PN-ACS-258

MALR
USAID
APRP
RDI

Ministry of Agriculture & Land Reclamation
US Agency For Intl. Development
Agriculture Policy Reform Program
Reform Design and Implementation

وزارة الزراعة واستصلاح الأراضي
الوكالة الأمريكية للتنمية الدولية
مشروع إصلاح السياسات الزراعية
وحدة تصميم وتنفيذ السياسات

RDI REPORTS

Ministry of Agriculture and Land Reclamation

AGRICULTURE POLICY REFORM PROGRAM

Reform Design and Implementation Unit (RDI)

USAID CONTRACT NO. 263-C-00-97-00005-00

Report No. 133

UPDATING THE AGRICULTURAL SECTOR MODEL OF EGYPT

(ASME 97 – Version 2000)

APRP

Reform Design and Implementation Unit

Development Alternatives Inc. Group: Office for Studies & Finance, National Consulting Firm Development Associates, Cargill Technical Services, The Services Group, Training Resources Group, Purdue Universities, University of Maryland

A

PN-ACS-258

Report No. 133

UPDATING THE AGRICULTURAL SECTOR MODEL OF EGYPT

(ASME 97 – Version 2000)

Prepared by:
Gamal Siam (CU)
Alexander Mueller (NWRP/MWRI)
Ali Mostafa, Awatef Abdel Fattah, Evette Guirgis (MALR)
Mohamed Abou El-Wafa (GTZ)

May 2001

B

Table of Contents

Acknowledgments 1

Abbreviations and Acronyms 2

Executive Summary 3

1. Introduction 6

2. General Study Objectives 6

3. Steps taken for updating ASME 1999 Version 7
3.1 Adjustments to the Model Structure 7
3.2 Update of the Model by Regions for Base Year 1997 7

Table (1): Updated Regions in the New Version of ASME 2000 9

3.3 Updating the Model for Base Year 1999 10
3.3.1 Adjusting model variables 10
3.3.2 The Model Outputs 11

4. Policy Issues and Current Crop Policies 12

5. Agriculture Sector Model Applicability for Egypt 15
5.1. Specific Constraints 16
5.2. ASME 1997 Base Solution 17
5.3. ASME 1999 Base Solution 18

6. Agriculture Policy Scenarios to be addressed by the model 19

7. Steps for using the model in Policy Assessment 22

Table (2): Major Agricultural policies: Objectives and Tools 23

Table (3): BASE MODEL CONTRASTED WITH SELECTED SENARIOS 23

ANNEX 24

C

Acknowledgments

The authors acknowledge the contribution of the technicians and experts from both MALR and MWRI who provided the required data and their comments to produce this report. Special thanks go to Eng. M. El-Shahed, Head of EAS/MALR, for facilitating the work of the group. Our appreciation also extends to Dr. Max Goldensohn, Chief of Party of RDI/APRP, Dr. Jane Gleason and Dr. Sayed Hussein of Resource Economics/RDI for their strong support and guidance in completing this study.

Abbreviations and Acronyms

MALR	Ministry of Agriculture and Land Reclamation
APRP	Agricultural Policy Reform Program
RDI	Reform, Design and Implementation Unit
MWRI	Ministry of Water Resources and Irrigation
EAS	Economic Affairs Sector
GTZ	German Technical Cooperation
CSPP	Cotton Sector Promotion Program
ASME	Agricultural Sector Model of Egypt
IFPRI	International Food Policy Research Institute
CU	Cairo University
NWRP	National Water Resource Program
SGNLAND	Sand Soil Grand Water Irrigation
SCNLAND	Sand Soil Canal Water Irrigation
CCNLAND	Calcareous Soil Canal Irrigation
NEWVAL	New Valley
GPV	Gross Production Value
NPV	Net Production Value
BCM	Billion Cubic Meter
ET	Evapo-Transpiration
GOE	Government of Egypt
MT	Metric Ton
ALCOTEXA	Alexandria Cotton Exporter Association
DP	Digested Protein
SE	Starch Equivalent
DM	Dry Matter
CAPMAS	Central Agency of Public Mobilization and Statistics

Executive Summary

Egypt's policy-makers are faced with two main responsibilities. The first is setting government policies; the second is anticipating factors over which they have no control, which are called externalities (e.g., the world market price). In this regard the Agricultural Sector Model of Egypt (ASME) is considered a planning tool that assists in analyzing and evaluating agricultural policies.

The basic ASME model (Version of 1995) was adjusted and updated in 1998 using 1997 prices. Thus, ASME 1997 version refers to the adjusted version of 1995 in a series of adjustments. The second adjusted version of the model was published in December 1999 in collaboration with the Ministry of Water Resources and Irrigation (MWRI) and entitled "Review of the Agricultural Sector Model of Egypt (ASME'97): 1999 Version." The adjustment made for the current 2000 version included modifying and reorganizing the model structures and identifying inconsistencies of the model using validation programs that run when generating the model. The current model's updating included modifying the regions (i.e., eleven regions instead of eight as in the old version), elasticity of demand, farm-gate prices, import and export prices and quantities, marketing margins, and processing costs for various crops.

The current updated 2000 version of ASME is fixed on the base year of 1999. The updated items include crop yields, prices of crops by region, parity prices, import and export prices, quantities for major tradable crops, and commodity consumption at the national level.

Comparisons between model solutions for both 1997 and 1999 consist of "real world" situations on one side and on the other, comparisons between the model solutions themselves. These comparisons are useful to deduce policy indicators. Discussion of the results focused on major crop policies. Price policies that imply supported farm-gate prices for wheat and maize as well as liberalized cotton prices (in 1999) are well reflected in the model solution. Food security policy, with prices paid to wheat and maize growers that are higher than the corresponding world prices, results in producing larger quantities than what should be produced under efficient allocation of resources. In this regard, the model assists policy-makers in exploring how much society must sacrifice in applying the concept of "efficiency" in order to maintain food self-sufficiency at a certain level.

Generally, the model proved to be a powerful tool in terms of its applicability to Egyptian agriculture. However, the model capability in this regard would be significantly improved if the following three factors are taken into consideration:

Place more emphasis on the regional dimension of the model structure;
Allow more integrated linkages between crops and livestock activities;
Modify the model for assessing input and technology policies.

However, the model could be used for analyzing, evaluating, and consolidating agricultural policies. It could also be used for addressing different policy scenarios, some which are essential in supporting policy-makers in projecting policy trends in the near future. Decision-makers could rely on the updated version to measure the impacts of certain policy

scenarios on the agricultural sector's performance and development objectives. Meanwhile, opportunity exists for strengthening the power of the model in policy assessment with regard to model constraints, regions, quality of inputs, integration between crop production and animal production, and elasticity.

1. INTRODUCTION:

The Agricultural Sector Model of Egypt (ASME) is a planning tool that is based on the General Algebraic Model System (GAMS). The basic GAMS model was modified to reflect the conditions of Egyptian agriculture. APRP/RDI responded to the request of MALR and MWRI to assist them in using this model for assessing and evaluating agricultural and water policies.

ASME was initiated in 1986 and updated for the first time in 1990 by IFPRI (Hazell et. al). ASME was updated for the second time in 1997 by APRP/ RDI (Filmore Binder through a contract with RDI). The last effort, which was carried out in 1999 by APRP (Report No. 27, ASME 1999 version issued jointly by RDI & EPIQ Units), involved reviewing the model for consistency, providing as reasonably detailed description of the model structure and data as possible, and assessing the model's efficiency for policy analysis.

