Impact on Egypt's Economy of Eliminating Domestic Support for Commodities

Literature Review of Supply and Demand Elasticity

September 2006

This publication was produced by Nathan Associates Inc. for review by the United States Agency for International Development.

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Acknowledgements

The author, Mounir Foda Sabaa, would like to thank those who provided support and advice in the preparation of this report. The cooperation of CD/WTO staff of Ministry of Trade and Industry, Mr. Waleed El Nozahy, Miss Azza Kamal, Miss Shereen El Sabagh, Mr. Mohamed Hamza, and Miss Shaimaa Helmy, was very much appreciated. The author also thanks Dr. Gamal Siam and Mr. Amro Radwan, Faculty of Agriculture, Cairo University, for their assistance. Many thanks also to Mr. Steve Magiera and Mr. Matthew Reisman of Nathan Associates' home office, USAID staff in Cairo and the United States, and the staff of Allied Corporation, Egypt.

Acronyms

AIDS	Almost Ideal Demand System
ATPSM	Agricultural Trade Policy Simulation Model
CAPMAS	Central Agency for Public Mobilization and Statistics
COMESA	Common Market for Eastern and Southern Africa
ERSAP	Economic Reform and Structure Adjustment Program
GDP	Gross Domestic Product
LAIDS	Linear Almost Ideal Demand System.

1. Introduction

USAID's technical support to the CD/WTO staff of Ministry of Trade and Industry includes analyzing the potential impact of Doha Development Agenda agriculture negotiations on Egypt. Mr. Steve Magiera and Mr. Mathew Reisman of Nathan Associates used UNCTAD's Agricultural Trade Policy Simulation Model (ATPSM) to simulate the effects of domestic support reductions. Because ATPSM results depend on built-in assumptions of likely changes in production and consumption as a result of changes in price (price elasticity of supply and demand) and to ensure realistic predictions, a realistic elasticity data set and knowledge about supply and demand factors for various commodities were needed.

The purpose of this assignment was to review literature that estimates supply and demand elasticity in Egypt for the commodities in ATPSM. This report lists the elasticity that appears in the literature for each commodity, summarizes each commodity's conditions "on the ground" affecting supply and demand, indicates commodities for which no literature exists, and summarizes each in the same way. Section 2 presents an overview of Egypt's agriculture sector and policies; Section 3 presents the literature review, and Section 4 summarizes the study.

2. Overview of Egypt's Agriculture Sector and Policies

The Egyptian economy has long relied on agriculture as a source of growth and support for other sectors. The dominance of agriculture was reinforced by its strong sector performance in the 1960s and 1970s when the government of Egypt used agricultural surplus to finance economic development in the 1980s and 1990s. This dominance declined, but agriculture still accounts for a significant share of growth, exports, and employment. Its contribution to gross domestic product (GDP) fell from 28 percent in 1960 to 16 percent in 2004. This decline partly reflects strong growth in other sectors, particularly oil, services, and construction.

Agriculture depends almost entirely on irrigation from the Nile, with 7.8 million feddan (feddan=0.42 hectares) in the Nile basin and delta. The three cropping seasons (winter—November–May; summer—April–October; and nili—July–October) enable elaborate crop rotations. The main winter crops are wheat, berseem (Egyptian clover), and broad beans; summer crops are maize, rice, and cotton. Vegetable crops such as tomato, potato, cucumber, and melons are cultivated in all seasons. Mixed farming—crops, livestock, and poultry—is common.

As measured by area planted and crop output value, the 12 most important crops are wheat, maize, cotton, rice, long- and short-season berseem, tomato, broad beans, onion, potato, soybeans, sugar cane, and sugar beets. Permanent crops, such as fruit trees, occupy about 8 percent of the cropped area.

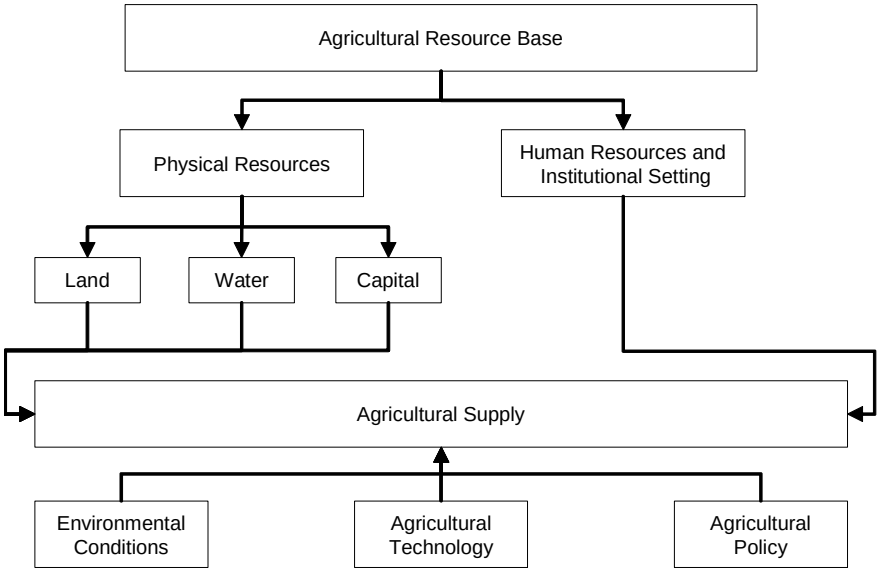
SUPPLY AND DEMAND FACTORS

Supply Factors

Defining the supply of an agricultural commodity (Si) as equal to domestic production (Yi) plus imports (Mi) minus exports (Xi), factors affecting the supply would include all determinants of the three components. Domestic production being the major part of supply, it is determined by four main sets of factors (see Figure 1-1).

First is the agricultural resources base, which encompasses physical resources such as land, water, capital, human resources, and institutional settings. The total cultivated area is about 7.8 million feddan, of which about 6 million feddan is old land and the remaining (1.8 million feddan) is new land. Land is cropped 1.8 times a year on average, which leads to a total cropped area of about 14.0 million feddan. Megaprojects—Toskha, Owaynat East, and EL Salam Canal— will add some 3.4 million feddan to the cultivated area by 2017.

Figure 1-1
Factors Affecting Supply of Agricultural Commodities



Per capita cultivated land is 0.12 feddan on average, which is the lowest in the world. There are 3.7 million landholders with an average farm size of about 2 feddan. Yet about 90 percent of land holders have less than 5 feddan, indicating severe fragmentation in Egyptian agriculture, which in turn affects agricultural production, often negatively.

Total water supply in Egypt is 63.5 billion cubic meters annually, of which 55.5 billion cubic meters comes from the Nile, while the rest comes from other sources, including reuse. Per capita water availability is about 850 cubic meters per year, which means that Egypt is below the water poverty line. About 80 percent of total water supplies is used in agriculture.

Agricultural capital encompasses a wide range of capital forms, including fixed forms such as agricultural machines, agricultural buildings, irrigation and drainage establishments, and livestock and variable forms such as fertilizers, pesticides, fuel, seeds, and animal feed. In fact, Egyptian agriculture suffers from lack of capital, leading to relatively low agricultural productivity. Government attempts to increase farmers' access to agricultural capital through a nationwide credit system managed by the Principal Bank for Development and Agricultural Credit. However, many difficulties remain in terms of capital provision for the majority of smallholders, particularly for capital-intensive, high-value crops such as horticultural crops.

Human resources in Egyptian agriculture are represented by 7.0 million laborers, the majority of which are unskilled. There is a lack of skilled labor, which constitutes another severe problem with respect to technological advancement to raise agricultural productivity. The institutional setting suffers from a lack of reforms, particularly after the government withdrew from agriculture under the Structural Adjustment Program.

Second is agricultural technology, which is increasingly important, given Egypt's limited land and water resources. High yield varieties, improved animal traits, and improved agricultural practices are technological advancements that have played an important role in improving Egyptian agricultural responsiveness and competitiveness. Yet there is still a significant technological gap

because of a lack of research and development, effective farmers' organizations, and skilled workers.

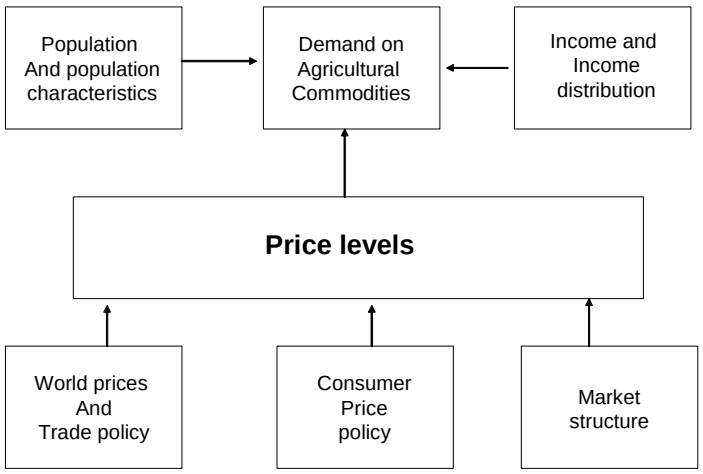
Third is environmental conditions. In one hand, Egypt has moderate and sunny weather throughout the year, but the imbalanced ratio physical resources (land and water) to population, and its continued deterioration, has led to a downward trend in terms of quality and quantity of these resources. Examples are water pollution, soil deterioration and soil erosion. Sustainable development in Egyptian agriculture needs considerable effort aimed at reversing this trend.

Fourth is agricultural policy, which must have set objectives and ways to achieve these objectives within a certain period of time. Historically, the government of Egypt's agricultural policy focused on food security (self-sufficiency of basic commodities), agricultural export, providing raw materials for local agroindustries. To achieve these goals, the government used price incentives, consumer subsidies, export subsidies, and public investments.

Demand Factors

In Egypt, three factors affect demand for agricultural commodities (Figure 1-2). First, population and population characteristics, including growth, age, and sex. Recently, the population has been growing at 2.0 percent annually, reaching 73 million in 2004. This rate is projected to decrease to about 1.9 percent by 2020. Assuming that other things remain equal, this rate of growth applies in projecting demand for food commodities. A high ratio of children in the population, which is the case in Egypt, will result in high demand for specific commodities, such as milk.

Figure 1-2
Factors Affecting Demand for Agricultural Commodities



Second, consumer price levels for a specific commodity, own price, and prices of substitute complementarities reflect response of the demand for the commodity to changes in consumer prices. Consumer prices now are outcome of three subfactors—market structures, consumer price policy, and world prices and trade policy. The extent of competitiveness of agricultural markets and price and trade polices would contribute to the dominating consumer prices and determine the way they are affected by world prices, particularly in the case of tradable commodities. Theoretically, the effect of these prices on demand is indicated by own and cross-price elasticity, for which literature estimates are reviewed and discussed later in this study.

