A Review of Agricultural Policy Evolution, Agricultural Data Sources, and Food Supply and Demand Studies in Egypt

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Working Paper 10-WP 506
March 2010

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Abstract

Over the years the control of the Government of Egypt on the agricultural sector has increasingly weakened with the progressive elimination of the input subsidy, area control, price control, procurement control, and the constraints in private sector participation in processing and trade. The only remaining major government involvement is the food subsidy in some wheat products, the "baladi" bread subsidy in particular.

Policy analysis studies in Egypt have been made possible because the Government of Egypt collects and publishes significant amounts of agricultural data on a regular basis. Two of the most widely used data sets are the Household Budget Survey conducted and published by the Central Agency for Public Mobilization and Statistics, and the Food Balance Sheet, which is derived and published by the Ministry of Agriculture. However, differences among various data sources remain and need to be harmonized.

A number of studies have been conducted to estimate food supply and demand parameters (i.e., elasticities) using mostly the two previously mentioned data sets. However, the range of elasticity estimates in these studies is rather wide. For example, price elasticity estimates classify animal products in the range of inelastic to elastic with respect to price, and as necessity to luxury with respect to income. This lack of precision makes these parameters less useful for policy analysis purposes. Further investigations are needed to pinpoint the source of these differences—whether it is due to data, model specification, or estimation techniques —so corrective measures can be applied to improve their precision. Only then can credible policy analysis be conducted using these parameters.

Keywords: agricultural data, agricultural policy, Egypt, elasticity, supply and demand.

Introduction

A confluence of factors has recently caused more change in the agricultural sector of Egypt than in any other period in its history. Continuing population growth, which only showed a significant slowdown in the last decade, is increasingly exerting pressure on Egypt's limited resources, particularly land and water. The recent spike in world prices created some social unrest, demanding that the Government of Egypt (GOE) put food security as a top policy priority. This was followed by a response from the GOE to restrict rice exports to retain its rice surplus for the domestic market. Moreover, the GOE has lowered border duties for basic commodities to allow a larger supply of cheap imports. But on the other hand, there are calls for re-examination of its food policies, with its budget burden for the "baladi" bread subsidy program alone reaching 9 billion Egyptian pounds, or LE.

For this reason there is growing interest in providing a science-based perspective of Egypt's emerging food policy issues. This review paper aims to contribute to this effort. To gain a better understanding of the current policy regime, we conduct a comprehensive review of the evolution of agricultural policies in Egypt, tracing the chronological changes of policies, describing the drivers of change, and laying out some of the impacts. Foundational in all efforts to understand and analyze the agricultural sector is the availability and sufficiency of basic data. We review the sources of basic data in Egypt, identifying the different government agencies tasked with collecting and publishing them, comparing data of same variables where available, and raising potential reliability issues. Finally, we review food supply and demand studies in Egypt,

summarizing and comparing elasticities that can be used to quantify likely impacts of changes in agricultural policies.

Evolution of Agricultural Policy

The period 1965-86 witnessed a very extensive involvement of the Egyptian government in the agricultural sector. Crop area controls, fixed producer prices, and compulsory procurement of crops were important policy instruments used by the Egyptian government during this period. Then, Egypt engaged in an ambitious set of macroeconomic policies and market reform programs known as the Structural Adjustment Program (SAP). The reform program began earlier in the agricultural sector compared to other sectors of the Egyptian economy. In 1987, the Ministry of Agriculture (MOA) began removing taxes and subsidies in the agricultural sector. In 1992, Egypt undertook a more widespread policy reform designed to affect all sectors of the economy. The adjustments caused by these reforms were substantial. Within the agricultural sector, not enough is known about the impact of the adjustment process on resource use, national food supplies, and employment and farm incomes**.** Deregulation of the Egyptian economy has been implemented via two major components, namely, through stabilization policies, and through the SAP. On the macro level, the fiscal and monetary policies were adjusted under SAP to allow interest rates and exchange rates to respond to market forces. The SAP is designed to improve the conditions of supply, correct distortions in economic policies, improve allocation of domestic resources, and produce institutional transformation to help reduce vulnerability to external shocks in the future. It consists of five components with respect to reforms in the agricultural sector (Soliman, 1994):

- Removal of government farm price controls.
- Removal of government crop area controls.
- Removal of government crop procurement controls.
- Elimination of subsidies on farm inputs.
- Removal of government constraints on private sector processing and marketing of farm products and inputs.

The policy adjustments could be classified here under supply-oriented policies and demand-oriented policies.

Supply-oriented policy adjustments

The major SAP policy changes introduced in the period 1987 to 1994 made crop areas and rotations freely decided upon by farmers, with the exception of the maximum area earlier set for rice at 1.2 million feddans, which was retained. Vegetables, fruits, and barseem (Egyptian clover) areas have been left unrestricted, and the minimum cotton area was relaxed. All inputs, which used to be distributed by the agricultural credit bank through cooperatives, with fixed quantities on per feddan basis for different crops and feed, were also delivered on a per head basis. The SAP made inputs freely marketed. Also prices of inputs have shifted from being set by the government, with an average subsidy of 50%, to market-determined price outcomes. Exceptions to the new input subsidy policy were granted on the diesel fuel price, a main input used for agricultural machinery, the subsidy on cotton seeds, and the costs of plant protection of cotton. Also, an indirect subsidy was established through the sugar cane council under a national program for raising the yield of sugar cane, which is fully financed by the government. Agricultural credit bank policy shifted to cash credit rather than credit in kind with

respect to input supplies. After leaving all input importation, distribution, and trade to the private sector, some market performance outcomes were deemed detrimental to farmers. Such experience motivated the government to interfere again via the agricultural credit bank and agricultural cooperative in this market. The agricultural credit bank activities have been closer to the competitive basis with commercial banks. Moreover, the compulsory delivery of major field crops, or delivery of quotas on a per feddan basis, was ended. These policies have been replaced by an optional delivery system for all crops except for sugar cane. Prices for optional deliveries are set by the government. Usually the government decides to make optional deliveries of wheat and sugar cane, priced at a per ton rate set higher than the world price equivalent. This policy is not applied for optional deliveries of paddy rice.

Initially, there were two exchange rates that prevailed in 1986. The first was the official exchange rate, which was equal to US$1.43/1 LE. The second was the free market rate, which was equal to US$0.47/1 LE. The official exchange rate was applied to all exports of cotton and rice, but it was applied to only one-half of exports of other crops, while the other half used the free market rate. This overvaluation of the exchange rate effectively maintained artificially low producer prices, which was equivalent to imposing an export tax. In 1990, the official exchange rate was devaluated to US$0.5/1 LE, whereas the free market rate decreased to US$0.34/1 LE. In 1991, the two exchange rates were unified, and the free market exchange rate was US$0.30/1 LE (Hazell et al., 1995).