The working group, including officials and technicians from both MALR and MWRI, was formed to review the model's constants, parameters, and constraints in order to identify problems facing this model's application to Egyptian agriculture. Several aspects of the model were identified, with special reference to the following:

- Improved short run by modifying the model.
- Developed long run policy analysis.
- Developed a data set reflecting 1997 data.
- Developed a set of automatic checks that identifies inconsistencies in the model structure and data.

2. General Study Objectives:

The aim at this stage of modifying ASME is to review and adjust the last version of the model (i.e., ASME 1999). The adjustment will include updating the data of the

model's parameters and providing reasonable solutions for the problems that arose from the last model's version. However, in order to make the model valid for Egyptian policy-makers, the following necessary objectives were specified:

- Continue updating some of the model parameters that remained from the last (i.e., 1999) version.
- Adjust the model parameters to include prices and elasticity of the major agricultural commodities.
- Provide solutions for the unsolved problems that were identified in the model's last version (i.e., Dec. 1999).
- Compare the model solutions with government policies in order to test the model applicability.
- Meet the request of Economic Affairs Sector (EAS/MALR) regarding the possibility of utilizing ASME for planning and assessing Egyptian agricultural policy by MALR experts.

3. Steps taken for updating ASME 1999 Version:

3.1. Adjustments to the Model Structures:

These adjustments include the following:

- Eliminating duplication of variables, equations, and sets
- Reorganizing the model structures
- Identifying inconsistencies in the model using validation programs that run when generating the model for both crops and livestock activities and mopping between linked data.
- Removing some of the minor crops and livestock activities that have no impact on the model's objective and purpose in order to simplify the model.
- Omitting the following import and export activities since they are negligible or are of different varieties:
    - Barley imports (different variety)
    - Bean exports (minor quantity)
    - Wheat exports (minor quantity)
    - Sources of data were mainly from ministry of Agriculture (MALR)

- The sections of the model dealing with livestock have been closely revised and updated in the current version. Much effort was devoted to create a formulation that is internally consistent, using the crossbred sheep, goat and camels in addition to draft animals (e.g., donkeys, horses). Labor is desegregated by source (i.e., family vs. hired) and by sector of use (crop production vs. livestock production). The ratio of family labor to hired labor is assumed to be constant.

- Adjusted the model and used the actual data for estimating milk production instead of using technical coefficients and projection equation. This adjustment was made by using different constants for breeds (i.e., buffalo, cow, exotic breeds), drawn from dividing the number of milking cows by the total number of the animal population, then multiplied by the total milk yield per head of each breed.

3.2. Update of the Model by Regions for Base Year 1997:

The regions have been identified in such a way to show further delineation as follows:

- The middle Egypt region has been split into two regions: middle Egypt and Fayoum.
- The East Delta region has been split into two regions: South-Eastern Delta and North-Eastern Delta.
- The Middle Delta region has been split into two regions: South-Middle Delta and North-Middle Delta.

Accordingly, Egypt is now divided into 13 main regions as seen in Table (1). These regions include eight old land regions, three old new land regions (SCNLAND); the ground irrigated areas (SGNLAND) and Nubarya (SCNLAND); and two new land regions, Sinai (El-Salam Canal project) and NEWVAL (Toshki and Owynat East areas).

The number of farmers has been determined at the regional level. While agricultural labor force has been calculated for different regions by multiplying the number of farmers, which is equal to the number of farm families, by 1.25 (the average family size is five persons) then multiplying by 0.25 (the labor force constitutes 25% of the total population).

Import and export parity prices for imported and exported agricultural commodities have

been calculated and introduced to the model. The official exchange rate was used in calculating parity prices. (See Table 1 in Annex.)

Demand for different crop and livestock products has been described through information including farm-gate price, import and export price quantities, domestic consumption and price elasticity. Accordingly, adjustments of the technical coefficients related to crops and livestock have been made.

Marketing margins are defined as the difference between consumer price and producer price. These margins differ from one commodity to another due to the nature of the commodity, structure of its market, and types of marketing services pertaining to the commodity. For simplification, the marketing margin is taken as an average for each group of homogeneous commodities. Generally, evidence from literature indicates that marketing margins for fruits and vegetables range between 25-35%, whereas it is much less than that for cereal commodities (including wheat, rice, maize, and sorghum), which range from 10-20% with an average of 15%.

Table (1): Updated Regions in the New Version of ASME 2000

Regions		Governorates
Old	**Updated**	
Upper Egypt	Upper Egypt	Assuot, Sohag, qena, Aswan, Luxor
Middle Egypt	Middle Egypt	Giza, Cairo, Minya, Beni Suif
	Fayoum	Fayoum
East Delta	South East Delta	Sharkeya, Ismailia, kauobaya, Suze
	North East Delta	Port Said, Damietta
Middle Delta	South Middle Delta	Menofya, Dakahleya
	North Middle Delta	Kafr El-Shakh, Garbeya
West Delta	West Delta	Behera
Old new lands	Sandy soil canal irrigation	Other new lands in the above regions
	Sandy soil ground water irrigation	Matrouh, Wadi El-Gedid, north and south Sinai
	Calcareous soil canal irrigation	Nubarya areas
New lands	Sinai	El-Salam Canal project
	New Valley	Toshka, East Owaynat

Regarding the processing per ton, they have been determined and considered in the model for the processed crops (i.e., wheat, rice, and maize milling costs), cotton (ginning costs), sugar, and oilseed crops, as follows:

- Wheat (to wheat flour) LE 80 per ton
- Maize (to maize flour) LE 80 per ton
- Paddy (to rice) LE 50 per ton
- Sugar cane (to sugar) LE 66.5 per ton
- Soybean, sesame (to oil) LE 400 per ton
- Seed cotton (ginning) LE 64 per kentar

The model updates also the demand data of livestock regarding base price, import and export price, import and export quantities, domestic consumption balance, and price elasticity for all livestock commodities (i.e., beef, milk, sheep and goat meat, poultry meat, and eggs).

Data regarding poultry have been updated in the current version. The new data include classification of poultry production systems (i.e., commercial or traditional). Classification was also made according to the type of production (e.g., broilers, layers), each of which has its own technical coefficients concerning feed requirements, yield, and other inputs.

3.3. Updating the Model for Base Year 1999:

3.3.1. Adjusting model variables:

The following data have been introduced to the model for the year 1999:

- Introducing the actual crop areas by region.
- Agricultural land area (cultivated area).
- Crop yield by region.
- Farm-gate prices for crops by region.
- Parity prices (see table T.5) in the Annex.
- All data in the Demand Data Table (DEMDAT), except price elasticity have been updated to the year 1999. The (DEMDAT) includes national base prices, export

and imports (quantities and prices) of major crops, national consumption by commodity, and price elasticity.

3.3.2. The Model Outputs:

The model outputs include a number of key variables, most of which could be used for policy analysis. These variables divided into two groups, variables are pertaining to agricultural production; and variables are relating to water and irrigation.

