	60	74
July	32	24	34	66	39	30	110
Aug.	44	19	37	79	80	53	69
Sept.	49	48	39	109	67	84	69
Oct.	35	40	26	102	30	126	124
Nov.	36	37	40	53	49	70	60
Dec.	58	31	65	56	58	79	69

Table 7: Quantities of Tomaotes Received and Average Prices at El Nozha Market, by Months, 1974-80

	Quantities Received (metric tons)						
	1974	1975	1976	1977	1978	1979	1980
Jan.	5,723	7,918	8,989	7,750	9,532	9,481	9,516
Feb.	4,328	7,435	8,800	7,682	8,359	7,677	7,618
Mar.	6,003	6,253	8,379	8,733	6,469	7,416	5,715
Apr.	3,293	1,967	3,027	7,989	3,690	8,214	951
May	6,799	9,534	6,654	10,103	11,570	11,623	7,611
June	7,844	9,407	6,007	8,736	10,423	9,051	9,608
July	8,827	9,595	8,578	8,841	10,260	11,446	6,668
Aug.	8,014	12,312	10,485	8,725	8,864	9,828	8,223
Sept.	7,987	8,770	10,638	4,897	10,880	7,379	7,248
Oct.	8,951	8,531	12,687	7,685	12,777	6,415	6,916
Nov.	7,258	8,377	8,672	9,741	7,406	8,737	7,904
Dec.	6,418	9,438	5,859	9,230	8,780	8,359	9,433

	Average Prices (LE per ton)						
Jan.	54	63	42	64	59	57	85
Feb.	57	64	46	56	37	74	70
Mar.	62	79	65	65	51	98	116
Apr.	93	112	82	70	96	91	269
May	53	42	71	44	44	68	129
June	35	27	54	46	48	55	57
July	29	23	37	49	32	35	99
Aug.	36	17	41	82	82	47	69
Sept.	42	39	41	94	50	83	63
Oct.	38	43	27	93	29	120	106
Nov.	41	45	41	49	52	68	58
Dec.	65	37	75	54	56	88	76

Table 8: Seasonality of Prices and Quantities
Received at the Rod El-Faraq and El Nozha
Wholesale Markets, 1976 to 1980

	Rod El-Faraq		El Nozha	
Month	Quantity	Average Price	Quantity	Average Price
Jan.	108.9	111	108.4	89
Feb.	102.5	109	96.2	83
Mar.	86.2	151	87.8	110
Apr.	66.5	223	57.2	178
May	124.7	125	113.9	104
June	89.9	109	105.0	76
July	100.5	110	109.7	74
Aug.	107.6	123	110.5	94
Sept.	93.5	142	98.3	97
Oct.	105.4	157	111.3	110
Nov.	113.9	105	101.7	78
Dec.	100.2	126	99.8	102

Source:

$$P_t = a + b_1 Q_t + b_2 I_t + b_3 \text{ DUJJ} + b_4 \text{ DUAM}$$

where P_t = average monthly price in LE per ton, deflated by the Consumer Price Index, in month t

Q_t = quantity arriving at market, in thousand tons, month t

I = Gross Domestic Income, deflated by the Consumer Price Index

DUJJ = dummy intercept variable for June and July

DUAM = dummy intercept variable for April and May.

Results from the two markets were very similar, and are given in Table 9. Income did not result statistically significant from zero in either case. The demand for tomatoes is slightly lower in June and July and slightly higher in April and May than for other months of the year. A possible reason for dimished demand in June and July is increased use of tomato paste for cooking. Increased demand in April and May may be due to the transition from winter to summer temperatures. Temperature is known to affect the demand for fresh tomatoes in other countries.[2]

Price elasticities at the means of the observations for all months except April, May, June and July were approximately -.9 for both the Rod El-Faraq and El Nozha markets. However, if one considers that only perhaps 70 percent of the tomatoes go through the central market, the price elasticity could be as low as -.6.

Results indicate that price is responsive to quantities delivered and

---

[2]Waheed Megahid and Richard L. Simmons, The Demand for Fresh Winter Tomatoes in West Germany, France and the U.K., Economics Working Paper No. 36, ADS/Egypt Project. July, 1981.

17

Table 9:   Estimated Demand Parameters for Rod El-Faraq and El Nozha

Market	Intercept	Quantity	DUJJ	DUAM	R^2
Rod El-Faraq	77.54	-2.48 (14.36)	-8.37 (4.20)	9.03 (4.49)	.78
El Nozha	78.51	-5.15 (11.77)	-6.71 (2.72)	7.79 (3.05)	.73

follows the normal increase relationship with quantity which is consistent with competitive markets. For example, an increase of one thousand tons per month in quantities delivered would decrease the price by 2.49 LE per ton in the Rod El-Faraq market and 5.15 LE per ton in the El Nozha market. The El Nozha market is about half as large as Rod El-Faraq and cannot absorb additional supplies as readily.