Before the economic reform program, a substantial part of agricultural trade was controlled by the government, leaving very little for the private sector other than

exporting horticultural crops, with the condition that 25% of the foreign currency received by private exporters should be delivered to the central bank at the official exchange rate. The policy was adjusted to give encouragement to the private sector to play a greater role in exportation of agricultural commodities. Revenues in dollars are left to be evaluated at the free market exchange rate. The private sector was permitted to establish stations for packing and preparing fruits for export.

Demand-oriented policy adjustments

On the consumption side, there has been a long history of intervention in food distribution. The General Authority for Supply Commodities (GASC), controlled by the Ministry of Supply and Internal Commerce, procured locally produced crops and was the sole importer of food items. In the early 1980s, sugar, tea, cooking oil, rice, beans, lentils, meat, poultry, and frozen fish were sold at subsidized prices. This subsidized price policy was implemented under a food rationing scheme. Wheat flour and bread were also subsidized and sold at fixed prices; bread was available in unrestricted amounts, but flour was rationed. Currently, about 10 million households (45 million persons) participate in the food ration program. This program offers half a kilogram of cooking oil and one kilogram of sugar per family member per month. The government has also opened the door again for households to add newborn children, an issue that was closed for a long time. The Ministry of Social Security, established in 2005 (formerly the Ministry of Internal Supply Trade and Supply) announced that it would renew ration cards. The new procedure includes filling out a form to register approved sources of income for all family members. Many have not renewed their registration and simply dropped off from this subsidy program because of the new requirement. It turned out to be an effective step to

get rid of a number of households that do not qualify for the subsidy program. Most of these households were government employees. Another main subsidy is the price subsidy for the popular wheat bread called “baladi” (83% extraction). This kind of bread is sold at 30% of its economic cost and is available in the market for anyone. Fuel is also subsidized, as the benzene price is sold in the retail market at 50% of its world price (on average). The food price subsidy does not represent more than one-fifth of the total subsidy in Egypt (see table 1 and table 2). It increased from less than five million LE (US$1 = 5.65 LE) in 2003 to more than 10 billion LE in 2006. With recent studies showing that the poverty gap is increasing (Soliman, 2006), the demand to continue the subsidy policy is great. Several studies tried to simulate the impact of phasing out the price subsidies of the subsistence food crops. The most important subsistence crop is wheat, which represents more than 50% of the food calories in the Egyptian diet (El-Asfahani and Soliman, 1989).

A pioneering study (Soliman and Shapouri, 1984) investigated the impacts of the wheat price policy on the poverty and nutritional status of Egyptian communities. The study derived demand functions for three levels of income: low, middle, and high. The study showed that keeping the consumer price subsidy policy of subsistence food items, on average, resulted in food intake calories adequate enough to cover recommended health requirements, but with a proportion of the rural population still suffering from protein quality deficiency. If the wheat price subsidy were eliminated, 57% of Egyptians would fall below the poverty line. In another study, the authors included not only the income and price effect on wheat consumption but also the impacts of prices of substitutes. Using the R. Fritsch model, they also inserted via the income utility of money

the cross-elasticity estimates between food and nonfood items (Soliman and Eid, 1992). These studies showed that phasing out the wheat price subsidy without reasonable cash compensation of about 20% of the real per capita income would lead to a deterioration of the standard of living, as the household would draw much from its expenditure on food to cover other subsistence requirements. This proportion represented 30% of the population. Soliman and Eid (1995a) have shown in a succeeding study that the proportion of people under the poverty line increased, raising concerns about neglecting the social dimension of agricultural policy and development. Moreover, these studies presented the changes in the income distribution pattern and its impacts on the standard of living in both urban and rural households of Egypt (Soliman and Eid, 1995b).

Any further studies to assess the impacts of the economic reform program should be conducted on time series data of sufficient length and should consider the resource use, national food supplies, employment, and farm incomes, as well as the following aspects on the consumer market level: (1) price liberalization, (2) foreign trade liberalization, (3) public sector reform program. and (4) social fund.

Agricultural Data and Their Sources

Data on the Egyptian economy, particularly the agricultural sector, are issued and published by two main governmental departments: the Central Agency for Public Mobilization and Statistics (CAPMAS) and the Ministry of Agriculture (MOA). However, there is high coordination between these two sources. Data concerning agricultural area, crop yields, livestock number and structure, and productivity are prepared and reported by the MOA. In addition to their own publications, the MOA

provides agricultural production data to CAPMAS for publication in their annual statistical year book. Both agencies share in reporting the Food Balance Sheet Annual Bulletin (FBS). CAPMAS provides mainly the foreign trade data, which they get from the Egyptian custom tariff offices. MOA, on the other hand, provides mainly the production data, which they get from their annual surveys.

Assessment of supply data

The domestic (Egyptian) estimates for both crop and livestock production were assessed by comparing them with Food and Agriculture Organization (FAO) estimates. Table 3 shows that crop production estimates, in terms of cultivated area and yield per feddan, from both sources are close, particularly the area estimates. However, the crop yield (wheat) shows differences of between 2%-10% less with respect to FAO estimates versus the domestic ones.

While FAO statistics claims that its database is basically derived from the official Egyptian statistical departments, the livestock (red meat production as a case study) showed wide differences in estimates of the number of slaughtered animals, off-take rate, and average carcass weight for both buffalo and cattle meat production (Table 4 and Table 5). While the buffalo slaughtered number estimated by FAO was higher than that of the domestic data sources, the opposite occurred with respect to the carcass weight. The result was less buffalo meat supply estimated by FAO than the MOA.

With respect to cattle meat production, the estimates of FAO were less not only for slaughtered numbers but also for the cattle stock in the mid-1990s. The difference shifted to be positive between the two sources beginning in the late 1990s to the present

period. The carcass weight estimates of FAO were in most years less than those of the MOA.

The reasons behind these differences are many. First, the responsibility of livestock production statistics has shifted from the undersecretary of economics and statistics to the technical animal production sector of the MOA. Accompanying this change is the adoption of a new model for estimation, which we believe is biased towards showing a positive high rate of growth. Secondly, while the MOA is using a linear transformation model of constant coefficients of calving rate, mortality rate, and culling rate, the FAO depends upon adding a percentage of animals slaughtered outside the official slaughter houses to those slaughtered in the official slaughter houses. Even though the FAO model simulates the cyclical trend of slaughtered animals that stems from the changes of the stocking rate on the "Berseem" Area, the percentage of slaughtered animals off-slaughter houses seems less than the actual (underestimated). However, the FAO estimates show more realistic cyclical changes in production than do the MOA estimates. What is needed is to find an approach to estimate the real proportion of animals slaughtered outside the official slaughter houses (Soliman, 2007a).