1) The key variables Pertaining to Agricultural Production:

These include the following:

- Cropping pattern by region
- Animal production by region
- Crop commodity quantities (in 000 t)
- Calculated market price (LE pt)
- National price elasticity
- Animal commodity quantities and market price elasticity
- Employment (by region)
- Gross production value (GPV)
- Gross production cost (GPC)
  - Net production value (NPV)
  - Net production value per Fadden (LE)
  - Net production value per m3 (LE)
- Net production value per farm (LE)
- Gross production value GPV (LE/Feddan) at the regional level
  - by crop
  - by animal product
- Shadow prices of resources (LE/unit)
- Imports and exports from crop and animal commodities
- Production of crop commodities
- Production of by-products
- Production of processed crop products

- Production of processed crop by-products
- Animal consumption of crop by-products
- Animal consumption of processed crop by-products
- Fertilizer use at the regional level
- Agricultural import-export balance
- Food self-sufficiency

2) The key variables pertaining to Irrigation Water:

These include the following:

- Total ET (BCM), regional
- Total potential ET (BCM), regional
- Relative ET to ETM (%)
- Relative yield to maximum (%)
- Diversions and consumption (BCM)
- Groundwater balance (BCM)
- National water balance (BCM)
- Irrigation demand and supply at field (BCM)
- Flow balance river (BCM), regional
- Drainage balance (BCM), regional

4. Policy Issues and Current Crop Policies:

The cropping pattern liberalization policy, which takes into consideration all technical and physical constraints, is considered one of the most challenging issues facing both the MOA and MWRI. This issue has become pronounced in the last four years in the rice and cotton crops. Despite MWRI's intervention in determining rice areas at the governorate, district and village levels and having placed monetary penalties on farmers who violated the decree, the farmers' responses were not positive towards these regulations. They not only increased the area of rice that the MWRI had allocated, but also grew the crop in some governorates where rice is forbidden to grow (e.g., Kaliobia and Menofia governorates). Monetary penalties seem to be ineffective in preventing the increasing trend in rice growing areas for various reasons, the most important being that

rice profits exceed both the penalties and the profits from competing crops, especially maize.

Regarding cotton, the cultivated area has been decreasing throughout the last three years. While the cotton area was 859,000 feddans in 1997, it decreased to 650,000 feddans in 1998. Cotton areas are reported to be as low as 540,000 feddans in 1999, which is only 60% of the area allocated to cotton in 1997. The main reason behind this tend is the low profit of cotton compared to competing crops, especially rice. Liberalization of the cotton trade in 1997, coupled with low world prices of cotton, has resulted in farmgate prices that have negatively affected the relative profit for cotton. The profit for wheat followed by rice rotation exceeds the profit from a short season berseem followed by cotton.

In the last year, the government intended to intervene with specific tools that focus on subsidizing the farmgate price. In addition, the GOE was to provide some items of the costs of production (i.e., pest control and land preparation) at subsidized rates. The reason for the subsidies is to encourage farmers to produce cotton that is needed for both the domestic industry and for exporting. The government also realizes that more effective control towards decreasing the rice area would help in achieving the goal of maintaining the cotton area as well as keeping production from falling to undesired lower levels.

To encourage farmers to cultivate cotton, the GOE continues to provide some assistance to cotton farmers to help with the cost of production, such as land preparation (LE 50/feddan), pesticides costs (LE 140/feddan), and 50% of planting seed cost (LE 40/feddan). It is estimated that on average, the government provides cotton farmers with a total support equivalent to LE 230 per feddan in 2000.

In addition to such support, the government announced in 2000 that the minimum guaranteed price for farmers would be LE 40 per kentar over the last year's minimum price. The nominal level of farm floor prices for all varieties will be calculated based on indicative export prices to be set by the Alexandria Cotton Exporter Association (ALCOTEXA) after deducting fobbing and preparation costs.

The model will address the cropping pattern liberalization policy in general and the issue of the cereal-cotton relationship in particular. This will help determining the most efficient states' tool for intervention that would enable Egypt to minimize social

(i.e., national) costs on one side while maximizing private benefits on the other.

The government's voluntary procurement policy is currently applied to two crops: wheat and maize. This policy's main goal is to provide the food subsidy program (i.e., subsidized baladi bread) with more domestically produced wheat and (more recently) maize, which are used for making baladi bread. To achieve this goal the government sets farmgate prices for voluntary procurement at levels that are higher than international prices. The procurement price for wheat is set at LE 700 per ton, which is about 35% higher than the international farmgate price. For maize, the procurement price is set at LE 630 per ton, which is 45% higher than the international farmgate price. Considering that the quantity of wheat procured is around 2.0 million tons annually, the price difference for such quantity amounts to LE 360 million. This amount should be looked at as a cost paid by the government that would not have been paid if the government imported this quantity from abroad.

Wheat prices increased dramatically in 1987, which contributed to a dramatic increase in production. During the 1987-93 period, total wheat production increased by 53%. Between 1986 and 1999, the area planted with wheat in Egypt doubled; the wheat yields increased by 50%; and total wheat production more than doubled.

The area planted with maize has not increased as dramatically as that of wheat or rice. In 1999, 2.0 million feddans of maize (i.e., summer and Nili), were planted compared to 1.9 million feddans in 1980. Total maize production has increased (to about 6 MMT annually) as a result of yield increases that resulted in turn from the increased use of hybrid seed. In 1999, the GOE base price set for maize was LE 90/ardab (LE 643/ton). The domestic maize price has risen slightly in recent years. The GOE appears to be the price setter, since the domestic maize price is far above international prices.

For rice, the government completely removed the mandatory delivery quotas on rice producers in 1991; fixed procurement prices were relaxed; and bans on transport, milling, marketing and storing of rice were also removed. Rice production expanded rapidly between 1990 and 1997 through increases in the area planted and due to yield increases. The area planted with rice expanded from 1,036,000 feddans in 1990 to 1,527,000 in 1997. During this same period the rice yield increased from 3.1 MT/feddan to 3.5 MT/feddan. The area and yield increases together resulted in an increase in total

rice production of 67% in the past decade. Rice production is prohibited in some governorates, and areas allocated to rice at the district level are based on permission from MWRI. The total area permitted for rice cultivation is 1.0 million feddans. However, the actual area cultivated with rice is 50% higher.

5. Agricultural Sector Model Applicability for Egypt:

Before discussing the results of ASME 1997 and 1999, it should be noted that in some cases the model solution indicated sensitive results. Small differences in yield, price, or cost of production data generated significant changes in solution values. Because the constraint set in the model is entirely linear, "Corner Solutions" can occur with respect to a given activity with only slight differences in one of its own or related parameters.

Furthermore, the model solutions are more sensitive on the regional level compared to the national level. Thus, highly specific results may differ substantially from the "real world" conditions. The more aggregated the results, the more likely they are to conform to those real world conditions, since aggregate national demand curves, rather than local production, "drive" the model's solutions.

The model is relatively sensitive to data inputs, a fact that imposes certain limits on the model for policy analysis. The sensitivity of the most relevant parameters and constraints must be examined carefully.

The model assumes profit-maximizing produce faced with deterministic prices and costs. In the "real world," there are other factors not considered in the model that might affect farmers' decisions. Among these factors is the attitude towards risk. If farmers are risk-averse, which is most probably true for most of the small Egyptian farmers, they would select a risk-reducing crop (i.e., traditional crop); whereas, the model would select a vegetable crop as the optimal crop. The inclusion of risk in the ASME is recommended to avoid this tendency. However, it should be noted that this inclusion would require a large expansion of the model.

5.1. Specific Constraints:

For the use of ASME in policy analysis, we may need a model solution that would be a mix of optimum solution and " real world " conditions. This could be achieved by introducing a set of constraints reflecting real "technical" and institutional conditions that exist in Egyptian agriculture.

Examples include sugarcane and rice. The solution gives no sugarcane grown in Upper Egypt and no rice grown in East Delta, but rather includes big areas of rice in the New Land. It is, however, reasonable to introduce a constraint forcing the model solution to include sugar cane cultivation only in the Upper Egypt region (i.e., Sohag, Qena, Aswan), where this crop and sugar factories historically do exist. Related to sugar cane, sugar beet is the other sugar crop that is grown mainly in the Delta region as well as in the Fayoum region, where there are two factories for sugar beet processing. Therefore, the model solution would be forced to limit sugar beet cultivation to these two regions.