Third, income levels and distribution affect the demand for agricultural commodities. Egypt is a lower-middle-income country, with a per capita GNP of US$1,300 in 2004. Furthermore, Egypt is a net food importer. GDP in the Egyptian economy has grown at 3.0–5.0 percent annually during the past decade, with per capita GDP growing at 1.0–3.0 percent annually. As for per income distribution, data are lacking, although one important indicator is the poverty line. Estimates of the size of the poor population range from 23 percent, according to official sources (CAPMAS), to 45 percent, according to the World Bank. Income elasticity for a specific commodity is a measure of response of the quantity demanded to changes in incomes. Such elasticity, however, differs from one income stratum to another, and from rural to urban. An accurate estimate of income elasticity should take into consideration all these differences. For Egypt, the only comprehensive set of data through which these differences could be addressed is the Family Budget Survey, a national census conducted by CAPMAS every 10 years. Yet, even in the Family Budget Survey, stratification is based on expenditure data rather than income data.

MACROECONOMIC AND AGRICULTURE SECTOR POLICIES

Before 1991, the Egyptian economy was dominated by extensive state ownership, particularly in the industrial sector, and was centrally controlled by comprehensive planning. This burdened the economy with a host of inefficient and overstaffed enterprises. Large subsidies and pervasive economic controls, many designed to protect the public sector from competition, encouraged waste and stifled competition. Low productivity and inflationary policies led to balance-of-payments weakness, which was suppressed through foreign exchange controls and trade barriers. As a result, government policies weakened growth and made the economy less open to foreign trade.

In 1991, Egypt embarked on the Economic Reform and Structural Adjustment Program (ERSAP), which was designed to correct microeconomic and external payments imbalances and reorient the economy toward the market system. ERSAP, supported by the World Bank and IMF, was a major departure from the static economic policies of the previous four decades.

Key measures of reforms under ERSAP have been the reduction of trade barriers, elimination of unnecessary regulations and restrictions, and privatization of the countries massive public sector.

To further integrate and open up to the world economy, in 1994 Egypt signed the final act in the Uruguay round agreement and the WTO and joined the Euro–Mediterranean Association Agreement in May 2004. Egypt also gained membership to two important regional trade arrangements, the Greater Arab Free Trade Agreement in January 1998, and the Common Market for Eastern and Southern Africa (COMESA) in October 1997. These agreements, in addition to other bilateral trade agreements, offer opportunities for development and access to international markets to the agricultural and agroindustrial sectors. But this new context threatens noncompetitive enterprises and those that do not adapt to international competition.

In agriculture, reforms started earlier than the rest of the economy. In 1987, reforms were initiated, including liberalization of pricing, and marketing of major crops that were under administrative pricing and compulsory procurement. In the early 1990s, more liberalizing procedures were implemented, including the lifting of compulsory procurement, decontrolling crop rotation, eliminating subsidies on agricultural inputs (i.e., chemical fertilizers, pesticides , seeds and animal feed concentrates) (completed in 1994), and eliminating subsidies on interest rates on agricultural loans. The late 1990s witnessed the liberalization of cotton marketing and of

agricultural land tenure, shifting from administrative to market-based rental values. As a result of actions taken between1987 and 1997, few government controls are left in agriculture. Ongoing controls include those over sugarcane production and marketing (compulsory procurement of whole production to the state-owned companies at administrative farm gate prices), permission for rice cultivation to ensure the upper limit of national rice area at 1.1 million feddan, and control on cotton-variety allocation at the district levels).

3. Results of Literature Review

ATPSM commodities are classified into two groups: commodities addressed in the literature and those not addressed. Each group is then subdivided into locally produced and not locally produced. Group 1 commodities are discussed in more detail in terms of factors affecting supply and demand as well as elasticity of supply and demand. Group 2, which includes only tobacco, is described briefly. Group 3 and 4 commodities are described briefly when information is available.

MODELS AND APPROACHES

The studies reviewed use a variety of models and approaches, with different study time series and cross-sectional data. For supply, the Nerlove Model was frequently used, as was multiple regression with different mathematical forms. The Saylor model was also used in a few studies. Most studies of supply used area response rather than overall supply; in this case, area response elasticity is taken as a rough measure for supply elasticity. Area response analysis often took into consideration not only farm gate prices and area grown, but also relative profitability of competing crops as well as other factors with a relevant time lag.

With respect to demand analysis, different models were used, such as the Almost Ideal Demand System (AIDS), Linear Almost Ideal Demand System (LAIDS), and Rotterdam, as well as other multiple regressions with different mathematical forms. Time-series and cross-sectional data provided by CAPMAS and family budget surveys for different time dimensions were used in estimation of price elasticity (own and cross) and income and expenditure elasticity.

Some studies dealt with the analysis of external demand and estimated elasticity, which could be used for deeper analysis.

ADDRESSED

Group 1. Locally Produced

- Livestock
- Bovine meat
- Sheep meat
- Milk, conc.
- Butter
- Cheese
- Wheat
- Rice
- Maize
- Pulses (broad bean)
- Tomatoes
- Routs and tubers (potatoes)
- Citrus
- Sugar, raw
  - Sugar cane
  - Sugar beet
- Sugar, refined
- Oilseed, temp
- Vegetable oil
- Cotton
- Poultry

Group2. Not Locally Produced

- Tobacco

NOT ADDRESSED

Group 3 Locally Produced

- Pig meat
- Barley
- Apple
- Bananas
- Other tropical
- Fruits
- Hides and skins

Group 4. Not Locally Produced

- Rubber
- Coffee
- Cocoa
- Tea

SUMMARY OF SUPPLY AND DEMAND ELASTICITY

Estimates of supply elasticity collected from the literature with respect to the commodities studied are presented in Appendix A . Estimates of demand elasticity are presented in Appendix B. Appendix C presents the elasticity of external demand for some commodities. Table 3-1 is a

matrix of demand elasticity and Table 3-2 is a matrix of supply elasticity. These tables are based on the results presented in Appendixes A and B. Elasticity was calculated in two steps: (1) the odd elasticity based on experience and economic theory was excluded, and (2) the remaining values were averaged. Thus, elasticity in the tables is the average of acceptable values for elasticity.

ELASTICITY OF COMMODITIES STUDIED

Commodities Locally Produced

Livestock

This subsector includes bovine and sheep meat, milk, cheese, and butter. It is traditionally highly integrated with the crop subsector. Animal power and manure are direct inputs to crop production, while 22 percent of crop products (mainly winter berseem clover) are direct inputs to livestock production. Ninety percent of livestock is intensively raised on smaller farms. Egypt's livestock inventory in 1999 included 14.45 million head: 3.42 million cattle, 3.33 million buffalo and 7.7 million sheep. The main livestock products include red meat (bovine and sheep meat) and dairy products (milk, cheese, and butter).

Supply Factors

Buffalos are the main dairy animals in Egypt. Average milk production per lactation is about 1.4 Mt per head. Small farmers own about 90 percent of the herd (i.e., one to two head per farmer); commercial farms own only 10 percent. Local and crossbreed cattle are about 3 million head, in addition to 200,000 head of Holstein in large and medium dairy farms.

Average milk production of indigenous cattle is as low as 0.8 ton/ lactation per season, of which 20 percent is consumed by the calf and 80 percent by the household as liquid, cheese, and ghee with no surplus for the market. It is therefore subsistence economy that is not market oriented.

The livestock subsector competes with crop production for direct feed use, since livestock consume corn, barely, wheat, and pulses. Livestock also competes directly for land as large proportion of land is devoted to production of berseem clover.

Sheep and goats are a major source of meat and income for peasants and Bedouins in the old valley and the desert. The total number of the sheep and goat herd is about 7.5 million head, of which 57 percent are sheep and 43 percent are goat—this varies with the production system (i.e., about 50 head with the village system and up to 1,000 heads with the Bedouin system). However, in the village system, ownership is about four to five heads.

Sheep and goats contribute about 15 percent of the red meat production in Egypt. Per capita consumption of sheep and goat meat is about 1.25 kg per year. Consumers prefer lamb to beef, which is reflected in prices that are 15 or 20 percent higher. Consumption levels, however, are seasonal.

The average amount of red meat produced during 2001–2003 is estimated at 764,667 mt, or about 83 percent of all consumed in Egypt. Between 1990 and 2005, red meat production grew 1.8 percent annually. The value of imports was US$182 million.

Table 3-1

Demand Elasticity of ATPSM Commodities

Commodity	Red meat	Poultry	Milk	Dairy products	Wheat	Rice	Maize	Pulses	Tomatoes	Roots/Tubers (potatoes)	Apples	Citrus Fruit	Bananas	Refined Sugar	Tobacco	Cotton	Vegetable Oils	Expenditure elasticity
Red meat	-.84	.19																1.05
Poultry	.19	-.76																1.19
Milk			-.58															1.05
Dairy products				-.29														.9
Wheat					-.47		-.05											-.02
Rice						-.66				-.34								.31
Maize					-.14		-.24	27.										.7
Pulses						.77		-.6		.61								.6
Tomatoes									-.12									.65
Roots and tubers (potatoes)								.62		-.49								.66
Apples											-1.01							.55
Citrus fruit												-.19						1.34
Bananas													-1.01					.55
Refined sugar														-.57				.9
Tobacco															-.4			
Cotton																-.59		
Vegetable oils																	-.17	.7

Table 3-2

Supply Elasticity of ATPSM Commodities

Commodity	Red meat	Poultry	Milk	Wheat	Rice	Barley	Maize	Pulses	Tomatoes	Roots/Tubers	(cane) Sugar (Cane)	Raw Sugar (beet)	Temp Oilseed	Cotton
Red meat	.25													
Poultry		.25												
Milk			.25											
Wheat				.38		-.46		-.13						
Rice					.21		-.4							
Barley														
Maize					-.53		.79							
Pulses								0.91						
Tomatoes									.5					
Roots and tubers										1.96				
Raw sugar (cane)											.09			
Raw sugar (beet)												.72		
Temp Oilseed							-.16							
Cotton														0.67

Constraints on the sector include low productivity, inefficient marketing, and government policies. Low productivity is caused by genetic quality, poor nutrition, scant veterinary and animal husbandry service, and farmers' experience. Buffalos and cows have low productivity partly because of low genetic potential for important economic traits, absence of recording technical inputs, no genetic evolution, no breed selection, and no breeding program, along with limited use of artificial insemination. Poor nutrition is due to a lack of affordable feedstuffs. Producers lack the finance to purchase a balanced ration for their dairy animals. In addition, feedstuffs for making feed mix is often inconsistent in quality. Animal performance is low in part because of a lack of veterinary and animal husbandry services.

Livestock owners do not receive timely delivery of services, and the cost of services can be unfavorable. Farmers lack experience in modern animal husbandry practices, and this affects all aspects of productivity. Moreover, extension systems are weak, particularly for animal husbandry, feed and feeding practices, and animal health care. The undeveloped marketing system results in large amounts of milk contamination through spoilage.

Red Meat Supply Elasticity

The literature on red meat supply indicates that own-price elasticity is estimated at 0.25, which means that each 1 percent change in red meat price would result in a 0.25 percent change in the quantity of red meat supplied (in the same direction). This relatively low elasticity reflects low responsiveness of red meat production to prices, which could be explained by the above-mentioned constraints on the red meat sector.

Red Meat Demand Factors

Egypt is about 76 percent self-sufficient in red meat production. Consumption of red meat in 2005 was estimated at 13 kg per capita per year, or 36 g per day (FAO). Animal protein consumption increased from 5.41 g per day in 1990 to 7.86 g per day in 2003.