Assessment of demand data

The FBS is a common source for time series data of food commodities consumption, derived as disappearance given the data for the other supply and utilization variables. However, there is some weakness in this important source of data. First, there is a long lag before these bulletins are made available to the public. Such lags sometimes extend to more than two years, to get all the data of the FBS. The second and most vital disadvantage is the reported biased estimates of some of FBS components of the

consumption profile for major commodities. For example, the proportion of losses of supply is measured subjectively. Moreover, the estimates of the quantities delivered to livestock or poultry as feeds appear to be simple linear transformation estimates rather than actual results from sample surveys.

CAPMAS also provides another vitally important source of data, the successively published Household Budget Surveys (HBS) (Fabiosa and Soliman, 2008). The HBS offers the best set of data available in Egypt for demand and consumption analysis. Such household surveys are conducted, processed, and published entirely by CAPMAS. These series of surveys started in 1958/1959 as a pilot small urban sample. Since the survey of 1964/1965, the sample has been expanded to a large representative sample from rural, urban and big cities. Until 1990/1991, CAPMAS used to issue this sample survey data each decade. After that the duration between each two successive sample surveys has been shortened to only five years until the 2004/2005 sample survey. More recently, CAPMAS decided to make the survey every three years. Accordingly, the survey of 2007/2008 has been conducted, and the data are in the processing stage to be published soon. HBS are collected on a quarterly basis during the specified year. The survey represents all income classes and demographic regions of Egypt. The sample size is around 50,000 households. However, the disadvantage of this kind of cross-section data is that it collects data for only one year. Therefore, it lends easily to the estimation of the income-consumption relationship, rather than the demand-price relationship. It is claimed to be more accurate in estimating the per capita consumption than the FBS. Also, HBS is reportedly reliable in estimating the annual growth rate of the total per capita expenditure

between each successive sample survey and to some extent the actual growth rate in income.

We present in table 6 an example of the differences between the per capita consumption estimated from FBS and two household sample surveys in the period 1994/1995, and1999/2000. In general, FBS per capita consumption estimates of food crops are significantly higher than what is reported in the HBS. In contrast, per capita consumption of red meat between the two sources is very close, while HBS is higher than FBS in poultry and table eggs. We take the example of wheat for an illustrative case to explain the possible sources of the difference in the estimates in per capita consumption from the two main sources of data in Egypt. Wheat consumption, in particular bread, noodles, pasta, and other wheat products, were all converted into wheat equivalent units first. The bread usually appears in the published tables of HBS as the value in Egyptian pounds for both types of bread, the popular subsidized "baladi" bread, and the white bread (as fresh bread style). Both are converted as number of loaves by using the price and value of expenditure, then further converted using the moisture content and the average weight per loaf. The extraction rate provides estimates in wheat equivalent units. Also, to get per capita consumption comparable to that estimated from the FBS, the aggregate weighted average of urban and rural was estimated from the household sample survey. The main source of difference in the estimates for wheat is the subjective assumption on the proportion of losses in supply. In the case of maize, the big difference between estimated maize consumption of HBS and FBS are due to the large underestimation by the FBS of maize for feeds in livestock and poultry.

Review of Supply and Demand Studies

With Egypt's move towards more market orientation, understanding the demand and supply drivers is of paramount importance. Egypt began to move towards a free market in the 1990s. However, the agricultural sector was ahead of the other sectors, starting its reforms earlier, in the 1986 to 1987 period. Core components of the reform were gradual privatization of the Egyptian economy, except for some selective strategic ones, and the liberalization of the market, including the exchange rate and the interest rate in 1990/1991 (Hazell et al., 1995; Soliman, 1994). Accordingly, economists in Egypt are increasingly interested in understanding demand and supply factors in order to be able to examine the impacts of these reforms on the market performance, with a special emphasis on the agricultural sector.

The quality of any estimated demand and supply model relies upon its specification and identification. The main consideration is to ensure that theoretical requirements are met and that statistical properties of the estimates are desirable. Therefore, in this review we focus only on studies with estimated models that considered these two criteria.

This review of available estimated demand and supply for agricultural products, crops, and livestock shows a wide variation in the estimated elasticity coefficients. The reasons behind these differences are numerous. Some of the variations for the same commodity can be traced to the differences of the period of the time series used. This is particularly critical since the Egyptian economy passed through many dramatic economic changes over the last three decades. Some other reasons are differences in the data used by the studies (Soliman and Aziz, 1984; and Soliman, 2007b).

The review is organized as follows. First, we present the consumption function estimation as a relation between the annual per capita consumption and the annual per capita income estimated from HBS as a special demand model derived from cross section data. Next we present studies on demand with parameters estimated from time series data. These studies show the long-run elasticity of income and at the same time present a full demand function model, including own-price response as well as response to changes in the price of substitute products. Then, we cover the supply models. The supply model includes both the specification with cultivated area as an endogenous dependent variable and where quantity of production is the dependent variable. Also, studies focusing on animal products are separated from studies with a major emphasis on field crops in all of the sub-sections.

Consumption function

The consumption function reviewed here belongs to the general class of models commonly known as "Engle's Curve." These studies used the successive HBS conducted in Egypt to estimate demand parameters, income elasticity in particular. The annual per capita income used in these models is the annual per capita expenditure. The models were estimated for both urban and rural regions.

Animal products

Shapouri and Soliman (1984) studied red meat consumption in Egypt. They utilized the HBS data for 1964/1965 and compared it with 1974/1975 to estimate the income-consumption elasticity of aggregate red meat and poultry meat. The consumption function form was the double-log function. For what will characterize the general results

of most consumption studies, it was first shown here that as per capita consumption of animal products increased with the improvement in household standard of living, the income elasticity of demand for such products decreased. That is, the estimates from the 1990/1991 HBS showed lower income elasticity when compared to the estimates from 1974/1975, which in turn was less than the estimates using the 1964/1965 survey (table 7). Soliman and Eid (1995a) provided further evidence for such a result from the HBS of 1990/1991, as shown in table 7. The study identified the best-fitted model for each commodity from three alternative functional forms, namely, double-log, semi-log, and double-log inverse functions. The estimates presented here are the average of the elasticity coefficient as it changes by the level of income (expenditure). Ragab et al. (2008) estimated the Engle's curve model using the double-log form. The model estimated the relation between the per capita annual expenditure on each food animal product commodity and the total per capita annual expenditure. The commodities of interests were fish, meat (poultry and red meat), and other animal products (dairy products and table eggs). The study compared the average estimated elasticity of the two most recent HBS, i.e., the 1999/2000 versus the 2004/2005. The estimated models and the comparison were made for both urban and rural regions, as shown in table 7. Again, it is shown that the average income elasticity of all animal products estimated for the year 2004/2005 is less than those of the year 1999/2000.