The specific technical constraints introduced for the model are as follows:

1) The model will not consider cultivating rice, sugar cane or cotton crops in the old new land regions.
2) Consider sugar cane crop is allowed only in the Middle and Upper Egypt regions.
3) The short-season berseem area should not exceed the cotton area at the regional level.
4) Rice cultivation is allowed only in specific regions.
5) No sorghum cultivation is allowed in the New Land.
6) Assume the fava-bean area equal to the area allowed in 1997.
7) Assume sugar beet area is minimal.
8) Assume maximum tomato area in the old land should equal 1.5 times the area that was used in 1997.
9) Quantities of imports and exports are limited to lower and upper boundaries equal to 0.5 and two times the 1997 levels, respectively.
10) Consumption should not be less than half of that in 1997.

5.2. ASME 1997 Base Solution:

Tables 1, 2, 2a, 2b,and 2c in the Annex present the solution of the base year updated version of 1997. Clearly, there are some differences between the model's projected values and the actual levels of variables. The following are comments on the main results of ASME 97 with regard to major crops and specific issues.

1) Rice:

The cultivated area for rice is determined by ministerial decree at 1.0 million feddans in specific governorates in Lower Egypt. The actual cultivated area is about 1.5 million feddans, a third of which violates the ministerial decree and exists outside the licensed area.

In light of these facts, the model should be forced not to grow paddies in Upper and Middle Egypt and the New Land regions as well. On the other hand, no maximum bound constraint (at 1.0 million feddans) was imposed, since the ministerial decree was not effective in preventing farmers from expanding paddy growing.

2) Cotton:

The model solution for 1997 included 1,281,000 feddans of area for cotton, which is larger than the area reported by MALR of 859,000 feddans. This is another example of deviations between the optimal situation and the "real world" conditions in Egyptian agriculture. This particular deviation reflects some degree of inconsistency between farmers' interests on one side and society's interest on the other. Analysis of traditional crop combinations show that including wheat or long-season berseem in the winter season followed by rice or maize in the summer season is preferred by farmers to the combination of short-season berseem followed by cotton, both in terms of profitability and home consumption considerations.

3) Sugar beet:

In the model solution, the total area of sugar beet is 76,000 feddans compared to an actual area of 56,000 feddans. Yet, the solution's area is allocated in both West Delta (52,000 feddans) and North-Middle Delta (23,000 feddans), whereas the main factory is

located in North-Middle Delta (Kafr El- Sheikh).

4) Self-sufficiency in Food and Efficiency Trade-off:

The model was used to clarify the nature of the relationship between food self-sufficiency and efficiency in the agricultural sector. Efficiency is indicated by the total of consumer and producer surplus. This was done by forcing the model solution to include both wheat and maize imports at 1997 levels (5.38 million tons for wheat and 3.07 million tons for maize) being used as the upper boundaries.

As a result of imposing this constraint, the total of consumer and producer surplus is reduced from LE. 48.5 billion to LE 48.2 billion. The loss in consumer surplus is LE 3.41 billion, whereas the gain in producer surplus is LE. 3.135 billion.

5) Animal feed:

The model assumes that production of all crop by-products (e.g., maize fodder, wheat straw, rice stalks, maize stalks, beets, groundnuts, etc.) and processing by-products (e.g., molasses, wheat bran, rice bran) are fully utilized as animal feed. Thus, most of the requirements of animal nutrients (DP, SE, DM) are satisfied from these sources of animal feed, which reduces the need for growing berseem. This is not, in fact, the case in the "real world," where berseem is the main source for animal feed in the winter season.

Under this assumption, the model solution includes a large area of maize (2.5 million feddans compared to an actual area of 1.6 million feddans), and a small area of berseem. A minimum berseem area should be imposed on the solution, not only because berseem is necessary animal feed during the winter season, but also because berseem, which is a nitrogen-fixing crop, should be grown in the crop rotation.

5.3. ASME 1999 Base Solution:

Table 2aa in the Annex presents the solution for ASME 1999. Still, some differences exist between the model solutions and the real world situations. Comparison between the ASME 1999 solution and the actual situation in terms of cropping pattern reveals that while there are no big differences with respect to areas of some crops, the

difference is significant with respect to others. The area of wheat is almost the same, where the actual area is 2.38 million feddans vs. 2.45 million feddans projected by the model. Rice (2.2. million feddans) and maize (2.75 million feddans) areas projected by the model are much bigger than the actual areas (1.56 million feddans for rice and 1.94 million feddans for maize). On the contrary, the projected cotton area (526,000 feddans) is smaller than the actual area (724,000 feddans). Regardless of the magnitude of the differences, the direction could be explained mainly by the price policies. Decreases in cotton prices in 1999 compared to those in 1997 accompanied with increases in maize prices (due to procurement policy) and rises in the price of rice resulted in a reduction in the cotton area and increases in both the maize and rice areas. It should be noted that the net increase in the area of field crops as indicated by the model solution was due to the area of vegetable crops. Total area of sugar crops (cane and beet) projected by the model is 317,000 feddans, compared to 435,000 feddans in the real world. Sugar consumption is thus compensated according to the solution by increasing sugar imports.

The model solution includes exports of citrus, cotton, onion, potato, rice and vegetables. As to livestock products, the model solution includes higher levels of production compared to real levels. However, the increase in milk production was more prominent. The total consumer and producer surplus resulting from the model solution amounts to LE. 57.4 billion, including LE 46.06 billion as consumer surplus and LE 11.33 billion as producer surplus.

6. Agricultural Policy Scenarios to be addressed by the model:

The ASME tests proved to be powerful tools for addressing policy analysis. There are several agricultural policy scenarios (Tables 2 and 3) that would be addressed by the model and meet the demand of decision- makers in this regard. Among these scenarios are food security, water saving policies, cotton policies, agricultural exports, national agricultural projects and the livestock sub-sector. The following are examples of such policy scenarios including policy goals and related tools:

Policy Goal (1): Food Security:

Tools: Wheat and maize government procurement (voluntary) at farm-gate prices that are higher than international prices.

Policy Goal (2): Water Saving through Decreasing Rice Area:

Tools:

1) Paddy cultivation is restricted by MWRI ministerial decree to specific districts and areas. The total paddy area nationally is determined at 1.0 million feddans.
2) Enforcing monetary penalties on farmers who violate ministerial permission. The fine is as high as LE 800 per feddan.

Policy Goal (3): Maintaining the Cotton Industry:

Tool: Encourage farmers to grow cotton by using the following incentives:

1) Subsidize the farm-gate price (LE 40 over the world price).
2) Subsidize specific inputs (i.e., seeds).
3) Subsidize specific operations (i.e., pest control and land preparation).

Policy Goal (4): Horizontal Expansion for Social Goals:

Tool: Encourage private investors to invest in New Lands (e.g., Toshka project, Owynat East and El Salam Canal) using the following incentives:

1) Public investment in infrastructure
2) Tariff exemption for machinery and equipment
3) Tax exemptions
4) Land for symbolic fee (i.e., only LE 50 per feddan)

Policy Goal (5): Increase Agricultural Exports:

Tools: Encourage exports using the following incentives:

1) Subsidize processing costs (rice milling)
2) Draw-back

Policy Goal (6): Improve Livestock Productivity:

Tools:

1) Encourage investment in livestock and poultry enterprises by local and international investors building on the perceived comparative advantage.
2) Develop feed resources. There are about 14 million tons of residual crops that are available to be used as animal feed, of which only 4.3 million tons already used. If the available roughage and crop residues are better used as animal feed, the area devoted to berseem could then be reduced. (It is estimated that an extra 2 million tons of wheat could be added to the domestic production from the land currently cultivated with berseem.) A large area could be saved for wheat, which is a competing winter crop. Thus, the large amounts of wheat imported for human consumption could be reduced.
3) Genetically improve local breeds of livestock. Select buffalo bulls and systematic crossing of native cattle with appropriate high-producing foreign breeds, supported by an efficient artificial insemination network and an organized performance recording system, could result in a considerable increase in beef and milk production. This could be reflected in the model by changing the structure of livestock herds (i.e., local, cross breeds, and foreign).