Per capita consumption of sheep and goat meat is about 1.25 kg per year. Lamb is preferred by consumers over beef, which is reflected in prices for lamb that are 15 or 20 percent higher than for beef. The level of consumption is seasonal, however. Generally, factors affecting demand on red meat, include own price of red meat, prices of red meat substitutes, such as poultry and fish, and per capita income. Red meat is expensive, so it is consumed mostly by high-income consumers.

Red Meat Demand Elasticity

The demand elasticity of red meat was estimated by a number of researchers for different points of time. Six studies estimated own-price demand elasticity at between –0.12 and –1.01. The lowest value was reported by El Batran (2002) using the Rotterdam approach for the period 1980–2000. The highest estimate was reported by the same author, El Batran (2000) and for the same period but using AIDS rather than Rotterdam. Johnson (1995) used LAIDS and found the own-price elasticity of red meat of an estimated -0.66. Atwa (2005) and Bouis (1998) reported estimations of -1.0 and -1.01, respectively. Excluding the lowest estimates, -0.12 and -0.27, and averaging the remaining estimates, the average estimate for own price elasticity was -0.84.

Cross-price elasticity was estimated for red meat by five of the six studies. This elasticity was estimated with respect to chicken by Atwa (2005) and El Hawary (1992) at 0.24 and 0.54 respectively and by El Batran (2002) at 0.03 and 0.05 using the Rotterdam and AIDS models

respectively. Johnson (1995) reported an estimated 0.09. The average of the seven estimates, that is 0.19, would be most acceptable to be the cross-price elasticity of red meat with respect to chicken meat.

Income and expenditure elasticity of demand on red meat was estimated by six studies. The estimates ranged from 0.78 (reported by Bouis 1998) to 1.62 (reported by El Batran 2002). Between the two values were estimates by Atwa (2005), El Batran (2002), El Hawary (1992), and Johnson (1995) at 0.85, 0.90, 0.97, and 1.19 respectively. Averaging these six estimates results in an estimate of 1.05.

Milk Supply Factors

Powdered milk is imported to make skim and whole milk and whey. The three main dairy product groups are butter and ghee, powdered milk products (skim, whole, and whey), and cheese. In 2005, butter and ghee imports were 30,000 Mt with a value of US$46 million. Powdered milk volume was 19.5 thousand Mt, with a value of US$35 million. FAO data indicate that cheese imports were 9,000 Mt with a value of US$205 million, and other dairy product imports were US$122.3 million.

World prices for whole powdered milk, skim milk, and butter and ghee were trending upward during the recent period as a result of WTO (USAID 2005). World prices will likely stabilize or continue to trend upward as the EU reduces subsidies and inventories continue to fall. These conditions should be in the interest of dairy producers.

Average milk production from the commercial dairy herd (mainly Holstein cattle) is about 7 tons per lactation per season.

Total milk production in Egypt is about 3.1 million Mt, of which a large proportion is produced by the commercial Holstein herds and represents the main supply of raw milk for the dairy processing factories, which produce UHT milk, cheese, yoghurt, ice cream, and other products. About 20 percent of buffalo milk is consumed fresh by the household and converted into butter and ghee and white cheese, while 50 percent of it is sold in the villages or to the network that moves the product to urban areas.

Milk Supply Elasticity

The literature on milk supply indicates that own price elasticity is estimated at 0.25, which is very low. This is explained by the constraints and low productivity of milking herds.

Milk and Dairy Demand Factors

Per capita consumption of locally produced milk increased from 38 kg per year in 1990 to 49 kg per year, in spite of the population increase. The total estimated demand of dairy products including artisan (unbranded) products in 1996, expressed in terms of liquid milk equivalent, was 3.5 million tons. However, local production, excluding artisan production, plus imports amounted to just 1.5 million tons, estimated to be worth US$362 million retail (USAID 2005). In 2005, the total estimated consumption of dairy products, expressed in terms of liquid milk equivalent, increased to 5.1 million tons. Processed milk, dominated by UHT, makes up only about 10 percent of milk; the rest is boiled by consumers. The devaluation of the Egyptian pound, however, led to an increase in animal feed prices, which would have the opposite impact on dairy

production. The reduction of tariffs on imported feedstuffs will move local prices closer to the world market price.

Cheese is a significant part of the Egyptian diet, as most of the population eats cheese with at least one meal a day. But artisan production, particularly of white cheese, makes up the bulk of cheese production, although processed cheese has grown fast.

Milk and Dairy Demand Elasticity

Only two studies have dealt with the demand elasticity of milk and dairy products. Johnson (1995) used LAIDS. To estimate an own-price elasticity for milk at 0.15, Bouis (1998) reported a value of -1.0 for such elasticity. The average of the two estimates is –0.58. Johnson (1995) and Bouis (1998) estimated the expenditure elasticity for milk at 1.4 and 0.69, respectively. The average of the two estimates is 1.05. Johnson (1995) estimated own-price elasticity for dairy products at –0.29 and expenditure elasticity at 1.09.

Wheat

Wheat is a major cereal crop in Egypt, planted in October/November and harvested in April/May. The average annual wheat area has been about 2.4 million feddan for the past 10 years. The area of wheat increased, however, from about 1.955 million feddan in 1990 to about 2.6 million feddan in 2005 (i.e., an increase of 33 percent); this makes up more than 20 percent of the total cropped area. The average yield increased from about 2.26 ton per feddan in 1990 to about 2.84 ton per feddan in 2004 (i.e., an increase of 26 percent). As a result, total domestic production of wheat increased from 4.268 million tons in 1990 to 8.141 million tons in 2005 (i.e., a growth rate of 4 percent).

Wheat Supply Factors

Before 1987, the government determined area allotments and quota delivery requirements at fixed prices. Just before the 1987 season, three policy reform measures were adopted that had a significant effect on the area planted in wheat. The reforms lifted the control on wheat area planted and abolished the mandatory delivery quota, and the government's fixed procurement price was replaced with a floor price. Farmers reacted immediately to this policy reform by planting more wheat.

Wheat is grown nationwide (with different varieties for different locations). About 70 percent of total holdings (farmers) are in wheat cultivation, of which 89 percent are small farmers who prefer to retain a large proportion of their wheat production for subsistence and the wheat byproducts as animal feed. In some years the value of wheat byproducts was higher than the value of wheat seed.

Other factors that affect the wheat area is the competition for land resources between wheat and other winter crops such as berseem clover, winter vegetable crops, broad beans, and sugar beet (especially in the north Delta area). Unless farmers obtain a high net return from wheat, they move directly to cultivate clover (which is almost as profitable), broad beans, and sugar beets.

Area Response—Elasticity

The literature review indicated several estimates of wheat price elasticity, ranging from 0.3 to 0.64 and averaging 0.375. This average indicates that a 10 percent increase in wheat farm gate price can be expected to increase the total wheat area by about 3.75 percent.

The cross-price elasticity indicates that a 10 percent increase in barley price and broad bean price is expected to be associated with a decrease in the wheat area at about 4.6 percent and 1.3 percent respectively.

In Egypt, as a result of land limitation, different wheat improvement programs are implemented. Greater emphasis is given to the development of high-yielding varieties that tolerate environmental stresses such as heat, salinity, and drought. The diffusion of new farm technologies, including high-yielding varieties, improved cultural practices, and mechanization has positively affected wheat productivity in Egypt. All wheat areas are currently cultivated with new varieties.

According to wheat researchers, sometimes wheat faces unfavorable climatic conditions (i.e., very high temperature especially April–May), which affects wheat yield negatively. A shortage in fertilizer supply, especially during the early growing stages, also has a negative impact on average wheat yields.

The annual total production of wheat increased from about 4.268 million tons in 1990 to about 6.42 million tons in 2004. The literature review indicates that the combination of higher yields and higher prices resulted in higher profitability of the wheat enterprise. This affected area, yield, and total production of wheat positively.

Wheat Demand Factors

Wheat is the dominant food staple in Egypt, and Egypt has one of the highest per capita wheat consumption levels in the world, with annual average consumption estimated at more than 180 kg per capita. One reason for this high level is that the government has subsidized bread consumption for a long time as a way to raise nutritional levels and help low-income families.

Total consumption of wheat in 2004/2005 is estimated at 13.9 MMT, including nearly 7.5 MMT of imported wheat. In addition to high per capita consumption of wheat, rapid population growth increases the total wheat consumption annually.

Wheat Elasticity

The literature review indicated that the calculated wheat own-price elasticity was negative, ranging from -0.12 to -0.82 (see Appendix B) and averaging -0.47. The cross-price elasticity between wheat and maize ranged from -0.05 and -0.14 and averaged about -0.1. Expenditure elasticity of demand of wheat was positive and small, estimated at 0.02.

Rice

Rice is the third-largest crop in Egypt in terms of cultivated area and total production after wheat and maize. It occupies about 10 percent of Egypt’s total cropped area. The total rice area for 2004 was estimated at 1.537 million feddan, compared to 1.037 million feddan in 1990 (an increase of 48 percent). Rice is also considered an important export crop. It is the third-largest export

commodity after cotton and citrus. In 2005, Egyptian rice exports continued to make significant volume of more than 1 million Mt, valued at US$410 million.

Rice Supply Factors

In general, the potential for increasing the area planted in crops in Egypt is limited. For rice, a variety of factors work together to determine the area of rice. Physically, two main factors determine the area devoted to rice: limited land resources (especially the type of soil) and the availability of irrigation, because rice is one of the most water-consuming crops. Each hectare of rice needs about 17,850 cubic meters of water, compared to maize, which requires 7,140 cubic meters of water, and cotton, which requires 8,330 cubic meters. Current government policy is to limit rice to no more than 1.1 million feddan (462,000 hectares). Studies indicate that economic factors such as farm gate price, yield, net return, and the profitability of rice compared to other crops affect farmers' decision to plant rice or other crops. Policy reforms increased the relative profitability of rice production, making it profitable for farmers to shift land from cotton and maize to rice production. Egypt has succeeded in developing several new high-yielding, short-duration, water-sparing varieties that most rice growers have adopted.

Area Response—Elasticity

The literature review showed several estimates of rice price elasticity, ranging between 0.16 and 0.26 and averaging 0.21 The cross-price elasticity indicated that an increase of 10 percent in maize farm gate price is expected to cause a decrease of about 4.7 percent in rice area in the next year.

As for yield, Egypt has the highest rice yield per unit area. This is due mainly to excellent climatic conditions, soil type, adequate irrigation, and comprehensive research and extension programs for developing and introducing the new high-yielding varieties, research, extension and technology transfer. Hybrid rice varieties are expected to increase the yield per unit area by about 40-50 percent. One important environment issue is that rice production is critical for the environment of the Northern Delta. The MPWWR estimates that 900,000 feddan of rice cultivation are required annually to prevent salt-water intrusion and maintain soil quality.

Rice Demand Factors

Rice is an essential food crop preferred by a large segment of the Egyptian population over other carbohydrates. The domestic food consumption of milled white rice varies year to year depending on the supply of rice and its price.

The domestic demand for rice increased since the early 1980s primarily because of rapid population growth. The total domestic consumption of white rice reached 3.401 million tons and per capita rice consumption an 49.1 kg in 2003/04. Compared to 1980/81, total national consumption of rice increased by 137 percent and per capita consumption by 51 percent.

Three main factors determine the level of rice consumption: taste and consumer preference, income, and the price of rice relative to the price of substitutes.