Another study by Sleem and Abdul Azziz (2006) dealt with estimating the consumption function of animal products (all types of meat) using HBS 1999/2000. It tested three functional forms—the linear, semi-log, and double-log, for fresh red meat, poultry, and fish. The authors compared their results with the similar studies that used the

same forms but on the HBS of 1995/1996. The results of the linear and semi-log functions were omitted in this presentation due to lack of economic consistency of the results. The results of the double-log function are shown in table 8. Sleem and Abdul Azziz derived the quality elasticity by subtraction of the average estimates of quantity/expenditure elasticity from the estimates of expenditure/expenditure elasticity of the same commodity.

Food crops

Atta (2006) estimated the Engle curve function for the relation between per capita annual consumption of grains as a function of annual per capita expenditure calculated from the cross section data of the 1999/2000 HBS. The study tried four functional forms: linear, double-log, semi-log, and quadratic forms. The exercise was repeated using the same relations and forms but changing the dependent variable with the value of expenditure on each commodity per capita per year. These functions were estimated for both major urban and rural regions of Egypt. The average elasticity of consumption was estimated. Two types of elasticities were estimated: one from the quantity-expenditure functions and the other from the commodity group expenditure–total expenditure functions. The difference between the expenditure elasticity and the quantity elasticity is an estimate of the quality elasticity. It means the changes are in the quality of the commodity, rather than the quantity due to an increase in income (total expenditure). This estimate of the quality elasticity assumes that better quality of a unit of a certain commodity commands a higher price. The estimated elasticity coefficients corresponding to each function form are shown in table 9. The author reached a significant result for urban households with respect to the elasticity from the expenditure-expenditure

specification of grains and rice. It is cited that all functions were insignificant in the estimate of elasticity from the quantity-expenditure specification for urban households. This is because most of the consumption of bread as the main type of grain consumed in urban areas is of a fixed subsidized price. However this explanation is not fully relevant in the case of urban rice consumption. Whereas, a proportion of rice was distributed at fixed subsidized price via the ration program, the largest proportion was still purchased from the free market, but this was also not significant (table 9).

Fabiosa and Soliman (2008) found the same pattern in meat and cereal-bread products for both rural and urban households, except that the elasticities in more recent HBS (2004/2005) were higher than earlier period surveys (1999/2000). The reason is that there was actually a decline in real per capita income from 1999/2000 to 2004/2005.

Demand function

Several studies estimated a food demand system for Egypt using time series data of different periods and applying different demand system specifications. Most of the reviewed studies did not impose theoretical restrictions in the estimation parameters except for the adding-up restriction when expenditure shares are used as the dependent variable because the expenditure share of one commodity groups needs to be dropped to avoid singularity in estimation. The rest of the theoretical restrictions, including homogeneity, symmetry, and curvature, are not imposed.

Animal products

In the case of animal products, the range of the elasticity estimates is very wide, covering the full range of elasticity product types from inelastic to elastic products. For

example, the own-price elasticity for fish is in the range of -0.10 to -1.80, for red meat is -0.01 to -0.64, and for poultry meat is -0.34 to -1.14. Similarly, the range of the estimated expenditure elasticity is also very wide covering the range of products from necessity to luxury products. For example, the expenditure elasticity for fish is in the range of 0.18 to 2.36, for red meat is 0.22 to 1.78, and for poultry meat is 0.03 to 2.5.

The MOA, CAPMAS, and MOT publish data used in most of these studies. Among the early demand system studies was that of Fayyad et al. (1995), which included six meat, dairy, and egg products in a Seemingly Ideal Demand System Model specification demand system (LAIDS) of 22 products. Ragab et al. (2008) applied the LAIDS and estimated demand parameters using the three-stage least square method. Their average estimated elasticities are presented in table 10. Ismail and Lotfi (2007) used a "Barten Mixed Model." Their estimated elasticities are presented in table 11. Atta (2006) used the Rotterdam, AIDS, and Generalized Add log Demand System (GADS) for red meat, poultry meat, and fish. The covered period was 1980 to 2003. The Rotterdam model was shown to be the best among the models. Prices were deflated with 1986 as the base period (i.e., 1986 = 100). The estimated elasticity matrix is shown in table 12. Atwoa (2006) used an AIDS model to estimate the demand for all types of meat in the Egyptian market. The estimated elasticities are reported in table 13. The sign of some cross elasticity coefficients were negative, suggesting that some of the products are complements rather than substitutes.

Field crops

The same wide range of elasticity estimates in the animal products is also observed in the elasticity in field crops. However, the main difference is that in the case

of field crops, all own-price elasticities show an inelastic demand for field crops. For maize, one study reports a negative expenditure elasticity, making maize an inferior product.

The MOA, CAPMAS, and MOT publish data used in most of these studies. The Fayyad et al. (1995) study included fifteen field crop products in the demand system. Ismail and Lotfi (2007) used an AIDS model to estimate the demand functions for grains. The price elasticities of the three main field crops are presented in table 14. Fadl Allah (1994) estimated a demand function for potatoes using a double-log functional form. The demand price elasticity estimated was -0.41 while the income (expenditure) elasticity was 0.48. Fadl Allah (1991) also estimated a demand function for Egyptian cotton. The price elasticity of domestic demand for cotton was -0.59. Abdul Fatah and Hassan (2002) built a market model for maize. The period covered was 1980 to 2001. The structural form of the model was four equations, for consumption, import, supply, and an identity equation where consumption = production + imports + net inventory change. Then the study derived the reduced-form estimates from the structural model. The elasticity estimates used in this model are presented in table 15. Soliman and Shapouri (1984) estimated the average elasticity of both the wheat price and per capita income. They used the HBS of 1974/1975 to estimate the income elasticity. These estimates were 0.29 for price and 0.27 for income. They used these elasticity coefficients to test the impact of wheat price liberalization on the nutrition status of the Egyptian communities in either urban or rural areas. Soliman and Mouselhi (1989) and then Soliman and Eid (1992) successively derived a demand elasticity matrix for estimating the impact of phasing out the wheat price subsidy at the consumer level. This matrix is reported in table 16.

Supply functions

Animal products

Few studies have dealt with livestock supply functions in Egypt. Even fewer are the number of studies that have reached results with acceptable theoretical properties and statistical significance. Among those are three studies by Soliman (1997a, 1997b, and 2007). These estimates were initially for studies on market models to test the impact of economic policy changes on the livestock and poultry market. The elasticities estimated are reported in table 17. The supply elasticity is in the range of 0.26 to 0.64. With a shorter production process involved, it is of interest that the poultry supply is the most inelastic, while beef and milk, believed to require longer production processes, show relatively more elastic supply.

Field crops

Similar to animal products, the available studies with reliable estimates of the supply function of field crops are limited. The supply elasticity estimates for field crops are not as widespread, with wheat supply ranging from 0.74 to 0.76, maize supply from 0.38 to 0.57, and broad beans supply from 0.75 to 0.97.