To apply the model for any of the proposed policy scenarios, as shown in table (3), the following steps should be undertaken:

- If the goal is to increase cotton exports for example then the alternative policy measures are:
    1. Increasing price support (PSc), or
    2. Increasing input subsidy (ISc), or
    3. Increasing both PSc and ISc
- Change the selected measure in the model and run.
- Compare the results of different measures with respect to cotton exports as a final goal and some other selected variable.

7. Steps for using the model in Policy Assessment:

The steps for assessing policy are as follows:

1. Determine the objective of a certain policy.
2. Determine the alternative measures that could lead to achieving the determined objective.
3. Change the relevant policy variables in the model.
4. Compare the results of the model at different levels of policy variables (i.e., sensitivity analysis). The comparison may focus on the level of the policy goal as well as other dependent variables (i.e., side effects of the policy).
5. Present summary of the output with brief explanation.
6. Policy-makers would select the relevant policy.

Thus increasing Egyptian cotton exports for a larger share in the world market would be through increasing cotton production to levels that could satisfy local demand as well as targeted exports. Meanwhile, production increase could be realized through certain policy variables including price support (PSc) at the farm level and/or input subsidy (ISc) (e.g., subsidizing costs of pest control and seeds treatment). Change in one or more of these policy variables would improve the relative profitability of cotton, which in turn would lead to an increase in the cotton area and thus, to increased cotton production.

Table (2): Major Agricultural Policies: Objectives and Tools

Policy objectives	Crops	Policy tools
Food Security	Wheat Maize Rice	-Farm-gate price (supported)> international price -Farm-gate price (supported)> international price -Farm-gate price (procurement)=LE 500
Water Saving	Rice	-Restricting rice area -Restricting sugarcane area
Maintaining Cotton Industry and Exports	Cotton	-Farm-gate price (supported)>international price -Input subsidy (seeds) -Cost subsidy (pest control)
Maintaining Sugar Industry	Sugarcane Sugarbeet	-Farmgate price (administrative)>world price -Tariffs (26%) on sugar imports -Contracting with farmers

Table (3): BASE MODEL CONTRASTED WITH SELECTED SCENARIOS (In Billion LE)

Table No.	Scenarios	Consumer Surplus	Producer Surplus	Consumer & Producer Surplus
T1.	Base solution, ASME 99			
T2.	Export double actual	44.085	9.996	49.081
T3.	50% increase in import price with (wheat & maize) = 99	46.399	8.850	55.249
T4.	50% increase in world price, free importation (wheat & maize)	51.592	5.195	56.787
T5.	Base price for import crop = import parity price of 99	68.810	2.474	71.285
T6.	Changing rice price per ton from LE 1091 to LE 740 & paddy price from LE 730 to LE 500	45.212	9.635	54.847
T7.	Decrease base price by 23% (eliminating of price support)	44.490	8.782	53.273
T8.	Increase base price of cotton by 16%.	45.349	11.100	56.445
T9.	Change available water from 55.5 bcm to 50.5 bcm	45.513	10.407	55.921
T10.	Assuming water cost recovery at LE 0.03.	46.351	8.598	54.949

Source: Tables (1) t0 (10) in the annex.

ANNEX

v.99 with 99 data
self sufficiency

TABLE (200) PROJECTED FARM PRICES, AREA, PRODUCTION, CONSUMPTION
EXPORT AND IMPORT FOR COMMODITIES CONSUMED NATIONALLY

COMMODITIES	PRICE (LE/t)	AREA (000fed)	PRODUC. (000t)	CONSUM. (000t)	EXPORT (000t)	price (LE)	IMPORT (000t)	price (LE)
CROP COMMODITIES								
BARLEY	606.88	58.14	120.34	126.34	0.00	0.0	6.00	462.90
CITRUS	808.42	818.85	6543.13	6095.63	484.00	882.0	36.50	1796.00
CTONELS	8691.25	108.44	35.30	26.30	9.00	7130.9	0.00	0.00
CTONLS	6879.55	418.01	188.19	141.69	46.50	4228.2	0.00	0.00
FBEAN	1164.38	251.21	249.82	415.82	10.00	1875.4	176.00	1100.80
FXFIB	391.83	4.81	9.50	0.00	10.00	3330.6	0.50	7245.30
GRDNUT	1456.84	141.68	216.78	213.78	3.00	1445.4	0.00	0.00
LEGUME	1810.78	32.40	26.25	46.25	0.00	0.0	20.00	1572.00
LENTIL	1624.72	61.82	51.31	90.31	0.00	0.0	39.00	2197.70
MAIZE	588.65	2748.25	9028.77	11134.49	0.00	0.0	4730.00	358.40
ONION	185.16	105.41	1447.24	1151.24	296.00	305.3	0.00	0.00
POTATO	480.16	140.82	1599.14	1081.14	520.00	613.8	2.00	979.40
RICE	1188.32	2186.11	5235.57	5082.07	153.50	477.2	0.00	0.00
SESAME	1967.46	83.41	83.41	105.91	0.00	0.0	22.50	2767.00
SORGHUM	664.74	536.83	913.03	925.03	0.00	0.0	12.00	371.70
SOYBEAN	794.60	0.00	0.00	126.51	0.00	0.0	126.51	794.60
SUGAR	1080.05	317.21	1258.06	1950.06	0.00	0.0	692.00	1196.00
TOMATO	231.51	360.59	8228.28	8218.28	10.00	631.6	0.00	0.00
VEGET	236.45	472.14	10689.33	10577.83	116.00	1493.0	4.50	2267.00
VEG-OIL	2128.80	756.35	64.79	980.44	0.00	0.0	915.65	2128.80
WHEATF	840.18	2448.92	5399.89	10019.89	0.00	0.0	4620.00	383.30
ANIMAL COMMODITIES								
BEEF	7673.66		983.46	1259.46	0.00		276.00	5342.00
MILK	802.91		5038.86	5171.36	22.00		154.50	4577.00
SGMEAT	4197.07		80.24	80.74	0.00		0.50	4573.00
PMEAT	3992.13		689.59	689.59	0.00		0.00	5514.00
EGGS	2190.76		310.51	310.51	0.00		0.00	2500.00

CONSUMER SURPLUS	46064.01 (million LE)	A MEASURE OF THE SATISFACTION OF CONSUMER
PRODUCER SURPLUS	11331.03 (million LE)	A MEASURE OF THE NET INCOME OF FARMERS
CONSUMER & PRODUCER SURPLUS	57395.04 (million LE)	

*PRICE: FARMGATE
*VEG-OIL: FROM SOYABEAN, SESAME, GROUNDNUT, CTONLS, CTONELS AND FLAX
*SUGAR: FROM SUGAR CANE AND SUGAR BEET
SOURCE: ASME97 AGRICULTRAL SECTOR MODEL OF EGYPT VERSION 1999

TABLE (T2.) PROJECTED FARM PRICES, AREA, PRODUCTION, CONSUMPTION
EXPORT AND IMPORT FOR COMMODITIES CONSUMED NATIONALLY
exports duble actual