Elasticity

The literature review indicated that the estimated rice own-price elasticity was negative, ranging between -0.45 and -0.82 (see Appendix B). It averaged -0.66. The cross-price elasticity between rice and broad bean was positive and averaged 0.52. The cross-price elasticity between rice and potato was negative and estimated at -0.34. The estimated expenditure elasticity of demand on rice ranged from 0.04 and 0.62 (see Appendix C) and averaged 0.25.

Maize

Maize is a major cereal crop in Egypt. It is planted in most governorates as a summer crop, but sometimes is planted as a fall (nili) crop. There are two types of maize—white and yellow, which is used as feed. The total area of maize increased from 1.5 million feddan in 1990 to 1.9 million feddan in 2005, which represents about 13 percent of the total cropped area. The average yield increased from 18.7 ardab in 1990 to 23.7 ardab in 2004, whereas the total production increased from 4.1 MMt in 1990 to 6.24 MMt in 2004 (i.e., an increase of about 52 percent).

Maize Supply Factors

Because maize is produced in both lower (Delta) and Upper Egypt as well as in the new reclaimed areas, expansion of the maize area faces competition from other summer crops since arable land is limited. In the delta, maize faces competition in the crop rotation mainly from rice and cotton. Field surveys revealed that farmers prefer to cultivate rice rather than maize because of high yield, price, and profitability. Moreover, when farmers succeed in marketing their cotton at a high price, they move directly to planting cotton instead of maize. In Upper Egypt, maize faces competition from sorghum and soybeans as well as cotton. In the new reclaimed areas, cultivating fruits and vegetables (in most cases) is more profitable than growing maize. In terms of water constraints, water requirements for maize cultivation (per unit area) are less than for the other main competing crops.

Area Response—Elasticity

The literature review gives several estimates of maize price elasticity of area response (see Appendix A). It averaged 0.79, indicating that a 10 percent increase in the maize farm gate price can be expected to increase the area of maize by about 7.9 percent.

The cross-price elasticity between maize and rice is negative at an average of -0.47. Maize yields increased steadily through the period 1990–2004 mainly because of farmers' adoption of hybrid high-yielding varieties and better cultural practices.

Maize Demand Factors

White maize has been part of the Egyptian diet, especially in rural areas, for a long time. Gradually, consumers switched to wheat bread. Currently, about 20 percent of the white maize produced locally is used for human consumption, particularly by rural households. Moreover, the government has purchased maize from farmers annually at a reasonable price and mixed the white maize flour at a ratio of 20 percent to white flour to make subsidized bread. The rest of white maize is used mainly as feed. Some is used for production of starch and syrup. The yellow corn is consumed totally as feed by livestock and poultry producers.

During the past 10 years, demand for maize has increased rapidly, especially for yellow maize. Domestic production has not been able to keep pace with rising demand; this has created a steady increase in yellow corn imports.

According to MALR statistics (food balance sheet), Total consumption of white maize was 6.2 million tons in 1990 and increased to 8.9 million tons in 2004 (i.e., an increase of about 44 percent). Per capita consumption was estimated at 63.5 kg per year in 1990. It increased to about 79 kg per year in 2004 (i.e., an increase of about 24 percent).

Elasticity

The literature review indicated that own-price demand elasticity for maize was an estimated -0.24. The expenditure elasticity of demand on maize was estimated at 0.7, which indicates that a 10 percent increase in expenditure can be expected to increase the demand for maize by about 7 percent.

Pulses

Broad bean is a common, preferred food for the majority of Egyptians and is a cheap source of protein. Therefore, it is the most important leguminous crop cultivated in Egypt.

Broad Bean Supply Factors

Broad bean is planted annually in both lower and upper Egypt as a winter crop. It competes for land resources with two other important crops—wheat and clover—as well as sugar beet (especially in the north Delta). The total annual area of broad beans fluctuated from year to year. It ranged from 303,000 feddan in 1990 to 240,000 feddan in 2004. Its area represented about 2 percent of the total cropped area.

Area Response—Elasticity

The literature review revealed that farmers' response to increase broad bean area is usually affected by both farm gate price and net return in the previous year. The price elasticity of area response is estimated at 0.91.

Along with changes in area, the total domestic supply of broad bean is affected by the changes in yield (productivity per unit area). Broad bean yield is affected mainly by two groups of factors. The first is the technological group, including new varieties and cultural practices. The second group includes climatic conditions and insect and disease infection. The average yield of broad bean per feddan ranged between 6 to 8 ardab during the period 1990–2004. Broad bean is attacked by numerous diseases that negatively affect both yield and farmers' profit. The most damaging of these diseases is the chocolate spot. It is spread in Egypt, especially in the north of the Delta, causing yield losses.

Total domestic production of broad bean fluctuated annually during the period 1990–2004 and decreased from 375,000 tons in 1990 to about 330,000 tons in 2004.

Water resources are not a problem because broad bean is planted as a winter crop and its water requirements are modest. However, sometimes water shortages are observed in the new land. Other inputs such as fertilizer, seeds, pesticides, labor are usually available to farmers.

Broad Bean Demand Factors

The per capita consumption of broad bean fluctuates annually. It ranged between 5.7 kg to about 7 kg during the period 1990–2004. In terms of total consumption, Egypt has consumed annually a significant and increasing volume of broad bean. Total consumption increased from 391,000 tons in 1990 to 643,000 tons in 2004. Because the domestic production could not meet the increasing domestic consumption, imports of broad beans increased significantly during the period 1990–2004. Because broad bean is a basic and staple food for most Egyptians, total demand (consumption) is expected to increase at a rate of at least 2 percent (even with fixed per capita consumption) as a result of population growth.

Elasticity

The literature review indicated that changes in income and broad bean retail prices (own price) and prices of other competing commodities affect the demand for broad bean.

Studies shows that the estimated broad bean own-price elasticity was -0.75, -0.26, -0.49 and -0.89 (the average is –0.6). The cross-price elasticity between broad bean and rice and potatoes is estimated at 0.77 and 0.61, respectively. Income elasticity of demand on broad bean is estimated at 0.8 and 0.4 (the average is 0.6).

Tomatoes

Tomato is an important vegetable crop. It is widely grown throughout Egypt during the winter, summer, and fall. It is also a highly profitable cash crop in normal conditions compared to other crops. Tomatoes are used mainly for domestic consumption; export and processing are relatively undeveloped.

Tomato Supply Factors

The area under tomato cultivation increased from 371,000 feddan in 1990 to 464,000 feddan in 2004. As new lands are brought into production, the amount of land devoted to production of tomatoes is also increasing. Currently 23 percent of tomatoes are produced in new land. The determining factors in increased tomato production have been the availability of land and financial resources to develop the system required to cultivate the land successfully. The tomato production system in the new land has been of a higher technology than that of the traditional production areas. Many areas of the country are better suited than others to tomato production in terms of soil characteristics, water availability, and proximity to markets.

Most studies have indicated that annual changes in tomato production are a function of expected yield per feddan, price, and total acreage lagged one year behind the stimulus. Studies also indicated that prices and supply exert the influences on each other that would be expected in a free market economy. The market response is predictable, the response of growers could be more predictable if they were aware of projected supplies and the resulting prices.

Area Response—Elasticity

The literature review indicated that tomato supply elasticity is estimated at 0.6. The average yield per feddan of tomatoes varies greatly by governorate and season. Production is highest in summer and lowest in winter. Generally, all yields increased steadily during the period 1990–2004, when the average yield was 11.4 ton per feddan in 1990 and reached 16.45 ton per feddan in 2004.

The major impediment to tomato yield and production are varieties. The small number of varieties limits the length of production and harvest. These varieties are selected for their resistance to virus and their handling characteristics. Disease and pest control are generally good, except for the control of white fly, which is a problem especially in warmer months. Water availability affects tomato yield and production especially in the summer. In the new land, water is generally of good quality, although some areas have salinity approaching the tolerance of tomatoes. Tomatoes have a high tolerance for salt, depending on the variety. Some soils are less suited to tomato production. A problem in the Delta region is a high pH in some soils.

The limited availability of credit, especially for small growers and tomato producers in the new lands, negatively affects farmers' capacity to finance tomato production (fertilizer, seed, pesticide, labor).

Physical losses in the Egyptian tomato marketing system are high, and negatively affect the supply of tomatoes. Tomato losses are caused mainly by post-harvest and handling practices. Some studies estimate total tomato losses in the 20–30 percent range.

Tomato Demand Factors

Tomato is considered a necessary commodity for both urban and rural households. The per capita consumption of tomato ranged between 49.6 kg and 82.8 kg per year during the period 1990–2004.

Total consumption of tomato increased from 4.2 million tons in 1990 to 7.688 million tons in 2004. Loss is the most important factor in determining the difference between domestic tomato production and consumption. Literature indicated that domestic consumption of tomato, as indicated in MALR data, amounted to nearly 80 percent of domestic production. Literature also indicates that per capita real disposable income and population growth, other things being equal, are considered the most important factors determining domestic consumption of tomato.

Elasticity

The literature review indicates that tomato own-price elasticity was negative and low, at -0.12. This low price elasticity reflect the importance of tomato as a necessary food commodity. The income elasticity of demand on tomato is estimated at 1.77.

Roots and Tubers

Potatoes are a multiseasonal crop, with three crops grown for food, two crops grown for seed. The majority of potato production in Egypt comes from traditional smallholds, most of which are less than two feddan, with 0.5–0.75 feddan devoted to potato production. Corporate farms in desert lands of up to 5,000 feddan each are increasingly the principal suppliers to export and processing markets. In most years, about 15 percent of total production is exported. Approximately 20 percent of the crop is saved for seed, but Egypt is entirely dependent on Europe for disease-resistant seed potatoes. Yield in small farms averages 8–9 Mt per feddan, while large corporate farms employing highly productive farming techniques average about 12 Mt per feddan.

Limitations

Smallholder potato production suffers from a number of poor cultural practices. These include use of uncertified seeds and poorly timed chemical applications, use of untreated manure, risking

spread of brown rot, and over watering. These poor cultural practices reduce both yield and quality.

Total area grown with potato increased from 189,600 feddan in 1990 to 248,000 feddan in 2005—an average annual growth rate of 1.8 percent.

Potato yields have grown from 8.64 mt per feddan in 1990 to 10.27 mt per feddan in 2005. This implies a growth rate of 1.2 percent annually, which is relatively low.

Overall production of potato increased from 1.64 million mt in 1990 to 2.55 million mt in 2005—an average of 3 percent growth annually.

Supply Elasticity

The literature review shows that potato own-price area elasticity averaged 1.96, which means that an increase in the potato farm gate price of 10 percent will increase the area of potato by 19.6 percent, reflecting high elasticity.

Demand Elasticity

The literature review shows that potato own-price elasticity averaged –0.49, indicating inelastic demand. Cross elasticity of demand on potatoes with respect to rice and broad bean was estimated at –0.34 and 0.62 respectively. Income elasticity is estimated at 0.66.

Citrus

Citrus occupies the largest area among fruit crops in Egypt. Citrus is exported and occupies the third position in terms of export value, after cotton and rice. Most of the expansion of the area in citrus has occurred in the new land. The area planted with fruit has expanded steadily to reach about 1.138 million feddan in 2004.