The elasticity of -.6 to -.9 indicates that increased supplies would result in lower gross revenues to producers. Lower production costs through better yields or better technologies would be necessary if supplies are to be increased without decreasing net returns. It is widely believed that yields can be improved.

CONCENTRATION OF HANDLERS IN THE ROD EL-FARAQ MARKET

The information in this section was derived from a survey of handlers in the Rod El-Faraq market in 1981 and 1982.

There are more than 100 tomato wholesalers in the Rod El-Faraq market. They range in size from very small (2 tons per year) to quite large (12,000 tons per year). A study of handlers at the market indicated that the larger wholesalers provide a range of services for their producer-patrons including credit, help in supplying production inputs, and transportation.

As indicated in Table 9, the nine largest handlers in the Rod El-Faraq market handled more than 51 percent of the volume of tomatoes in 1981. Of the more than 100 handlers in the market usually not more than 60 to 80 are active at any particular time (Table 10). While it would be difficult to classify this structure as perfectly competitive, given the high proportion of volume in the hands of the nine largest, a consideration of price behavior of tomatoes indicates that any deviation from competitive price behavior may be insignificant.

Table 10:   Quantity of Tomatoes Handled and Proportion of Total Volume
            Handled by Large Wholesalers at Cairo Wholesale Market,
            1981

Order of Decreasing Size of Handler	Quantity Handled (tons)	Percent of Total Vol.	Cumulative Percent of Total Volume
1	12,260	11.2	---
2	9,824	9.0	20.2
3	7,616	7.0	27.2
4	7,136	6.5	33.7
5	6,364	5.8	39.5
6	3,404	3.1	42.6
7	3,396	3.1	45.7
8	3,233	3.0	48.7
9	3,162	2.9	51.6
10	2,985	2.7	54.3
11	2,926	2.7	57.0
12	2,728	2.5	59.5
13	2,616	2.4	61.9
14	2,432	2.2	64.1
15	2,415	2.2	66.3
16	2,351	2.1	68.4
17	1,824	1.7	70.1
18	1,806	1.7	71.8
19	1,615	1.5	73.3
All others	29,295	26.8	100.0
TOTAL	109,388	100.0	

Table 11: Degree of Concentration of Tomato Wholesalers as Measured by Gini Coefficients

Cumulative Percent of Number of Wholesalers	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
					Cumulative Percent of Quantity Handled								
5	0.06	0.11	0.12	0.09	0.09	0.05	0.12	0.10	0.05	0.11	0.02	0.01	0.03
10	0.18	0.26	0.27	0.21	0.20	0.15	0.30	0.28	0.11	0.25	0.08	0.32	0.11
15	0.34	0.50	0.50	0.39	0.35	0.30	0.51	0.51	0.31	0.40	0.20	0.62	0.21
20	0.53	0.79	0.79	0.68	0.55	0.52	0.91	0.77	0.66	0.60	0.34	1.01	0.38
25	0.77	1.13	1.13	1.13	0.84	0.83	1.43	1.16	1.08	0.85	0.44	1.67	0.65
30	1.11	1.53	1.69	1.78	1.33	1.47	2.05	1.64	1.56	1.19	0.83	2.57	1.02
35	1.52	1.98	2.57	2.74	1.96	2.20	2.76	2.34	2.14	1.65	1.28	3.63	1.50
40	2.08	2.67	3.62	3.93	2.67	3.03	3.89	3.32	3.05	2.21	2.09	4.90	2.10
45	2.82	3.49	4.72	5.47	3.84	3.95	5.45	4.56	4.13	3.04	3.11	6.26	2.92
50	3.76	4.44	5.91	7.78	5.17	5.09	7.28	6.19	5.35	4.24	4.36	8.21	3.82
55	5.11	5.79	7.72	10.29	6.83	6.37	9.49	8.46	6.58	6.07	6.15	10.56	4.91
60	6.84	7.34	9.98	13.18	8.72	8.35	12.27	11.18	8.94	8.62	8.82	13.20	6.26
65	8.80	9.46	12.69	16.81	11.15	10.91	15.79	14.22	11.25	12.61	11.99	17.28	7.84
70	11.40	12.02	16.06	20.94	14.22	14.76	20.19	18.45	15.33	17.43	15.88	22.08	10.19
75	14.87	15.59	20.22	25.50	18.65	19.90	25.91	23.87	21.06	23.41	20.43	27.22	14.04
80	19.89	20.83	25.30	30.73	25.48	26.02	33.52	32.12	27.83	30.60	25.83	32.72	20.04
85	26.92	27.81	31.51	37.29	33.98	33.22	42.53	42.33	37.67	39.60	34.76	39.62	28.32
90	39.72	38.13	39.73	44.56	45.04	43.38	54.37	56.08	50.92	50.98	45.88	52.47	40.63
95	58.24	55.55	51.74	56.95	64.04	59.35	70.23	37.68	68.33	63.79	59.78	70.57	57.51
100	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Gini Factor	.745	.735	.719	.660	.552	.710	.642	.649	.684	.637	.708	.635	.748
No. of Handlers	80	78	68	55	72	79	73	76	71	68	69	63	107

Average prices tend to be quite responsive to total receipts at the market, as indicated in the analysis of demand functions in the previous section. Also, Table 11 indicates that for the period 1976-1980 the seasonal index of average prices followed a rather close inverse relationship with quantities. Furthermore, retail prices seem to be closely linked between governorates. Correlation coefficients of monthly average retail prices all possible pairs of the five most important governorates for the period 1978-81 are given in Table 12. The high correlation between prices for all five governorates indicates good correspondence in price movements over time among the various regions.