COMMODITIES	PRICE (LE/t)	AREA (000fed)	PRODUC. (000t)	CONSUM. (000t)	EXPORT (000t)	price (LE)	IMPORT (000t)	price (LE)
CROP COMMODITIES								
BARLEY	606.68	84.18	120.37	126.37	0.00	0.0	6.00	462.90
CITRUS	786.78	840.59	6698.82	6251.32	484.00	882.0	36.50	1064.00
CTONELS	8976.96	93.17	30.33	21.33	9.00	4007.5	0.00	0.00
CTONLS	6893.84	416.58	185.08	138.58	46.50	3192.9	0.00	0.00
FBEAN	1149.47	257.25	254.23	420.23	10.00	1875.4	176.00	1100.80
FXFIB	391.83	4.81	9.50	0.00	10.00	3330.6	0.50	7245.30
GRDNUT	1470.22	140.92	215.61	212.61	3.00	1445.4	0.00	0.00
LEGUME	1815.40	32.26	26.13	46.13	0.00	0.0	20.00	1572.00
LENTIL	1674.21	61.15	49.19	88.19	0.00	0.0	39.00	2197.70
MAIZE	547.99	3002.78	9722.21	11784.86	0.00	0.0	4730.00	411.70
ONION	182.66	106.21	1458.24	1162.24	296.00	305.3	0.00	0.00
POTATO	477.65	140.66	1602.56	1084.56	520.00	613.8	2.00	979.40
RICE	1294.91	2000.20	4761.43	4607.93	153.50	493.3	0.00	0.00
SESAME	1786.42	89.80	87.23	109.73	0.00	0.0	22.50	2767.00
SORGHUM	616.43	568.68	977.66	989.66	0.00	0.0	12.00	451.20
SOYBEAN	954.20	0.00	0.00	112.44	0.00	0.0	112.44	954.20
SUGAR	1054.98	327.98	1300.86	1992.86	0.00	0.0	692.00	1196.00
TOMATO	263.75	413.27	7764.04	7754.04	10.00	631.6	0.00	0.00
VEGET	241.38	469.20	10622.60	10511.10	116.00	1493.0	4.50	2267.00
VEG-OIL	1457.60	745.28	62.48	1187.37	0.00	0.0	1124.88	1457.60
WHEATF	858.99	2370.26	5222.00	9842.00	0.00	0.0	4620.00	450.70
ANIMAL COMMODITIES								
BEEF	7673.66		983.46	1259.46	0.00		276.00	5342.00
MILK	802.91		5038.86	5171.36	22.00		154.50	4577.00
SGMEAT	4197.07		80.24	80.74	0.00		0.50	4573.00
PMEAT	3873.55		701.43	701.43	0.00		0.00	5514.00
EGGS	2111.58		314.83	314.83	0.00		0.00	2500.00

CONSUMER SURPLUS	46577.46 (million LE)	A MEASURE OF THE SATISFACTION OF CONSUMER
PRODUCER SURPLUS	10570.27 (million LE)	A MEASURE OF THE NET INCOME OF FARMERS
CONSUMER & PRODUCER SURPLUS	57147.73 (million LE)	

*PRICE: FARMGATE
*VEG-OIL: FROM SOYABEAN, SESAME, GROUNDNUT, CTONLS, CTONELS AND FLAX
*SUGAR: FROM SUGAR CANE AND SUGAR BEET
SOURCE: ASME97 AGRICULTRAL SECTOR MODEL OF EGYPT VERSION 1999

TABLE (T.3) PROJECTED FARM PRICES, AREA, PRODUCTION, CONSUMPTION
EXPORT AND IMPORT FOR COMMODITIES CONSUMED NATIONALLY

50% increase in import price with (wheat &mazie) = 99

COMMODITIES	PRICE (LE/t)	AREA (000fed)	PRODUC. (000t)	CONSUM. (000t)	EXPORT (000t)	price (LE)	IMPORT (000t)	price (LE)
CROP COMMODITIES								
BARLEY	587.00	86.33	123.45	129.45	0.00	0.0	6.00	462.90
CITRUS	773.25	859.67	6796.14	6348.64	484.00	882.0	36.50	1796.00
CTONELS	8069.69	141.66	46.11	37.11	9.00	7130.9	0.00	0.00
CTONLS	6509.67	617.78	268.80	222.30	46.50	4228.2	0.00	0.00
FBEAN	1134.67	268.08	258.61	424.61	10.00	1875.4	176.00	1100.80
FXFIB	391.83	4.81	9.50	0.00	10.00	3330.6	0.50	7245.30
GRDNUT	1448.80	142.14	217.48	214.48	3.00	1445.4	0.00	0.00
LEGUME	1839.42	31.55	25.56	45.56	0.00	0.0	20.00	1572.00
LENTIL	1661.79	61.79	49.72	88.72	0.00	0.0	39.00	2197.70
MAIZE	527.97	3048.03	10063.74	12105.11	0.00	0.0	4730.00	358.40
ONION	179.88	107.10	1470.42	1174.42	296.00	305.3	0.00	0.00
POTATO	475.06	141.81	1606.08	1088.08	520.00	613.8	2.00	979.40
RICE	1104.51	1582.77	3808.24	3654.74	153.50	477.2	0.00	0.00
SESAME	1733.87	91.03	88.33	110.83	0.00	0.0	22.50	2767.00
SORGHUM	592.93	565.59	1009.11	1021.11	0.00	0.0	12.00	371.70
SOYBEAN	794.60	0.00	0.00	126.51	0.00	0.0	126.51	794.60
SUGAR	1030.64	338.42	1342.39	2034.39	0.00	0.0	692.00	1196.00
TOMATO	260.01	417.20	7817.92	7807.92	10.00	631.6	0.00	0.00
VEGET	239.58	470.27	10647.02	10535.52	116.00	1493.0	4.50	2267.00
VEG-OIL	2128.80	997.43	90.91	980.44	0.00	0.0	889.53	2128.80
WHEATF	853.30	2411.92	5275.86	9895.86	0.00	0.0	4620.00	575.00
ANIMAL COMMODITIES								
BEEF	7673.66		983.46	1259.46	0.00		276.00	5342.00
MILK	802.91		5038.86	5171.36	22.00		154.50	4577.00
SGMEAT	4197.07		80.24	80.74	0.00		0.50	4573.00
PMEAT	3814.94		707.28	707.28	0.00		0.00	5514.00
EGGS	2072.54		316.96	316.96	0.00		0.00	2500.00

CONSUMER SURPLUS	46399.19 (million LE)	A MEASURE OF THE SATISFACTION OF CONSUMER
PRODUCER SURPLUS	8850.41 (million LE)	A MEASURE OF THE NET INCOME OF FARMERS
CONSUMER & PRODUCER SURPLUS	55249.60 (million LE)	

*PRICE: FARMGATE
*VEG-OIL: FROM SOYABEAN, SESAME, GROUNDNUT, CTONLS, CTONELS AND FLAX
*SUGAR: FROM SUGAR CANE AND SUGAR BEET
SOURCE: ASME97 AGRICULTRAL SECTOR MODEL OF EGYPT VERSION 1999