Oranges are Egypt's leading fruit crop. The planted area increased significantly through the early 1990s, due primarily to planting in newly reclaimed lands. Usually less than 5 percent of total production is exported, with Saudi Arabia the principal market. National yields approximate 8 Mt per feddan. The Mediterranean fruit fly is present in Egypt but has been well controlled through appropriate action at both the field and packing house levels.

Citrus Supply Factors

Physical agricultural resources. For Egypt, availability of water is the most limiting factor for agricultural production in general and citrus production in particular. Expansion in land reclamation is also determined by the availability of water. Through megaprojects, namely Toshka, owaynat East, and El-Salam Canal, it is planned to add about 3.4 million feddan by 2017. With such an area, there is great potential to expand the growing area of horticultural crops, including citrus.

In 2004, the total planted orange area was estimated at more than 215,000 feddan, of which 20 percent are located in the new land. Total orange production reached about 1.8 million MT. Currently the government prohibits the expansion of cultivating fruit crops in the old land and encourages its expansion in the new land.

Citrus Demand Factors

As for any food commodity, market demand for citrus is determined by population growth, citrus prices in the local market, prices of substitutes, and income. Citrus is a popular fruit and is consumed by almost all income categories. Consumer prices of citrus usually are lower than those of other fruits, thus citrus would be found in the diet of low-income consumers. Per capita consumption of oranges is estimated at about 17 kg per year.

Elasticity

The literature review indicated that the own-price elasticity of demand for citrus fruits was –0.19. The expenditure elasticity was 1.34. External demand on citrus, orange in particular being an export commodity, is determined by economic conditions in foreign markets, especially prices of Egyptian and competing countries' orange.

Raw Sugar

Two sugar crops are grown in Egypt. Sugar cane, which is the old one, is grown mainly in upper Egypt, whereas sugar beet is the second and new sugar crop, most production of which is located in the northern part of the Nile Delta and in the newly reclaimed area.

Production of sugar cane increased from about 11.09 million Mt in 1990 to about 16.23 million Mt in 2004. (an increase of 46 percent), whereas production of sugar beet increased from 575,000 Mt in 1990 to about 2.86 million Mt in 2004 (an increase of 397 percent).

Sugar Supply Factors

The area of sugar cane was almost stable in the past 10 years, ranging from 291,000 to 327,000 feddan. Because of the scarcity of land and water resources in Egypt, government policy is to maintain a stable sugar cane area; future growth in sugar cane production would have to be through yield increase. The area of sugar beet increased from about 40,000 feddan to more than 150,000 feddan during the period 1990–2004. Most beet production is located in the northern part of the Nile Delta, where the soil is poor, or in the new area. Currently, production of sugar beet represents about 28 percent of Egypt's total sugar production. The increase in sugar beet area and production is due to some farmers shifting to sugar beet cultivation instead of other winter crops as beet became more lucrative. Sugar beet is competing mainly with wheat, clover, and other winter crops for land resources.

One of the limiting factors that affect the expansion of sugar beet area is the limited capacity of sugar beet processing; farmers therefore have to contract with the processing company before planting sugar beet.

Area Response—Elasticity

The literature review shows several estimates of the sugar cane own price elasticity (see annex1). It averaged at 0.09. which indicated that a 10 percent increase in the sugar cane farm gate price is expected to increase the area of this crop at only 0.9 percent this is seem logic when considering the government policy of limiting the expansion of sugar cane area because of its high water requirements.

The sugar beet own-price elasticity of supply is presented in Appendix A and Table 3-2. It is estimated at 0.72, indicating that an increase in the sugar beet farm gate price by 10 percent can be expected to increase the area of sugar beet at 7.2 percent. This is also logical, considering the possibility of expanding sugar beet area in both Delta and the new lands.

As for yield, currently, Egypt's sugar cane yields are among the highest in the world. The average yield of cane increased from 42 ton per feddan in 1990 to 50.4 ton per feddan in 2004. Weather does not play a major role in cane production in Egypt. The entire cane crop is irrigated, and the climate is fairly consistent throughout the major production area of upper Egypt. The Agricultural Research Center is conducting field experiments on improving cane varieties that have higher yields, more resistance to insect and plant diseases, and consume less water. As for sugar beet, the average yield of sugar beet increased from 16.86 ton per feddan in 1990 to about 20.29 ton per feddan in 2004. MOA conducts experiments to improve sugar beet varieties. Weather conditions in the Delta area are favorable throughout the winter beet-growing season.

Government policy sets the delivery price for sugar cane at LE 130 per Mt, making the profitability of sugar cane much higher than that of many other competing crops. The government policy is also promoting expansion of sugar beet production which is suitable for cultivation in the newly reclaimed land. The delivery price for sugar beet usually is set by the sugar beet companies. A premium is also paid to farmers for early delivery.

Sugar Demand Factors

Per capita sugar consumption in Egypt is estimated at 32 kg per year. The government subsidizes consumption under the national ration system.

Egypt's total consumption of sugar increased from 1.79 million Mt in 1990 to 2.2 million Mt in 2004 (an increase of 23 percent). This increase is due mainly to the increase in population. Under the current program of sugar subsidy, about 500,000 Mt of refined sugar is needed for distribution under the ration system. The remainder of total consumption is freely traded on the open market.

Because sugar is considered an important food commodity and is used in a variety of foods and drinks in urban and rural areas, the growth rate of 2 percent of the population is expected to increase the total demand for sugar annually by 2 percent (other factors remain the same).

Elasticity

The literature review indicated that the calculated price elasticity of sugar as presented by different studies ranged between -0.16 and -0.97, with an average of -0.57. The calculated expenditure elasticity is positive, and ranged between 0.53 and 1.63, with an average of 1.08.

Oilseed

Several oil crops are cultivated in Egypt—groundnuts, sunflower, sesame, and soybean. Cottonseed, a byproduct of cotton production, is the most important oilseed in Egypt. Total vegetable oil production derived from all these crops represents only about 10 percent of total consumption, while 90 percent is imported.

Oilseed Supply Factors

Beside some general features, different factors affect the supply of each oilseed crop. Groundnuts, for example, is an export crop, while sesame is an import crop. Cottonseed being a byproduct of cotton production, all factors affecting cotton lint production affect cottonseed production. Normally a kentar of seed cotton contains 50 kg of lint and 107 kg of seeds.

Because about 70 percent of edible oil production comes from cottonseed, it could be said that the downward trend of cotton production in Egypt that has been experienced throughout the past decade could also apply to oil production. Decreases in relative prices of cotton compared to competing cereal crops and berseem have resulted in a shrinking area for cotton, thus reducing cottonseed production proportionally to cotton lint production.

As for other oilseed crops, a variety of factors affect their production, imports or exports. World prices affect supply of groundnuts, as export crop, and sesame and soybeans as import crops. Generally oilseed crops have low profitability compared to competing crops. They are all cultivated in summer, which prompted the government to attempt to introduce canola as a winter oilseed crop.

Vegetable Oil

Vegetable oil is a basic food commodity in the Egyptian diet. It is a basic element in the consumption pattern as for all income categories however with different important in the family food budget.

Vegetable Oil Supply Factors

Supply of vegetable oil is composed mainly of imports with a small contribution of local production ranged between 10 to 15 percent of total supply of edible oil. Domestic production is extracted from locally produced oil seed crops, namely groundnuts, sesame, soybeans, sunflower, olives as well as from cotton seeds and maize. These crops have been previously addressed. Local production of edible oil decrease from 101,000 Mt. in 1990 to 98,000 Mt. in 1998 showing decreasing trend.

Demand Factors

Consumption of edible oil is determined by population growth, own price, other food prices, and incomes. Food policy also affects consumption of edible oils in terms of subsidized price of edible oil of quantities distributed through ration card system. About 85–90 percent of consumption is sourced from imports. Imports increased from 751,000 Mt. in 1990 to 999,000 Mt. in 1999 showing increasing trend. Total consumption of edible oil increased from 781,000 Mt. in 1990 to 1021 thousand Mt in 1999. Per capita consumption of edible oil decreased from 8.6 kg per year in 1990 to 5.9 kg. per year in 2003.

According to the review of literature own price elasticity of demand on edible oil was estimated at -0.17. Expenditure elasticity was estimated at 0.7.

Cotton

Overall production of cotton had a negative trend, from 10.6 million lint kentar (50 kg each) in the 1980/81 season, to 5.9 million lint kentar in the 1990/91 season, and reaching a 20–year low of 4.2 million lint kentar in the 200/01 season. Overall production is a function not only of area

planted and harvested but of yields. Average annual yields fell, from 8.5 LK per feddan to an estimated 7.42 LK per feddan in 2001/02.

Egypt produces LS and ELS cotton lint almost exclusively. Egypt produced 4.2 million LK of LS cotton in 1990/91 and about 3.5 million LK in 2000/01. Production of ELS actually declined in the 1990s to 1.77 million LK.

Supply Factors

Supply of cotton in Egypt is determined by several factors, some of which are internal and some external. Among the internal factors are the prices of competing crops, yield per feddan, and input prices. The world price of cotton is the most important external factor. Under the liberalization policy, world prices of cotton play an important role in determining local prices, which affect the area grown in cotton. Cotton yield is affected by the quality of varieties that are derived through long-term breeding programs. The cotton variety map is set by the Ministry of Agriculture and Land Reclamation (the Cotton Council) according to which specific varieties are distributed at the district level.

Elasticity

Reviewing the literature with respect to cotton supply shows that own-price area elasticity is estimated at 0.67. This elasticity is relatively low because of the historically heavily intervention of the government in cotton production, trade, and prices. As mentioned earlier, the cotton trade was not liberalized until the 1997/98 season.

Demand Elasticity

With respect to cotton demand elasticity, the own-price elasticity is estimated at about –0.59, which means that an increase in the local price (processing companies' price) at 10 percent can be expected to decrease the amount of cotton demanded by about 5.9 percent.

Poultry

Egypt's poultry sector has significant importance in terms of domestic production and consumption. This sector includes chickens, which are divided into commercial (international breeds) and Balady (traditional breeds) operations, and other types of poultry—ducks, geese, turkeys, and pigeons, all of which are also subdivided into commercial and backyard operations.

More than 60 percent of Egypt's chicken meat output is produced by commercial operations. The commercial poultry sector has developed dramatically since the early 1990s. Total investments in this sector are estimated at about 16 billion Egyptian pounds.

Supply Factors

Generally, three main factors affect the supply of poultry meat: (1) total production capacity, (2) production efficiency, and (3) policy and price incentives. Poultry production in Egypt varies widely according to the extent modern technology is adopted, management skills, and the size of commercial (compared with traditional) operations. The main constraints affecting the poultry sector in Egypt are low productivity, poor management practices, and feed efficiency.

According to officials and specialists, modernization is needed at all levels of production and marketing. Production, particularly for broilers, is mainly from a large number of small producers. The traditional marketing system directly and indirectly affects supply and prices, because it is tightly controlled by a relatively small number of dealers who have considerable influence on the market.

In terms of efficiency, commercial broiler chicken breeds are more efficient in feed use than the Balady strain. Moreover, the commercial strains average seven-week growth cycles, enabling an average of five cycles per year. The Balady breeds grow more slowly—requiring 17 weeks to reach slaughter—and therefore complete no more than three cycles per year.