A recent study by Ismail and Lotfi (2007) estimated the price elasticity of supply from linear functions for wheat, rice, and maize. The average elasticity was 0.76, 0.87, and 0.57, for wheat, rice, and maize, respectively. The study used the published secondary data of MOA and CAPMAS for the period 1991 to 2005. Abdul Fatah and Hassan (2002) built a market model for maize in Egypt, using annual data published by CAPMAS, FAO, and the Council of Arabic Economic Union. The period covered was

1980 to 2001. The structural form of the model was four equations: consumption, import, supply, and definition equation where consumption = production + imports + net inventory change. Then the study derived the reduced-form estimates. The supply elasticity of maize from this model was estimated as 0.382. Estimates were identified from other reliable studies and are presented in table 18.

Most of the available supply response estimated for crops in Egypt specified a form that presented the explanatory variables as ratios of profitability, costs of production or even prices of the given crop relative to the same variable of the competing crop. Alawady (2005) showed with high statistical significance estimates of area (000 feddan) in Egypt as a function of lag area, cost of production of lintels in the previous year, net revenue per feddan of broad beans. Ismail and Lotfi (2007) applied the multimarket model and succeeded in introducing wheat farm price in the previous year as an explanatory variable that explains partially the variation in the current area of wheat. We estimate an average supply response elasticity of 0.06. Bahloul (2006) estimated the wheat area supply response using a linear function and applied the "Prais Winston" method to minimize the autocorrelation of the successive error of the time series data. The results showed that the short-run supply elasticity was 0.19 and the long-run elasticity was 0.74.

Kenawi(2008) recently applied several models, such as the Fisher, Solow, Cudahy, and other models, to estimate the supply response of some major crops in Egypt. The data used were those published by MOA, CAPMAS and FAOSTAT for the period 1990 to 2006. The maize supply response has area as the dependent variable and is expressed as a function of the maize farm price. All price parameters were estimated with

the expected positive sign. Hafez (2006) studied the supply of broad beans. The estimated supply elasticity of broad beans was not significant but had the expected positive sign. The average supply elasticity was 0.97. When the author used the stepwise method to identify the most significant variable explaining the area of beans, only the ratio of the return on beans relative to wheat came out as significant. The lack of statistical significance of the other variables may be due to the presence of multi-co-linearity. Moreover, serial correlation of the residual needed to be properly addressed. Dweidar (2004) used the Nerlove model to estimate the supply response of broad beans in Egypt. From the correlation matrix of the variables of interest, the least correlated ones with the bean area were omitted. The estimated supply response to lag of farm price was 0.69. Suleiman (2003) applied the Fisher model to estimate the supply response for sugarcane area in Egypt. As a perennial crop, a three-year lag and four-year lag response of the sugarcane farm price was applied. The estimated elasticity of price lagged three years was 0.15, while that lagged for four years was 0.15. As expected, the supply response of sugarcane is rather low because the crop stays for up to three to four years (three cuts). Kamal (2005) estimated supply functions of important legume crops in Egypt. The own-price elasticity was about 0.75. Table 18 presents a profile of price supply elasticities of some major field crops in Egypt.

Summary and Conclusion

The agricultural sector in Egypt has gone through significant policy regime changes, from a regime of tight government control to a largely liberalized sector. The GOE has also attempted to collect and publish relevant agricultural data that enables

researchers to examine the impact of these policy shifts. In particular, a number of studies have estimated demand and supply functions to derive parameters needed for policy analysis. However, although the available studies on demand and supply functions of Egyptian agriculture are many, few are based on theoretically consistent specifications with desirable statistical results.

We summarize some major observations from our review of policy, data, and demand and supply studies. Regarding the data, a better approximation of the proportion of production that is lost as products move in the value chain, and better estimates of the amount of grains used in the livestock sector would help harmonize the differences that exist between different data sources.

Regarding the demand studies, we found that the estimates of income elasticity from the consumption function (Engel's curve) were always higher than those estimated from time series data. If the former are short-run elasticity estimates while the latter reflect the long-run effect on elasticity, then the higher short-run elasticity may suggest an overshoot in the short-run response. Or, since the short-run elasticities are estimated from HBS from one-year data where other factors are constant, particularly prices and consumer tastes, the HBS estimates may provide a higher probability of precision.

We observed in the successive estimates of income elasticity of agricultural food commodities that the values have decreased over time, i.e., the demand response to income relatively decreases. As the standard of living improves and the average level of per capita consumption also increases, we would expect that the relative increase in the quantity demand to a given relative increase in income would decrease.

The range of demand elasticity estimates was rather wide, covering the entire range of product categories, from inelastic to elastic products and necessity and luxury products. The supply elasticity for field crops had a narrower range, many above 0.50. On the other hand, the supply elasticity of animal products was lower with a surprisingly low elasticity of poultry compared to other meats, despite poultry having the shortest production cycle and the quickest ability to respond to changes in incentives.

With still a wide range of elasticity estimates, there is a need in Egypt to reconcile data sources and improve the precision of parameter estimates to make them useful for policy analysis.

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Table 1. Trend of Consumer Price Subsidies by Sector

Year		Food	Other	Total Direct Subsidy	Indirect Subsidy	Grand total of Subsidy
2002/2003	Billions LE	4.259	2.686	6.945	16.065	23.01
	%	18.50	11.70	30.20	69.80	100.00
2003/2004	Billions LE	3.591	4.409	8	16.7	24.7
	%	14.50	17.90	32.40	67.60	100.00
2004/2005	Billions LE	11.627	3.974	15.601	23.4	39.001
	%	29.80	10.20	40.00	60.00	100.00
2005/2006	Billions LE	10	16.9	26.9	22	48.9
	%	20.40	34.60	55.00	45.00	100.00

Source: Estimated from the Bulletins of the Ministry of Finance.

Table 2. Structure of Subsidies Provided to Egyptian Consumer Prices

Item	Value in thousand million dollars	%
Food price Subsidy	10.0	20.4%
Other Direct Subsidy	16.9	34.6%
Total direct subsidy	26.9	55.0%
Natural Gas Price	8.9	18.2%
Biotin Gas Price	4.7	9.6%
Diesel	7.2	14.7%
Benzene	1.0	2.0%
Kerosene	0.2	0.4%
Total indirect subsidy	22.0	45.0%
Total Subsidy	48.9	100.0%

Source: Calculated from the Bulletins of the Ministry of Finance, Cairo, Egypt.