The price data used in this correlation analysis are given in Table 13.

A more technical measure of degree of concentration in the Rod El-Faraq market is given in Table 10. Where Gini coefficients[3] are estimates for each month of 1981. The Gini coefficient measures on a scale of 0 to 1 the degree of concentration of volume handled associated with the number of handlers. A Gini factor of 0 indicates total concentration in the hands of one handler and a Gini factor of 1 indicates complete uniformity in size of handler. Estimates Gini coefficients ranged from a low of .55 in April to a high of .80 in January, with an overall average of .75. The degree of concentration given by this rather technical measure would not appear to indicate serious monopolistic problems.

---

[3]The formula for calculating the Gini coefficient is:

$$G = \frac{\sum_{i=1}^{n} X_i \ Y_{i+1} - \sum_{i=1}^{n} X_{i+1} \ Y_i}{100.0}$$

where X_i = the cumulative percent of number of wholesalers in class i
$i = 1, 2, \ldots n$

Y_i = the cumulative percent of volume of tomatoes handled by wholesalers in class i.

Table 12:   Simple Correlation Coefficients of Monthly Average Retail Prices in Various Pairs of Markets in Egypt.

	Cairo	Zagazig	El Fayum	Damanoir	Kafr El-Sheikh
Cairo	1.00	.91	.93	.95	.94
Zagazig	--	1.00	.89	.92	.93
El Fayum	--	--	1.00	.92	.93
Damanoir	--	--	--	1.00	.96
Kafr El-Sheikh	--	--	--	--	1.00

Table 13:   Average Retail Price by Month, by Governorate, 1978-81 (piasters per kg.)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Cairo	11.3	10.8	14.4	26.9	9.5	11.2	10.8	10.4	11.6	14.3	11.3	11.3
Alexandria	12.5	11.8	14.8	30.8	10.7	10.5	10.3	10.5	11.3	14.8	11.8	13.5
Port Said	13.8	12.3	17.5	28.3	10.7	12.0	12.3	11.5	13.5	17.0	11.5	13.5
Suez	13.3	12.8	14.5	22.0	12.7	12.3	12.8	12.0	13.0	16.3	12.3	12.0
Domiat	13.5	11.9	16.0	33.3	11.7	11.8	11.0	12.0	12.0	16.0	12.0	12.0
El Mansura	14.0	11.5	14.8	33.0	9.3	10.0	11.3	10.5	12.5	13.0	10.0	9.5
Zagazig	12.0	11.3	12.8	29.3	8.0	9.6	9.8	9.0	13.8	16.0	10.0	11.5
Banha	13.0	11.2	17.5	31.8	11.0	11.0	10.0	12.8	11.2	17.8	12.0	11.5
Kafr El Sheikh	14.3	15.2	16.0	39.8	10.0	9.8	10.0	11.2	14.3	18.0	12.0	13.2
Tanta	16.3	13.0	15.3	33.4	10.7	10.3	10.0	9.5	11.7	18.1	12.3	12.5
Shibin El Koom	14.0	14.3	17.8	32.5	9.7	11.8	11.5	12.5	12.3	21.3	13.0	14.8
Damanhoir	13.5	14.5	17.3	35.0	7.3	10.0	10.6	12.3	11.7	17.8	14.0	14.5
Ismailia	10.0	9.8	12.3	19.5	6.5	10.8	11.3	12.5	10.5	16.0	12.3	10.8
Giza	10.5	10.7	14.5	24.8	7.1	11.0	10.8	11.3	9.8	13.5	9.5	10.4
Banisweit	10.8	11.2	19.8	33.5	10.8	12.8	11.0	14.5	13.7	19.4	10.8	12.9
Fayum	11.1	11.5	17.2	35.8	11.3	13.4	11.0	13.3	13.9	21.8	13.5	12.5
Minha	14.0	11.3	16.5	29.8	10.0	11.0	14.3	13.3	12.8	15.3	12.3	16.3
Assuit	12.1	10.4	13.8	25.6	9.6	10.3	11.8	14.8	12.8	18.3	12.4	13.1
Sohag	10.4	10.8	11.3	19.0	11.0	10.8	11.2	11.3	13.0	16.0	12.3	11.3
Kina	10.0	7.9	9.5	26.3	12.3	12.9	13.9	18.8	17.0	20.5	14.0	12.8
Aswan	11.5	9.3	14.0	16.5	14.0	15.0	14.0	18.5	16.3	22.3	14.5	13.3