TABLE (T.4) PROJECTED FARM PRICES, AREA, PRODUCTION, CONSUMPTION
EXPORT AND IMPORT FOR COMMODITIES CONSUMED NATIONALLY

50% increase in wheat world price , free importation of wheat and maize

COMMODITIES	PRICE (LE/t)	AREA (000fed)	PRODUC. (000t)	CONSUM. (000t)	EXPORT (000t)	price (LE)	IMPORT (000t)	price (LE)
CROP COMMODITIES								
BARLEY	425.17	74.02	153.22	154.72	0.00	0.0	1.50	462.90
CITRUS	702.31	925.45	7306.43	6858.93	484.00	882.0	36.50	1796.00
CTONELS	6259.41	321.36	104.60	68.60	36.00	7130.9	0.00	0.00
CTONLS	5753.90	1003.24	433.51	387.01	46.50	4228.2	0.00	0.00
FBEAN	934.64	435.42	449.83	483.83	10.00	1875.4	44.00	1100.80
FXFIB	391.83	4.81	9.50	0.00	10.00	3330.6	0.50	7245.30
GRDNUT	1367.66	152.67	233.58	221.58	12.00	1445.4	0.00	0.00
LEGUME	1354.88	64.43	52.19	57.19	0.00	0.0	5.00	1572.00
LENTIL	1233.65	83.13	68.06	107.06	0.00	0.0	39.00	2197.70
MAIZE	448.54	2041.75	6688.57	13375.54	0.00	0.0	9460.00	358.40
ONION	165.49	111.70	1533.61	1237.61	296.00	305.3	0.00	0.00
POTATO	455.57	133.39	1632.65	1114.65	520.00	613.8	2.00	979.40
RICE	974.71	1768.69	4195.10	4041.60	153.50	477.2	0.00	0.00
SESAME	1439.56	94.54	94.54	117.04	0.00	0.0	22.50	2767.00
SORGHUM	516.93	513.65	1110.79	1122.79	0.00	0.0	12.00	371.70
SOYBEAN	794.60	0.00	0.00	126.51	0.00	0.0	126.51	794.60
SUGAR	923.64	384.36	1525.04	2217.04	0.00	0.0	692.00	1196.00
TOMATO	259.90	420.26	7819.53	7809.53	10.00	631.6	0.00	0.00
VEGET	231.87	573.16	10751.44	10639.94	116.00	1493.0	4.50	2267.00
VEG-OIL	2128.80	1576.63	154.69	980.44	0.00	0.0	825.75	2128.80
WHEATF	666.92	1095.62	2419.03	11659.03	0.00	0.0	9240.00	575.00
ANIMAL COMMODITIES								
BEEF	7673.66		983.46	1259.46	0.00		276.00	5342.00
MILK	802.91		5038.86	5171.36	22.00		154.50	4577.00
SGMEAT	4197.07		80.24	80.74	0.00		0.50	4573.00
PMEAT	3582.41		730.48	730.48	0.00		0.00	5514.00
EGGS	1917.66		325.41	325.41	0.00		0.00	2500.00

CONSUMER SURPLUS	51592.69 (million LE)	A MEASURE OF THE SATISFACTION OF CONSUMER
PRODUCER SURPLUS	5195.28 (million LE)	A MEASURE OF THE NET INCOME OF FARMERS
CONSUMER & PRODUCER SURPLUS	56787.97 (million LE)	

*PRICE: FARMGATE
*VEG-OIL: FROM SOYABEAN, SESAME, GROUNDNUT, CTONLS, CTONELS AND FLAX
*SUGAR: FROM SUGAR CANE AND SUGAR BEET
SOURCE: ASME97 AGRICULTRAL SECTOR MODEL OF EGYPT VERSION 1999

TABLE (T.5) PROJECTED FARM PRICES, AREA, PRODUCTION, CONSUMPTION
EXPORT AND IMPORT FOR COMMODITIES CONSUMED NATIONALLY

base price for import crops = import party prices 99

COMMODITIES	PRICE (LE/t)	AREA (000fed)	PRODUC. (000t)	CONSUM. (000t)	EXPORT (000t)	price (LE)	IMPORT (000t)	price (LE)
CROP COMMODITIES								
BARLEY	362.31	78.76	163.04	164.54	0.00	0.0	1.50	462.90
CITRUS	969.95	1129.99	8763.35	8678.85	121.00	882.0	36.50	1796.00
CTONELS	5896.69	340.75	110.91	74.91	36.00	7130.9	0.00	0.00
CTONLS	5327.19	1316.84	526.51	480.01	46.50	4228.2	0.00	0.00
FBEAN	847.64	420.55	441.21	475.21	10.00	1875.4	44.00	1100.80
FXFIB	391.83	4.81	9.50	0.00	10.00	3330.6	0.50	7245.30
GRDNUT	1332.97	154.65	236.62	224.62	12.00	1445.4	0.00	0.00
LEGUME	1191.28	64.48	51.58	56.58	0.00	0.0	5.00	1572.00
LENTIL	1208.84	94.15	78.05	117.05	0.00	0.0	39.00	2197.70
MAIZE	370.72	1235.25	3936.07	10540.33	0.00	0.0	9460.00	358.40
ONION	161.93	112.84	1549.25	1253.25	296.00	305.3	0.00	0.00
POTATO	450.37	133.96	1639.73	1121.73	520.00	613.8	2.00	979.40
RICE	956.93	1803.01	4248.09	4094.59	153.50	477.2	0.00	0.00
SESAME	1260.26	315.99	93.30	115.80	0.00	0.0	22.50	2767.00
SORGHUM	427.85	335.83	818.92	830.92	0.00	0.0	12.00	371.70
SOYBEAN	794.60	0.00	0.00	104.00	0.00	0.0	104.00	794.60
SUGAR	892.48	428.49	1700.52	2392.52	0.00	0.0	692.00	1196.00
TOMATO	254.15	425.04	7902.34	7892.34	10.00	631.6	0.00	0.00
VEGET	756.84	632.30	11626.42	11514.92	116.00	1493.0	4.50	2267.00
VEG-OIL	2128.80	2133.03	298.51	866.00	0.00	0.0	567.49	2128.80
WHEATF	395.40	0.00	0.00	9240.00	0.00	0.0	9240.00	383.30
ANIMAL COMMODITIES								
BEEF	7673.66		983.46	1259.46	0.00		276.00	5342.00
MILK	802.91		5038.86	5171.36	22.00		154.50	4577.00
SGMEAT	4197.07		80.24	80.74	0.00		0.50	4573.00
PMEAT	3354.59		753.22	753.22	0.00		0.00	5514.00
EGGS	1765.90		333.69	333.69	0.00		0.00	2500.00

CONSUMER SURPLUS	68810.92 (million LE)	A MEASURE OF THE SATISFACTION OF CONSUMER
PRODUCER SURPLUS	2474.59 (million LE)	A MEASURE OF THE NET INCOME OF FARMERS
CONSUMER & PRODUCER SURPLUS	71285.51 (million LE)	

*PRICE: FARMGATE
*VEG-OIL: FROM SOYABEAN, SESAME, GROUNDNUT, CTONLS, CTONELS AND FLAX
*SUGAR: FROM SUGAR CANE AND SUGAR BEET
SOURCE: ASME97 AGRICULTRAL SECTOR MODEL OF EGYPT VERSION 1999

TABLE (T.6) PROJECTED FARM PRICES, AREA, PRODUCTION, CONSUMPTION
EXPORT AND IMPORT FOR COMMODITIES CONSUMED NATIONALLY
changing rice price from 1091 to 740 & paddy price from 730 to 500