Table 3. A Comparison between FAO and Egyptian MOA Estimates of Wheat Area and Yield

Year	FAO Estimates			Ministry of Agriculture Estimates			(FAO-MOA)/(MOA)%		
	(000)Feddan	Ton/Feddan	Production (tons)	(000)Feddan	Ton/Feddan	Production (tons)	Area	Yield	Production
1985	1,185.7	1.58	1,872	1,186.0	1.58	1,873	-0.02%	-0.05%	-0.07%
1986	1,207.1	1.60	1,928	1,206.4	1.60	1,929	0.07%	-0.12%	-0.05%
1987	1,373.8	1.98	2,721	1,373.0	1.98	2,725	0.06%	-0.20%	-0.14%
1988	1,422.3	2.00	2,838	1,421.0	2.07	2,944	0.09%	-3.67%	-3.59%
1989	1,533.1	2.08	3,182	1,532.0	2.08	3,183	0.07%	-0.10%	-0.02%
1990	1,955.5	2.18	4,268	1,954.7	2.29	4,471	0.04%	-4.59%	-4.55%
1991	2,216.0	2.02	4,482	2,215.1	2.14	4,735	0.04%	-5.37%	-5.33%
1992	2,092.5	2.21	4,618	2,091.6	2.38	4,976	0.04%	-7.23%	-7.19%
1993	2,172.2	2.22	4,833	1,717.2	2.43	4,181	26.50%	-8.62%	15.60%
1994	2,111.8	2.10	4,437	2,110.9	2.34	4,940	0.04%	-10.21%	-10.18%
1995	2,512.8	2.28	5,722	2,511.8	2.46	6,187	0.04%	-7.54%	-7.50%
1996	2,421.9	2.37	5,735	2,420.9	2.56	6,195	0.04%	-7.46%	-7.42%
1997	2,487.1	2.35	5,849	2,486.1	2.49	6,202	0.04%	-5.72%	-5.68%
1998	2,422.1	2.52	6,093	2,379.9	2.67	6,344	1.77%	-5.62%	-3.95%
1999	2,380.9	2.67	6,347	2,380.0	2.82	6,701	0.04%	-5.33%	-5.29%
2000	2,464.3	2.66	6,564	2,463.3	2.80	6,887	0.04%	-4.73%	-4.69%
2001	2,342.2	2.67	6,255	2,341.8	2.76	6,463	0.02%	-3.25%	-3.23%
2002	2,451.4	2.70	6,625	2,450.4	2.79	6,826	0.04%	-2.98%	-2.94%
2003	2,507.2	2.73	6,845	2,506.2	2.82	7,075	0.04%	-3.29%	-3.26%
2004	2,606.5	2.75	7,178	2,605.5	2.84	7,410	0.04%	-3.17%	-3.13%
2005	2,985.3	2.73	8,141	2,985.3	2.80	8,351	0.00%	-2.52%	-2.52%
2006	3,064.3	2.70	8,274	3,063.7	2.77	8,479	0.02%	-2.43%	-2.42%

Source of Data:
(1) FAOSTAT, © FAO Statistics Division 2009, 13 December 2009.
(2) Ministry of Agriculture and Land Reclamation: Economic Affairs Sector.

Table 4. A Comparison between FAO and Egyptian Estimates for Buffalo Stock and Meat Production Parameters

Year	FAO Estimates					Ministry of Agriculture Estimates					(FAO-MOA)/(MOA)%			
	Stock (000) Head	Slaughtered number (000)	Off-Take Rate %	Carcass Weight (Kg)	Production (000)Ton	Stock (000) Head	Slaughtered number (000)	Off-Take Rate %	Carcass Weight (Kg)	Production (000)Ton	Stock (000) Head	Slaughtered number (000)	Carcass Weight (Kg)	Production (000)Ton
1985	2429	1010	41.6%	133.6	135	2,429	707	29.1%	210.7	149.0	0.0%	42.9%	-35.9%	-10.3%
1986	2443	1020	41.8%	133.3	136	2,443	874	35.8%	147.6	129.0	0.0%	16.7%	-7.9%	3.3%
1987	2454	1025	41.8%	133.1	137	2,455	1573.5	64.1%	126.8	199.5	0.0%	-34.9%	7.7%	-33.3%
1988	2464	1035	42.0%	132.8	138	2,484	1061	42.7%	155.5	165.0	-0.8%	-2.5%	-11.6%	-19.5%
1989	2549	1070	42.0%	132.7	142	2,485	1075	43.3%	154.4	166.0	2.6%	-0.5%	-8.0%	-20.1%
1990	2897	1215	41.9%	132.5	161	2,752	1089	39.6%	154.3	168.0	5.3%	11.6%	4.4%	-21.1%
1991	2994	1250	41.8%	133.6	167	3,165	1103	34.8%	153.2	169.0	-5.4%	13.3%	9.0%	-20.9%
1992	3165	1300	41.1%	132.3	172	3,642	1125	30.9%	153.8	173.0	-13.1%	15.6%	11.8%	-23.5%
1993	3250	1330	40.9%	132.3	176	2,823	1147	40.6%	154.3	177.0	15.1%	16.0%	14.1%	-25.3%
1994	2920	1280	43.8%	133.3	171	2,189	1255	57.3%	278.9	350.0	33.4%	2.0%	-38.8%	-61.9%
1995	3018	1375	45.6%	130.4	179	3,018	858	28.4%	289.0	248.0	0.0%	60.3%	-37.9%	-47.4%
1996	2907	1370	47.1%	152.1	208	3,057	886	29.0%	301.4	267.0	-4.9%	54.6%	-30.8%	-43.0%
1997	3096	1450	46.8%	176.2	256	3,096	901	29.1%	299.6	269.9	0.0%	60.9%	-14.7%	-34.7%
1998	3149	1520	48.3%	175.1	266	3,149	935	29.7%	303.1	283.4	0.0%	62.6%	-12.2%	-38.2%
1999	3330	1580	47.5%	175.2	277	3,330	948	28.5%	301.8	286.1	0.0%	66.7%	-8.2%	-38.8%
2000	3379	1640	48.5%	175.6	288	3,379	953	28.2%	302.2	288.0	0.0%	72.1%	-4.7%	-39.0%
2001	3532	1073	30.4%	175.6	189	3,533	964	27.3%	294.2	283.6	0.0%	11.4%	-35.9%	-38.1%
2002	3550	1157	32.6%	175.5	203	3,717	1054	28.4%	320.2	337.5	-4.5%	9.8%	-36.6%	-48.0%
2003	3777	1305	34.6%	175.6	229	3,777	1048	27.7%	309.4	324.3	0.0%	24.5%	-25.9%	-45.9%
2004	3845	1530	39.8%	175.6	269	3,845	1068	27.8%	309.1	330.1	0.0%	43.3%	-13.1%	-46.8%
2005	3898	1538	39.4%	175.5	270	3,885	1115	28.7%	317.1	353.6	0.3%	37.9%	14.9%	-50.4%

Source of Data:

(1) FAOSTAT, © FAO Statistics Division 2009, 13 December 2009.

(2) Central Agency for Public Mobilization and Statistics "Livestock Statistics."