Responding to increased demand for poultry meat, production has trended upward in recent years. In 1994 poultry meat production was 307,000 MT and increased to 899,000 MT in 2003 (i.e., an increase of about 193 percent).

Elasticity

The literature review indicated that poultry meat producers' response to increase production due to the increase in poultry prices. The price elasticity of poultry production response is estimated at 0.25.

Current Situation

A recent threat to the Egyptian traditional and modern poultry sector is avian influenza. Many poultry farms lost money and stopped production, which hurt supply and resulted in higher consumer prices. The government took two actions: in October 2005, it banned the importation of live birds, meat, and products. In July 2006, because of the decrease in domestic supply and dramatic increase in prices, the government allowed the private sector to import poultry meat exempted from custom tariffs. The government also started a plan to develop this sector, taking into consideration environmental, health, and economic aspects, and to change the traditional poultry marketing system.

Demand Factors

Because poultry meat is generally less expensive than red meat, it is the most-consumed meat in Egypt. Per capita poultry meat consumption in Egypt reached about 8.9 kg in 2000.

Elasticity

The literature review indicated that the poultry own-price elasticity is –0.76. The cross-price elasticity between poultry and red meat is positive—estimated at 0.19—implying that they are substitutes. The expenditure elasticity of poultry is positive, between 0.6 to 1.6 (see Appendix B), averaging 1.19.

Commodities Not Locally Produced

Tobacco

Egypt has the highest rate of tobacco consumption in the Arab world. Cigarette consumption increased from 12.027 million sticks in 1970 to 51.814 million sticks in 1997. The number of

smokers in Egypt increased more than twice as fast as the population in the past 30 years. Per capita consumption declined between 1990 and 1995, however, in response to price increases, but this trend was reversed by a policy of price freezes and rising incomes.

Demand

The public sector has a monopoly on cigarette production in Egypt. Egypt's tobacco industry is dominated by the Eastern Tobacco Company, the largest cigarette manufacture in the Middle East.

Employment in the tobacco industry increased from 13,100 workers in 1970 to 17,900 in 2000, or 1 percent of employment.

Tobacco growing is banned in Egypt, so the country imports large amounts of raw tobacco, mostly from India and China, as well as from the United States. A small but growing volume of cigarettes is imported, and Egyptian cigarettes are exported to neighboring countries, mostly for Egyptians working in this countries.

Price and income elasticity

Nassar (undated) showed a small decrease in spending on cigarettes relative to total spending—from 5.86 percent to 5.14 percent between the 1995/96 and 1999/2000 household budget surveys. Health and education campaigns do not appear to have much impact. Expenditure elasticity estimated for tobacco is less than 1.0. The price elasticity of cigarettes is -0.397, -0.412 and -0.385 at the national, urban, and rural levels according to 1999/2000 data.

COMMODITIES NOT STUDIED

Locally Produced

Barley

Supply

In Egypt, barley is grown mainly under rainfed conditions in the north coastal regions, under irrigation in the newly reclaimed lands, and in saline soils where irrigation water is limited. The total area under barley cultivation in Egypt fluctuates according to the amount and distribution of annual rainfall. In the Nile Valley, the production area has decreased gradually, especially where irrigation is feasible and other strategic crops such as wheat can be grown. The barley production area has increased, however, in the newly reclaimed lands.

According to MALR statistics the total area under barley production decreased from about 192,000 feddan in 1990 to about 142,000 feddan in 2004 (i.e., a decrease of about 26 percent).. Meanwhile, the average yield increased, from 0.77 ton per feddan in 1990 to 1.15 tons in 2004. Therefore, total production increased from 148,000 tons in 1990 to 163,000 tons in 2004.

In rainfed areas, the large variation in yield between years is associated with the variation in the amount of rainfall and its distribution. The increase in barley productivity was due mainly to the

release of improved barley varieties and to the application of improved agronomic practices. The literature available to this study does not include any results on barley supply elasticity.

Demand

The largest use of the grain is for animal feed. Grain protein content ranges from 10 to 15 percent, depending on the climatic and soil conditions under which the barley grows. High protein content is desirable in barley used for feed. Barley protein is nutritively unbalanced because of a deficiency in the essential amino acid lysine.

The largest use of barley for food is found in regions where other cereals do not grow well because of low rainfall or soil salinity. Barley is used for food as pearled barley, flour, and malt. Barley is used in baby and other specialty foods. Barley-malt products are used in making breakfast cereals and confectionery products.

According to MALR statistics, total consumption of barley increased from 129,000 tons in 1990 to about 166,000 tons in 2004 (i.e., an increase of about 29 percent). The per capita consumption was very small and decreased from 1.2 kg per year in 1990 to only 0.1 kg per year in 2004.

The literature available for this study does not include any information on demand elasticity.

Apples

Apple is an important fruit in the horticultural production of Egypt. Small quantities are imported to fill the gap between consumption and production. In 1990 apples occupied 11,156 feddan. This increased to 61,130 feddan in 2004. Yield increased from 5.53 Mt per feddan in 1990 to 8.93 Mt per feddan in 2004, an annual growth rate of 3.5 percent. Apple cultivation expanded mostly in the new land. Overall consumption of apples amounted to 173,000 tons in 1990 and increased to 581,000 tons in 2004, 9 percent annual growth. In spite of the population increase, per capita consumption increased from 2.1 kg per year in 1990 to 7.2 kg per year in 2004.

Bananas

Banana is an important fruit in the horticultural production of Egypt. Small quantities are imported to fill the gap between consumption and production. In 1990 banana occupied 0.4 percent of total cropped area in Egypt. This increased from 35,500 feddan in 1990 to 50,622 feddan in 2004. Yield increased from 12 Mt per feddan in 1990 to 17 Mt per feddan in 2004, a growth rate of 2.8 percent annually. Banana cultivation expanded mostly in the new land. Banana is a water-intensive crop and its production is limited by water availability. Furthermore, banana production is chemical intensive, and only financially capable farmers can grown it. Overall consumption of bananas amounted to 408,000 tons in 1990 and increased to 875,000 tons in 2004 (i.e., an increase of 114 percent). In spite of the population increase, per capita consumption increased from 4.7 kg per year in 1990 to 8.1 kg per year in 2004.

Not Locally Produced

Coffee

Total consumption of coffee in Egypt is between 20,000 and 25,000 tons per year, all imported in the form of green coffee. The consumption of coffee in Egypt is 0.1 kg per capita, which is considerably below consumption in Scandinavian countries, which reached more than 8 to 10 kg

per capita. Egypt is a nation of tea drinkers. Tea consumption is estimated to be 65 times greater than coffee consumption. Most coffee drinkers prefer traditional Turkish coffee over instant coffee. There is a lack of data and information on the coffee market and consumer demand in Egypt. Companies in the sector generally began as handcraft-manufactures more than 60 years ago, adapting to local taste while preserving and developing quality traditions.

Table 3-3
Coffee Market Structure by Type of Coffee and Channels, 1999 (tons)

Type of Coffee	Retail Domestic Market	Hotels, Cafés, Restaurants	Total
Roast ground coffee market	673	424	1,061
Instant coffee market	275	14	289
Total coffee market	912	538	1,350

***SOURCE**. UNIDO, 2002. strategic diagnostic and upgrading / modernization program.*

Total coffee consumption was 1,350 tons in 1999, of which 912 tons were distributed to retail domestic market and 538 tons were consumed by hotels, cafés, and restaurants (i.e., 70 percent and 30 percent for the two channels respectively). There are two types of coffee, roast ground and instant, with marketed quantities of 1,061 and 289 tons respectively, making up about 80 percent and 20 percent of the market, respectively.

Cocoa

Cocoa and chocolate production is an important component in the food processing sector in Egypt. The value of production of cocoa chocolate amounted to LE 483.4 million in 1996, which constituted about 6.3 percent of total manufacturing sector production. In 2002 cocoa and chocolate production decreased to about LE 445.6 million, representing about 3.3 percent of total manufacturing.

Tea

Egypt is the largest market for tea in the Near East. Consumption in 2003 was 77,400 tons (Table 3-4), sourced almost entirely from imports. Kenya is the main supplier of tea to Egypt, accounting for some 62 percent of total tea imports in 2003. Consumption continued to increase, from an average of 68,000 tons in 2000–2002 to 77,400 tons in 2003, with per capita consumption of more than a 1 kg, well above many other major consuming countries. The majority of imports is in bulk for repackaging and blending inside Egypt. Imports of retail-packed teas have remained low.

Factors affecting the demand for tea

Demand for tea in Egypt is affected by several factors, including level and growth of GDP, macro and price policies, and individual incomes and income distribution. Consumption of tea, as with other commodities, was affected by measures taken under ERSAP. The Egyptian pound was floated in January 2003, which affected prices and inflation, resulting in September 2003 in the Government reintroducing some subsidies on basic foodstuffs. A number of changes have influenced Egypt’s trade and consumption over the past 10 years

Table 3-4
Tea Imports, Exports, and Consumption in Egypt, 1994–2003

Year	Imports (000 tons)	Exports (000 tons)	Consumption (000 tons)	Per capita Consumption (kg)
1994	57.2	0.2	57.0	0.98
1995	80.0	0.1	79.9	1.30
1996	65.0	0.3	64.7	1.04
1997	77.9	0.2	77.7	1.10
1998	65.5	0.3	65.2	1.00
1999	73.3	0.3	73.0	1.10
2000	71.7	0.9	70.8	1.04
2001	56.4	0.7	55.7	0.81
2002	79.0	1.4	77.6	1.10
2003	79.0	1.6	77.4	1.06

Source: FAO.

A reduction in import tariffs under COMESA gives a comparative advantage to Kenya in particular, over the previous main supplier, Sri Lanka. Import duties range from 30 percent to 60 percent, ad valorem. In addition to the customs duties, Egypt applied a sales tax and a the reinstatement of food subsidies on some products in September 2003; removed monopolistic control on imports from state-owned companies in 1994/95, encouraged the rapid growth of private sector trade; service charge on tea imports.

Tea is among the cheapest beverages on the market, a factor that influences its consumption, especially in rural areas where incomes are lowest.

Consumers in Upper Egypt and rural areas purchase mainly medium- and low-quality tea. According to a survey carried out for FAO in 1995/96, tea consumption in Egypt was highest in rural areas. Drinking preferences also varied, with consumers in Upper Egypt south of the Nile preferring dark strong tea, while those in North Nile (which includes Cairo, Alexandria, and Port Said) preferred lighter teas.

The survey also showed that consumption was higher in the older age groups; rural consumers preferred tea because it was the cheapest beverage; and tea quality was an important factor in competition between individual brands.

4. Summary and Conclusion

STUDY OBJECTIVES

This study had the following objectives:

- Review the literature in the Egyptian context concerning elasticity of demand and supply of agricultural commodities
- Provide a brief summary for each commodity concerning the “on the ground “conditions that affect supply and demand for the studied commodities.
- Identify and prepare a brief written summary for each of the commodities for which no literature exists.

Findings of this study are to be reviewed with CD/WTO staff in the Ministry of Trade and Industry.

STUDIED COMMODITIES

Agricultural commodities addressed in this study are those included in the ATPSM. The total number of these commodities is 34, distributed among different sectors.

From the livestock subsector, commodities included are livestock, bovine meat, sheep meat, pig meat, and hides and skins, concentrated milk, butter, cheese. From the cereal subsector, four commodities are included: wheat, barley, maize, and sorghum. Horticulture commodities are tomatoes, apples, citrus fruits, banana, and other tropical fruits. Sugar commodities include raw and refined sugar. Beverages include coffee (green and processed), cocoa (beans and processed), tea, and tobacco (leaves). Fiber crops are represented by cotton. Other commodities include pulses, roots and tubers, oilseeds (temperate and tropical), vegetable oil, and rubber.

In reviewing literature on the above-mentioned commodities, we found that although there have been several studies for some commodities, there is a lack of data and information, particularly with respect to elasticity estimates, for the others. We also found that literature on demand elasticity is richer than literature on supply elasticity. Furthermore, supply elasticity has been addressed in all cases as area response elasticity rather than overall supply (except for livestock commodities), which should take into consideration supply as domestic production (area multiplied by yield) plus imports. Therefore, area response elasticity estimates reviewed in this study should be viewed as rough estimates for supply elasticity.

Different econometric approaches were used to estimate response elasticity in the case of crop commodities’ supply elasticity in the case of livestock commodities (chicken, red meat, and milk). As per area response, the Nerlove model has been used frequently, using time series data for farm gate prices and areas grown, provided by the Ministry of Agriculture and Land Reclamation.

As with demand elasticity, more diverse literature was found on price elasticity (own and cross) and income elasticity. Approaches used include AIDS, LAIDS, Rotterdam, and other mathematical forms. Data were either cross-section data, particularly data produced through family budget survey by CAPMAS, or time series data about consumption and prices supplied by CAPMAS.

COMMENTS ON ELASTICITY FROM LITERATURE

From a theoretical point of view, supply elasticity is determined in light of several factors, including storage, length of production period, and for transferring resources to or from commodity production.

Storage Capacity

The supply of a commodity is elastic if the producer is capable of changing the quantity supplied. Conversely, supply is inelastic if the commodity cannot be stored. The supply of cereal / fiber and dried commodities therefore would be elastic while the supply of perishable commodities would be inelastic.

Length of Production Period

In the case of agricultural commodities producers can not easily respond to changes in prices in the short term. Generally supply of agricultural commodities is less elastic than supply of manufacturing commodities. Based on that, supply elasticity of fruits would be less than supply elasticity of vegetables.

Capability of Transferring Resources to or from Commodity Production

If it is easy to direct more resources to producing a certain commodity, responding to an increase in its price, the supply of this commodity is elastic.

Table 3-2 shows that in all cases except one (roots and tubers), supply elasticity is less than 1. The studied commodities are inelastic, which corresponds with the theoretical background. The elasticity of supply of potatoes, the major root-and-tuber crop, is estimated at 1.96, indicating elastic supply. This relatively high elasticity (compared with the elasticity of other commodities studied) can be explained by the fact that potatoes are an exportable commodity. About 20 percent of production is exported, which leads to a more dynamic market and high responsiveness to price changes.

Elasticity of supply of livestock products (bovine meat, sheep meat, poultry, and milk) is estimated at 0.25, which is relatively low. Red meat producers cannot respond easily to changes in red meat price. The bulk of red meat is produced under the traditional system, which faces several problems and constraints. Even commercial production (fattening) takes at least six months. Also, red meat and poultry are perishable, which contributes to the low elasticity of supply.

Own-price elasticity for wheat, rice, and maize is estimated at 0.68, 0.21, and 0.79, respectively. These are high compared to the elasticity of livestock commodities. This is explained by the fact although the production period ranges from four to six months, the cereal crops are storable, it should be noted that all of these have an elasticity that is less than 1, meaning that they are inelastic, which corresponds with agricultural products in general.

Likewise, demand theory states that demand elasticity is high when (1) the commodity is luxurious (e.g., expensive fruits such as apples), (2) substitutes exist, and (3) the commodity has multiple uses. Demand will be inelastic when (1) the commodity is necessary (e.g., bread), (2) the price is so low that consumers do not care about responding to changes in price, and (3) demand for the commodity depends on demand for another.

Table 3-1 shows that all cases of demand elasticity are less than 1 except for apple and banana. Demand for animal protein commodities (i.e., red meat [bovine and sheep meat]), poultry meat is rather elastic with respect to price. Estimates of own-price elasticity of red meat is -0.84 and of poultry meat -0.76. Red meat elasticity is higher than that of poultry meat because poultry is cheaper and consumed by more consumers. The elasticity of milk concentrate is –0.58, smaller than that of red meat and poultry; although milk concentrate is also animal protein commodity, it has a higher necessity than red meat. Elasticity of demand for both butter and cheese is –0.29, which is smaller than the elasticity of demand for milk, although the two commodities are dairy products. This is because milk concentrates have multiple uses, which causes a higher response to price changes. Own-price elasticity of demand on wheat, rice, and maize is estimated, from the literature, at –0.47, -0.66, and -0.24 respectively. They are all less than 1, meaning an inelastic demand with respect to price because of their necessity in Egyptian consumption patterns.

Expenditure elasticity shown in Table 3-1 and collected from the literature is estimated about 1 or less than 1, with few cases higher than 1. Income elasticity for livestock products—bovine meat, poultry, milk, butter and cheese—are 1.05, 1.19, 1.05, 0.9, and 0.9 respectively. For wheat, rice and maize income elasticity is -0.02, 0.31, and 0.7 respectively. The negative sign for wheat may be explained by the inferiority of bread; nevertheless it is nearly zero. For citrus fruits, income elasticity is estimated at 1.34. The fruits are consumed by relatively high-income consumers, and they are not a necessary commodity in the consumption pattern.

LITERATURE AND FAO ESTIMATES

A comparison of the elasticities provided by the literature and those reported by FAO reveals some differences (see Table 4-1).

Although the supply elasticity of bovine and sheep meat is 0.25 in the literature, FAO estimates it at 0.14. In fact, the literature estimate, the larger, may be recommended, as the FAO estimate is too low. As for poultry, the literature estimate for supply elasticity is 0.25, compared to 0.45 according to FAO. Poultry production would be more responsive to price than would red meat production; therefore, a supply elasticity of 0.45 would be acceptable. Similarly, the literature estimate of the supply elasticity of milk concentrate, 0.25, is recommended over the FAO estimate of 0.13. And as for wheat, rice, and maize, the supply elasticity according to the literature is 0.38, 0.21, and 0.79, respectively, compared to 0.45, 0.38, and 0.33, respectively, by FAO. Literature estimates for wheat and rice are more acceptable, but for maize, the FAO estimate is recommended. Rice cultivation is controlled by the government for water conservation purposes. On the contrary, wheat production is encouraged by the government in the context of food security policy.

Table 4-1

Commodity Elasticity by Source (FAO and Literature)

Name	Commodity Code		FAO		Literature		
	Own	Cross	Supply	Demand	Supply	Demand	Expenditure or Income
Livestock	00100	00100	0.14	-0.4	0.25	-0.84	
Bovine meat	01100	01100	0.14	-0.4	0.25	-0.84	1.05
	01100	01230 (poultry)	0	0.01	0	0.19	
Sheep meat	01210	01210	0.14	-0.6	0.25	-0.84	
	01210	01100 (bovine meat)	0	0.02	0		
	01210	01230 (poultry)	0	0.03	0		
Pork	01220	01220	0.2	-0.2			
Poultry	01230	01230	0.45	-0.6	0.25	-0.76	1.19
	01230	01100 (bovine meat)	0	0.02	0	0.19	
	01230	01210 (sheep meat)	0	0.02	0		
Milk, conc.	02222	02222	0.13	-0.1	0.25	-0.58	1.05
Butter	02300	02300	0.25	-0.3		-0.29	0.9
Cheese	02400	02400	0.11	-0.2		-0.29	0.9
Wheat	04100	04100	0.45	-0.2	0.38	-0.47	-0.02
	04100	04200 (rice)	-0.011	0.01			
	04100	04300 (barley)	-0.02	0.04	-0.46		
	04100	04400 (maize)	-0.02	0.02		-0.5	
	04100	04530 (sorghum)	-0.01	0.02			
Rice	04200	04200	0.38	-0.3	0.21	-0.66	0.31
	04200	04100 (wheat)	-0.01	0.018			
	04200	04200 (rice)	-0.02	0.03			
	04200	04400 (maize)	-0.02	0.016	-0.4		
	04200	04530 (sorghum)	-0.01	0.03			
Barley	04300	04300	0.33	-0.2			
	04300	04100 (wheat)	-0.073	5			
	04300	04200 (rice)	-0.081	2.641			
	04300	04400 (maize)	-0.101	2.876			
	04300	04530 (sorghum)	-0.008	0.098			
Maize	04400	04400	0.33	-0.2	0.79	-0.24	0.7
	04400	04100 (wheat)	-0.022	0.022		-0.14	
	04400	04200 (rice)	-0.024	0.01	-0.53		
	04400	04300 (barley)	-0.03	0.02			
	04400	04530 (sorghum)	-0.01	0.03			
Sorghum	04530	04530	0.53	-0.45			
	04530	04100 (wheat)	-0.093	0.317			
	04530	04200 (rice)	-0.103	0.27			

Table 4-1 (continued)

Name	Commodity Code		FAO		Literature		
	Own	Cross	Supply	Demand	Supply	Demand	Expenditure or Income
	04530	04300 (barley)	-0.02	0.01			
	04530	04400 (maize)	-0.085	0.441			
Pulses	05420	05420	0.4	-0.33	0.91*	-0.6	0.6
Tomatoes	05440	05440	1.2	-0.52	0.5	-0.12	0.65
Roots and Tubers	05480	05480	0.3	0	1.96*	-0.49	0.66
Apples	05700	05700	0.56	-0.85		-1.01	0.55
Citrus fruits	05710	05710	1.42	-0.6		-0.19	1.34
Bananas	05730	05730	0.48	-0.89		-1.01	0.55
Other tropical fruits	05790	05790	0.48	-1.04			
Sugar, raw	06110	06110	0.6	-0.6	0.09		
Sugar, refined	06120	06120	0.6	-0.6		-0.57	0.9
Coffee, green	07110	07110	0.2	-0.15			
coffee, proc.	07120	07120	0.2	-0.15			
Cocoa beans	07210	07210	0.45	-0.29			
Cocoa, proc.	07220	07220	0.4	-0.55			
Tea	07410	07410	0.14	-0.43			
Tobacco leaves	12100	12100	0.2	-0.5		-0.4	
Hides and skins	21100	21100	0	-0.4			
	21100	21100 (bovine meat)	0.14	0			
Oilseed, temperate	22200	22200	0.5	-0.5			
Oilseed, tropical	22300	22300	0.5	-0.5			
Rubber	23200	23200	0.5	-0.5			
Cotton	26300	26300	0.44	0.44	0.67	-0.55	
Vegetable oils	42000	42000	0.18	0.18		-0.17	0.7

The supply elasticity of pulses was estimated at 0.91 in the literature, compared to 0.4 in the FAO estimates. The larger elasticity is more acceptable, because pulses include several commodities, some of which are responsive to prices. As for tomatoes, the FAO estimate of supply elasticity, 1.2, is recommended over the literature estimate of 0.5. But for roots and tubers (potatoes), the literature estimate, 1.96, is more acceptable than the FAO estimate of 0.3. Supply elasticity for raw sugar is estimated in the literature at 0.09, which reflects the low responsiveness of sugar cane production, because of government control that limits its cultivation at 300,000 feddan; thus, the literature estimate is recommended over the FAO estimate of 0.6. Cotton supply elasticity is estimated at 0.67 in the literature and at 0.44 by the FAO; the smaller, FAO estimate is more recommended because of the low responsiveness of farmers to cotton price, compared to cereal crops.