(3) Central Agency for Public Mobilization and Statistics "Bulletin of Income estimates from Agricultural Sector" Several Issues" Cairo, Egypt.

(4) Ministry of Agriculture and Land Reclamation: Economic Affairs Sector.

Table 5. A Comparison between FAO and Egyptian Estimates for Cattle Meat Production Parameters

FAO Estimates					Ministry of Agriculture Estimates						(FAO-MOA)/(MOA)%			
Year	Stock (000) Head	Slaughtered number (000) Head	Off-Take Rate %	Carcass Weight (Kg)	Production (000) Ton	Stock (000) Head	Slaughtered number (000) Head	Off-Take Rate %	Carcass Weight (Kg)	Production (000)Ton	Stock (000) Head	Slaughtered number (000) Head	Carcass Weight (Kg)	Production (000) Ton
1985	1709	780	45.6%	130.7	102	3,105	854	27.5%	120.6	103	-45.0%	-8.7%	8.4%	-1.0%
1986	1855	825	44.5%	139.3	115	3,174	1239	39.0%	120.3	149	-41.6%	-33.4%	15.8%	-22.8%
1987	2300	970	42.2%	139.1	135	3,245	2692	83.0%	136.1	367	-29.1%	-64.0%	2.2%	-63.2%
1988	2780	1170	42.1%	133.9	157	3,317	1839	55.4%	138.7	255	-16.2%	-36.4%	-3.4%	-38.6%
1989	2721	1150	42.3%	134.7	155	3,389	1878	55.4%	138.4	260	-19.7%	-38.8%	-2.7%	-40.4%
1990	2618	1065	40.7%	134.2	143	2,983	1918	64.3%	138.2	265	-12.2%	-44.5%	-2.9%	-46.0%
1991	2973	1250	42.0%	134.4	168	2,719	1959	72.0%	137.8	270	9.4%	-36.2%	-2.5%	-37.8%
1992	2970	1255	42.3%	136.0	171	2,468	2002	81.1%	137.4	275	20.3%	-37.3%	-1.0%	-37.9%
1993	2977	1367	45.9%	135.3	185	2,752	2045	74.3%	137.4	281	8.2%	-33.2%	-1.5%	-34.2%
1994	2989	1457	48.7%	145.1	211	2,728	1056	38.7%	177.2	187	9.6%	37.9%	-18.1%	13.0%
1995	2996	1497	50.0%	143.2	215	2,996	819	27.3%	282.1	231	0.0%	82.8%	-49.2%	-7.1%
1996	3107	1400	45.1%	174.5	244	3,057	853	27.9%	287.2	245	1.6%	64.1%	-39.2%	-0.3%
1997	3117	1413	45.3%	175.5	248	3,117	871	27.9%	285.1	248	0.0%	62.2%	-38.4%	-0.1%
1998	3217	1426	44.3%	176.7	252	3,217	899	27.9%	286.4	258	0.0%	58.6%	-38.3%	-2.1%
1999	3418	1350	39.5%	172.4	233	3,417	966	28.3%	283.3	274	0.0%	39.8%	-39.2%	-14.9%
2000	3530	1478	41.9%	172.9	256	3,530	989	28.0%	285.0	282	0.0%	49.4%	-39.3%	-9.3%
2001	3801	1427	37.5%	172.9	247	3,801	995	26.2%	274.9	274	0.0%	43.4%	-37.1%	-9.8%
2002	4000	1459	36.5%	172.9	252	4,081	1145	28.1%	293.8	336	-2.0%	27.4%	-41.2%	-25.0%
2003	4227	1642	38.8%	174.5	287	4,227	1149	27.2%	286.6	329	0.0%	42.9%	-39.1%	-13.0%
2004	4369	1622	37.1%	200.4	325	4,369	1178	27.0%	289.0	341	0.0%	37.7%	-30.7%	-4.5%
2005	4500	1600	35.6%	200.0	320	4,485	1216	27.1%	290.0	353	0.3%	31.6%	-31.0%	-9.3%

Source of Data:

(1) FAOSTAT, © FAO Statistics Division 2009, 13 December 2009.

(2) Central Agency for Public Mobilization and Statistics "Livestock Statistics."

(3) Central Agency for Public Mobilization and Statistics "Bulletin of Income Estimates from Agricultural Sector" Several Issues, Cairo, Egypt.

(4) Ministry of Agriculture and Land Reclamation: Economic Affairs Sector.

Table 6. Per Capita Consumption of Commodities

Commodity	Per Capita Annual Consumption				
	Source of Data	1990/91	1995/96	1999/2000	2004/2005
Wheat	FBS	132.390	132.400	122.000	131.150
	HBS	53.398	62.168	50.514	62.531
Rice	FBS	37.200	49.550	50.700	47.450
	HBS	25.246	28.920	32.317	31.177
Maize	FBS	57.360	54.310	60.045	78.600
	HBS	10.725	9.357	5.604	5.719
Broad Beans	FBS	2.705	6.950	5.150	6.900
	HBS	1.766	1.938	1.261	2.188
Red Meat	FBS	10.650	10.350	8.850	10.750
	HBS	7.414	6.517	7.461	6.144
Poultry	FBS	7.800	6.480	8.835	9.850
	HBS	8.802	9.162	13.879	11.521
Table Eggs	FBS	65.000	54.000	52.500	70.000
	HBS	66.707	88.980	100.140	95.204
Dairy Products (Milk equivalent)	FBS	50.500	41.480	50.000	70.000
	HBS	35.621	48.201	46.095	45.915

FBS = Food Balance Sheet
HBS = Household Budget Survey

Table 7. Income Elasticities Estimates from Household Budget Surveys in Egypt

Commodity	Year of Household Survey	Region	Average income elasticity	Type of Elasticity	Model's form	Author(s)
Total Red Meat	1964/65	All Egypt	1.02	Q/E	DL	Shapouri and Soliman, 1984
Poultry Meat	1964/65	All Egypt	1.54	Q/E	DL	Soliman and Shapouri, 1985
Beef	1990/91	All Egypt	0.765	Q/E	DL	Soliman and Eid, 1995a
Imported Frozen Meat	1990/91	All Egypt	0.16	Q/E	DLI	
Poultry Meat	1990/91	All Egypt	1.125	Q/E	DL	
Milk	1990/91	All Egypt	1.294	Q/E	SL	
Table Eggs	1990/91	All Egypt	0.9	Q/E	SL	
Fish	1990/91	All Egypt	1.205	Q/E	SL	
Total Red Meat and Poultry	1999/200	Urban	0.740	E/E	DL	Ragab et al., 2008
	2004/2005	Urban	0.358	E/E	DL	
	1999/200	Rural	0.762	E/E	DL	
	2004/2005	Rural	0.419	E/E	DL	
Dairy Products and Table Eggs	1999/200	Urban	0.766	E/E	DL	
	2004/2005	Urban	0.335	E/E	DL	
	1999/200	Rural	.529	E/E	DL	
	2004/2005	Rural	0.463	E/E	DL	
Fish	1999/200	Urban	0.695	E/E	DL	
	2004/2005	Urban	0.401	E/E	DL	
	1999/200	Rural	0.777	E/E	DL	
	2004/2005	Rural	0.528	E/E	DL	