With respect to commodities that are not produced in Egypt, all supply is sourced from imports. These commodities include coffee (refined and processed), cocoa (beans and processed), tea,

rubber, and tobacco leaves. By definition, prices of these commodities in the local markets are derived from world prices. Imported quantities thus depend mainly on world prices as well as Egypt's GDP, which determines its capacity to import. Although the supply of sourced from domestic production responds positively to domestic prices, which in turn—in the case of tradable commodities—are determined by world prices, supply sourced from imports should respond negatively to world prices. Thus, an increase in world prices of these commodities may be expected to result in more liberalization of agricultural world trade, and would lead to a decrease in Egypt's imports unless other factors, such as the increase in GDP, compensate for the negative price effects.

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Appendix A. Supply Elasticity

Table A-1
Supply Elasticity of Primary Crops

Commodity		Author	Year	Study Period	Model	Price Elasticity			
						Own	Cross		
							1	2	3
Wheat	1	H. H. Dwedar	2005	1986–2003	Nerlove	4.61**			
	2	A. E. Mahfoz	2000	1977/78–1997/98	Nerlove	0.3	-.46 (ba.)	-0.7 (cl.)	-0.13 (bb.)
	3	Abo Mandor M.	1995	1966–1992		0.26	-0.13 (cl.)		
				1980–1992		0.31			
	4	T. Ibrahim	2004	1974–1986		0.465			
				1987–2002					
	5	M. F. Sabaa	1995	1986–1994	Nerlove	0.276			
	6	O. A. Melouk	2004	1987–2002	Nerlove	4.7**			
	7	M. K. Hegazy		1986–2001		0.64			
Cotton	1	Abo Mandor M.	1995	1980–1992			-0.2 (cl.)		
	2	E. A. Shehata	1996	1980–1994	Saylor	0.13			
	1	A. Taha	1997	1970–1995	Nerlove	1.2			
Rice	1	Abo Mandor M.	1995	1966–1992		0.16	-0.4 (ma.)		
	2	E. Fwad	1991			0.26			
Maize	1	Abo Mandor M.	1995	1966–1992		0.08	-0.28 (ri.)		
	2	T. Ibrahim	2004	1974–1986		1.145			
				1987–2002		1.598			

Commodity		Author	Year	Study Period	Model	Price Elasticity			
						Own	Cross		
							1	2	3
	3	M. K. Hegazy		1986–2001		0.57	-0.78 (ri.)		
	4	E. Fwad	1991			0.56			
Broad beans	1	H. H. Dwidar	2004	1993–2003		1.36			
	2	A. M. Rashad	1995	1970–1986	Linear	0.91			
		A. M. Rashad	1995	1987–1993	Linear	2.9			
Tomatoes		NARP	1994			0.6			
Tomatoes (winter)		S. M. Arafa	1998	1981–1996	Multiple regression	1.26			
		S. M. Arafa	1998	1981–1996	Nerlove	0.41			
Tomatoes (summer)		S. M. Arafa	1998	1981–1996	Multiple regression	0.16			
		S. M. Arafa	1998	1981–1996	Nerlove	0.18			
Tomatoes (nili)		S. M. Arafa	1998	1981–1996	Multiple regression	0.4			
Sugar cane	1	S. M. Ahmed	1993	1975–1990		0.07			
	2	E. A. Shehata	1996	1980–1994	Nerlove	0.07			
		E. A. Shehata	1996	1980–1994	fredman	0.16			
		E. A. Shehata	1996	1980–1994	Saylor	0.06			
Sugar beet		N. S. Mohamed	1997	1983–1995	Nerlove	0.72			
Potatoes (winter)	1	H. S. Mohamed	1997	1980–1994	Simple regression	1.96			
	2				Multiple regression	3.72**			
Potatoes (nili)					Simple regression	2.3			
Sunflower	1	Sadek T.	2004	1995–2002	Nerlove		-0.16 (ma.)		

Note: ba.—Barley, bb.—broad beans, cl.—clover, ma.—maize, and ri.—rice

*** Values excluded from average because they are not logical.*

Table A-2

Supply Elasticity of Livestock Products

Commodity	Author	Year	Study Period	Own-Price Elasticity
Chicken	I. Soliman	1997	1976–1996	0.25
Red meat	I. Soliman	1997	1976–1996	0.25
Milk	I. Soliman	1997	1976–1996	0.25

Appendix B. Demand Elasticity

TableB.1

Demand Elasticity of Livestock Products

Commodity		Author	Year	Study Period	Model	Price Elasticity			Expenditure or Income Elasticity
						Own	Cross		
							1 (Red Meat)	2 (Chicken)	
Red meat	1	M. H. Atwa	2005	1999/2000	AIDS	-1		0.24	0.85
	2	E. Z. Elhawary	1992	1988	AIDS	-0.27**		0.54	0.97*
	3	M. M. Elbatran	2002	1980–2000	Rotterdam	-0.12**		0.03	1.62*
	4	M. M. Elbatran	2002	1980–2000	AIDS	-0.66		0.05	0.9*
	5	S. R. Johnson	1995	1991	LAIDS	-0.61		0.09	1.19
	6	H. E. Bouis *	1998	1997		-1.01			0.78
Chicken	1	M. H. Atwa	2005	1999/2000	AIDS	-0.35	0.05		1.6
	2	E. Z. Elhawary	1992	1988	AIDS	-0.83	0.09		1*
	3	M. M. Elbatran	2002	1980–2000	Rotterdam	-0.07**	0.08		0.6*
	4	M. M. Elbatran	2002	1980–2000	AIDS	-1.28	0.38		1.3*
	5	S. R. Johnson	1995	1991	LAIDS	-0.58	0.35		1.44
Milk	1	S. R. Johnson	1995	1991	LAIDS	-0.15			1.4
	2	H. E. Bouis *	1998	1997		-1			0.69
Dairy products	1	N. Elagrody	2005						0.7
	2	S. R. Johnson	1995	1991	LAIDS	-0.29			1.09

** Income elasticity*

*** Values excluded from average because they are not logical.*

Table B-2
Primary Crops

Commodity		Author	Year	Study Period	Model	Price Elasticity			Expenditure Elasticity
						Own	Cross		
							1	2	
Pulses (broad beans)	1	F. Kamal	2005	1984–2002		-0.75			
	2	S. R. Johnson	1995	1991	LAIDS	-0.26	0.77 (ri.)	0.61 (po.)	1.3**
	3	H. H. Dwidar	2004	1993–2003		-0.49			0.8
	4	H. E. Bouis *	1998	1997		-0.89			0.40
Wheat	1	S. R. Johnson	1995	1991	LAIDS	-0.12	-0.05 (ma.)		1.18**
	2	H. E. Bouis *	1998	1997		-0.82			-.02
Maize		S. R. Johnson	1995	1991	LAIDS	-0.24	-0.14 (wh.)		0.7
Rice	1	S. R. Johnson	1995	1991	LAIDS	-0.45	0.27 (bb.)	-0.34 (po.)	0.26
	2	H. E. Bouis *	1998	1997		-0.72			0.04
	3	M. S. Hosny	2001	1980–2000	Linear	-0.82			0.62
		M. S. Hosny	2001	1980–2000	Semi log	0.05**			
		M. S. Hosny	2001	1980–2000	Double log	0.02**			
		M. S. Hosny	2001	1980–2000	exponential	-0.03**			0.08
Potatoes	1	S. R. Johnson	1995	1991	LAIDS	-0.57	-1.04 (ri.) **	0.62 (bb.)	1.3**
	2	M. F. Sabaa	2001	1995/1996					0.37
		M. F. Sabaa	2001	1986–1999					0.94
	1	S. Fthalla	1991	1974–1988		-0.41			0.42
Tomatoes	1	S. R. Johnson	1995	1991	LAIDS	-0.12	0.004 (on.) **	-0.7 (wa.) **	1.77**
	2	El Gaar I.	2000	1980–1995		-0.002**			0.033**
Citrus		S. R. Johnson	1995	1991	LAIDS	-0.19	0.09 (da.) **		1.34
Vegetable oils	1	N. Eltatawy		1975–1990		-0.1			0.26

Commodity		Author	Year	Study Period	Model	Price Elasticity			Expenditure Elasticity
						Own	Cross		
							1	2	
	2	E. Sabra	2005	1990–2003	Double log	-1.47**			1.86
	3	W. M. Elbolony	1995	1988–1991		-0.19			0.27
	4	N. Elagrody	2005						0.48
	5	S. Fayad	1999	1990/91					0.63
				1995/96					0.31
	6	S. R. Johnson	1995	1991	LAIDS	-0.23			1.08
Refined sugar	1	S. R. Johnson	1995	1991	LAIDS	-0.16			1.63
	2	H. E. Bouis*	1998	1997		-0.97			0.53
	3	N. Elagrody	2005						0.55
	4	S. M. Ahmed	1993	1981/82		0.25			1
Vegetables		H. E. Bouis*	1998	1997		-0.98			0.65
Fruits	1	N. Elagrody	2005						0.44
	2	H. E. Bouis*	1998	1997		-1.01			0.65
Cotton	1	S. Fadllalh	1991	1974–1988		-0.59			

Note: bb.—Broad beans, da.—dates, ma.—maize, on.—onion, po.—potatoes, ri.—rice, wa.—watermelon, wh.—wheat

** Calculated as an average of the elasticity in rural and urban areas.*

*** Values excluded from average because they are not logical.*

Appendix C. External Demand Elasticity (Exports)

Commodity		Author	Year	Study Period	Model	All Markets	Destination Markets Elasticity							
							1	2	3	4	5	6	7	8
Onions	1	F. Kamal.	2005	1990–2002	Substitution		-0.91 S.A.	-0.79 Le	-0.71 Ku	-1.19Gr	-1.08It	-0.05 Fr	-0.03 E.U.	
Potatoes	1	S. M. Elkady	2005	1985–2003	AIDS		-0.23 En	2-.74 Ge						
	2	S. H. Osman.	2000	1986–1999	AIDS		-0.56 En							
	3	M. F. Sabaa	2001	1986–1999			0.06 En	0.24 It	0.84 Ge	0.51 Gr	0.08 Le	1.54 S. A.	1.25 Ku	
Rice	1	S. E. Shams	2002	1990–2000	Market Share		0-.85 S. A.	-0.12 Le	-0.07 Sy	-0.07 Tu	-1.01 Le	-1.24 Ju	-0.03 Ro	0.82 Su
Cotton	1	S. Fadlallah	1991	1974–1988		-0.41								

Note: En.—England, E. U.—European Union, Fr.—France, Ge.—Germany, Gr.—Greece, It.—Italy, Ju.—Jordan, Ku.—Kuwait, Le.—Lebanon, Ro.—Romania, S. A.—Saudi Arabia, Su.—Sudan, Sy.—Syria, Tu.—Turkey.