Table 8. Estimates of Meat Income Elasticity for Quality in Egypt

Commodity	Year of the Household Budget Survey	Urban			Rural		
		Quantity Elasticity	Expenditure Elasticity	Elasticity for quality	Quantity Elasticity	Expenditure Elasticity	Elasticity for quality
Fresh Red Meat	1995/1996	0.46	0.52	0.06	0.46	0.52	0.06
	1999/2000	0.38	0.68	0.3	0.7	0.71	0.01
Poultry	1995.1996	0.74	0.79	0.05	0.74	0.79	0.05
	1999/2000	0.33	0.46	0.13	0.37	0.66	0.29
Fish	1995.1996	0. 8	1.4	0.6	0. 8	1.4	0.6
	1999/2000	0.39	0.89	0.50	0.49	0.66	0.17

Source: Sleem and Abdul Aziz, 2006.

Table 9. Grains Elasticities of Demand for Quality in Egypt

Elasticity by form and by Region	Urban						Rural					
	Quantity Elasticity		Expenditure Elasticity		Quality Elasticity		Quantity Elasticity		Expenditure Elasticity		Quality Elasticity	
	Total Grains	Rice	Total Grains	Rice	Total Grains	Rice	Total Grains	Rice	Total Grains	Rice	Total Grains	Rice
Linear Form	0.36	0.10	NS	NS	NS	NS	0.39	0.43	Ns	0.26	NS	0.17
Double-Log Form	0.40	0.15	NS	NS	NS	NS	0.4	0.62	Ns	0.5	Ns	0.12
Semi-Log Form	1.1	0.35	NS	NS	NS	NS	1.20			1.50	1.03	0.47
Quadratic Form	0.5	0.16	NS	NS	NS	NS			0.33	0.71	0.65	0.06

Table 10. Estimates of Own-Price, Cross-Price, and Income Elasticity of Animal Products

Estimated Model	Commodity	Fish	Red Meat	Poultry Meat
Demand Price Elasticity and Cross Elasticity	Fish	-0.684		
	Red Meat	0.723	-0.571	
	Poultry Meat	0.351	0.281	-0.943
Income (Expenditure) Elasticity		0.185	0.221	0.035

Source: Ragab et al., 2008.

Table 11. Elasticity Coefficients from a Barten Mixed Model of the Demand for Meat Types

Commodity	Fish	Red Meat	Poultry	Expenditure
Fish	-0.104	0.038	0.016	2.36
Red Meat	0.155	-0.011	1.096	1.718
Poultry	0.017	0.381	-1.144	2.504

Source: Ismail and Lotfi, 2007.

Table 12. Elasticity Coefficients Using the Rotterdam Demand Model for Meat Types in Egypt

Commodity	Red Meat	Poultry Meat	Fish	Expenditure	Weighted Average
Red Meat	-0.169	0.150	0.019	1.110	0.58
Poultry Meat	0.407	-0.612	0.206	0.925	0.214
Fish	0.053	0.214	-0.267	0.767	0.206

Source: Atta, 2006.

Table 13. AIDS Model to Estimate the Demand for All Types of Meat

Commodity	Beef	Other Red Meat	Poultry	Fish	Expenditure
Beef	-0.645	-0.601	-0.369		0.763
Other Red Meat	-0.645	-1.001	-0.242	-0.271	0.852
Poultry	-0.401	0.047	-0.347	-1.082	1.602
Fish	0.007	-0.183	-0.799	-1.803	0.831

Source: Atwoa, 2005.

Table 14. AIDS Model to Estimate the Demand Functions for Grains

Commodity	Price Elasticity of Demand			Income (Expenditure) Elasticity of Demand
	Wheat	Rice	Maize	
Wheat	-0.57	0.49	-0.38	0.597
Rice	0.43	-0.95	0.40	0.871
Maize	0.34	0.49	-0.52	-0.495

Source: Ismail and Lotfi, 2007.

Table 15. Estimates of Parameters of Demand and Supply Model of Maize in Egypt

Demand and Supply of Maize	Local Price	Imported Price of Maize	Income	World Price of Maize	Exchange Rate
Domestic Demand	-0.203	-0.152	0.174		
Demand for Imported Maize	-0.319	-0.427		-0.12	-0.063

Source: Abdul Fatah and Hassan, 2002.

Table 16. The Matrix of the Elasticity Coefficients of Demand for Major Food Commodities

Commodity	Wheat	Rice	Maize	Sorghum	Lentils	Broad Beans	Oranges	Sugar Cane	Sugar Beet	Potato	Tomato
Wheat	-0.290	0.270	0.290	NA	0.004	0.004	NA	-0.013	-0.013	NA	NA
Rice	0.340	-0.540	0.210	NA	-0.004	-0.004	NA	-0.016	-0.016	NA	NA
Maize	0.170	0.140	-0.190	NA	-0.002	-0.002	NA	-0.006	-0.006	NA	NA
Sorghum	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lentils	-0.002	-0.001	-0.001	NA	-0.460	NA	NA	-0.002	-0.002	NA	NA
Broad Beans	-0.002	-0.001	-0.001	NA	-0.460	NA	NA	-0.002	-0.002	NA	NA
Oranges	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sugar Cane	-0.010	-0.002	-0.002	NA	NA	NA	NA	-0.512	-0.512	NA	NA
								-0.273			
Sugar Beet	-0.010	-0.002	-0.002	NA	-0.002	-0.002	NA	-0.512	-0.512	NA	NA

Source: Soliman and Mouselhi, 1989; Soliman and Eid, 1992.

Table 17. Estimates of Supply Price Elasticities of Animal Products

Commodity	Average Supply Elasticity
Beef	0.46
Poultry Meat	0.26
Milk	0.64
Egg	0.50

Source: Soliman, 1997a; Soliman, 1997b.

Table 18. Estimates of Supply Elasticities of Some Major Field Crops in Egypt

Crop	Wheat	Rice	Maize	Sorghum	Cotton	Lentils	Broad Beans	Oranges	Sugarcane
Wheat									
Rice	(0.397 - 0.47)								
Maize			0.38						
Sorghum				(0.70-1.90)					
Cotton									
Lentils									
Broad Beans							(0.69-0.972)		
Sugarcane									0.15

Source: Yaseen and Hassan, 2002; Hassan, 2004; El Ashmawy and Al Sharif, 2008; Aitta, 1997;and Suleiman, 2003.