COMMODITIES	PRICE (LE/t)	AREA (000fed)	PRODUC. (000t)	CONSUM. (000t)	EXPORT (000t)	price (LE)	IMPORT (000t)	price (LE)
CROP COMMODITIES								
BARLEY	581.83	86.89	124.26	130.26	0.00	0.0	6.00	462.90
CITRUS	771.05	862.21	6811.97	6364.47	484.00	882.0	36.50	1796.00
CTONELS	8042.88	143.09	46.58	37.58	9.00	7130.9	0.00	0.00
CTONLS	6490.37	627.89	273.01	226.51	46.50	4228.2	0.00	0.00
FBEAN	1133.58	268.37	258.94	424.94	10.00	1875.4	176.00	1100.80
FXFIB	391.83	4.81	9.50	0.00	10.00	3330.6	0.50	7245.30
GRDNUT	1444.72	148.26	226.84	214.84	12.00	1445.4	0.00	0.00
LEGUME	1836.83	31.63	25.62	45.62	0.00	0.0	20.00	1572.00
LENTIL	1660.73	61.84	49.77	88.77	0.00	0.0	39.00	2197.70
MAIZE	526.14	3053.34	10095.00	12134.43	0.00	0.0	4730.00	358.40
ONION	179.33	107.27	1472.86	1176.86	296.00	305.3	0.00	0.00
POTATO	474.60	141.87	1606.71	1088.71	520.00	613.8	2.00	979.40
RICE	1040.97	1555.45	3740.44	3586.94	153.50	477.2	0.00	0.00
SESAME	1726.24	91.21	88.50	111.00	0.00	0.0	22.50	2767.00
SORGHUM	590.83	566.70	1011.91	1023.91	0.00	0.0	12.00	371.70
SOYBEAN	794.60	0.00	0.00	126.51	0.00	0.0	126.51	794.60
SUGAR	1027.53	339.76	1347.71	2039.71	0.00	0.0	692.00	1196.00
TOMATO	259.98	417.23	7818.38	7808.38	10.00	631.6	0.00	0.00
VEGET	239.49	470.32	10648.13	10536.63	116.00	1493.0	4.50	2267.00
VEG-OIL	2128.80	1015.27	92.25	980.44	0.00	0.0	888.19	2128.80
WHEATF	852.66	2415.63	5281.86	9901.86	0.00	0.0	4620.00	383.30
ANIMAL COMMODITIES								
BEEF	7673.66		983.46	1259.46	0.00		276.00	5342.00
MILK	802.91		5038.86	5171.36	22.00		154.50	4577.00
SGMEAT	4197.07		80.24	80.74	0.00		0.50	4573.00
PMEAT	3809.57		707.81	707.81	0.00		0.00	5514.00
EGGS	2068.96		317.16	317.16	0.00		0.00	2500.00

CONSUMER SURPLUS	45212.44 (million LE)	A MEASURE OF THE SATISFACTION OF CONSUMER
PRODUCER SURPLUS	9635.19 (million LE)	A MEASURE OF THE NET INCOME OF FARMERS
CONSUMER & PRODUCER SURPLUS	54847.63 (million LE)	

*PRICE: FARMGATE
*VEG-OIL: FROM SOYABEAN, SESAME, GROUNDNUT, CTONLS, CTONELS AND FLAX
*SUGAR: FROM SUGAR CANE AND SUGAR BEET
SOURCE: ASME97 AGRICULTRAL SECTOR MODEL OF EGYPT VERSION 1999

TABLE (T.7) PROJECTED FARM PRICES, AREA, PRODUCTION, CONSUMPTION
EXPORT AND IMPORT FOR COMMODITIES CONSUMED NATIONALLY

decrease base pric by 23%(elimination of price support)

COMMODITIES	PRICE (LE/t)	AREA (000fed)	PRODUC. (000t)	CONSUM. (000t)	EXPORT (000t)	price (LE)	IMPORT (000t)	price (LE)
CROP COMMODITIES								
BARLEY	554.90	72.05	128.46	134.46	0.00	0.0	6.00	462.90
CITRUS	767.56	859.90	6837.05	6389.55	484.00	882.0	36.50	1796.00
CTONELS	7730.47	159.79	52.01	43.01	9.00	7130.9	0.00	0.00
CTONLS	6207.11	776.69	334.74	288.24	46.50	4228.2	0.00	0.00
FBEAN	1100.80	274.89	270.18	434.64	10.00	1875.4	174.46	1100.80
FXFIB	391.83	4.81	9.50	0.00	10.00	3330.6	0.50	7245.30
GRDNUT	1429.96	149.10	228.13	216.13	12.00	1445.4	0.00	0.00
LEGUME	1667.05	36.66	29.69	49.69	0.00	0.0	20.00	1572.00
LENTIL	1485.42	70.89	57.28	96.28	0.00	0.0	39.00	2197.70
MAIZE	535.39	3057.38	9937.25	11986.37	0.00	0.0	4730.00	358.40
ONION	177.23	107.94	1482.07	1186.07	296.00	305.3	0.00	0.00
POTATO	473.12	136.96	1608.73	1090.73	520.00	613.8	2.00	979.40
RICE	1094.77	1598.30	3837.28	3683.78	153.50	477.2	0.00	0.00
SESAME	1744.45	90.79	88.11	110.61	0.00	0.0	22.50	2767.00
SORGHUM	602.41	567.39	996.42	1008.42	0.00	0.0	12.00	371.70
SOYBEAN	794.60	0.00	0.00	126.51	0.00	0.0	126.51	794.60
SUGAR	992.14	354.95	1408.11	2100.11	0.00	0.0	692.00	1196.00
TOMATO	261.39	415.15	7797.96	7787.96	10.00	631.6	0.00	0.00
VEGET	233.68	473.80	10726.91	10615.41	116.00	1493.0	4.50	2267.00
VEG-OIL	2128.80	1181.18	111.44	980.44	0.00	0.0	869.00	2128.80
WHEATF	758.95	1838.85	4023.57	8643.57	0.00	0.0	4620.00	383.30
ANIMAL COMMODITIES								
BEEF	7673.66		983.46	1259.46	0.00		276.00	5342.00
MILK	802.91		5038.86	5171.36	22.00		154.50	4577.00
SGMEAT	4197.07		80.24	80.74	0.00		0.50	4573.00
PMEAT	3836.23		705.15	705.15	0.00		0.00	5514.00
EGGS	2086.91		316.18	316.18	0.00		0.00	2500.00

CONSUMER SURPLUS	44490.61	(million LE)	A MEASURE OF THE SATISFACTION OF CONSUMER
PRODUCER SURPLUS	8782.90	(million LE)	A MEASURE OF THE NET INCOME OF FARMERS
CONSUMER & PRODUCER SURPLUS	53273.51	(million LE)	

*PRICE: FARMGATE
*VEG-OIL: FROM SOYABEAN, SESAME, GROUNDNUT, CTONLS, CTONELS AND FLAX
*SUGAR: FROM SUGAR CANE AND SUGAR BEET
SOURCE: ASME97 AGRICULTRAL SECTOR MODEL OF EGYPT VERSION 1999

TABLE (T.8) PROJECTED FARM PRICES, AREA, PRODUCTION, CONSUMPTION
EXPORT AND IMPORT FOR COMMODITIES CONSUMED NATIONALLY
increasing base price of cotton by 16%

COMMODITIES	PRICE (LE/t)	AREA (000fed)	PRODUC. (000t)	CONSUM. (000t)	EXPORT (000t)	price (LE)	IMPORT (000t)	price (LE)
CROP COMMODITIES								
BARLEY	605.74	84.28	120.52	126.52	0.00	0.0	6.00	462.90
CITRUS	790.70	843.26	6670.58	6223.08	484.00	882.0	36.50	1796.00
CTONELS	8742.69	170.08	55.36	46.36	9.00	7130.9	0.00	0.00
CTONLS	7021.04	852.75	368.19	321.69	46.50	4228.2	0.00	0.00
FBEAN	1188.44	253.87	242.70	408.70	10.00	1875.4	176.00	1100.80
FXFIB	391.83	4.81	9.50	0.00	10.00	3330.6	0.50	7245.30
GRDNUT	1479.65	140.38	214.78	211.78	3.00	1445.4	0.00	0.00
LEGUME	1924.90	28.28	23.51	43.51	0.00	0.0	20.00	1572.00
LENTIL	1737.24	57.69	46.49	85.49	0.00	0.0	39.00	2197.70
MAIZE	555.48	2900.30	9594.39	11665.01	0.00	0.0	4730.00	358.40
ONION	183.20	106.03	1455.85	1159.85	296.00	305.3	0.00	0.00
POTATO	478.69	140.53	1601.14	1083.14	520.00	613.8	2.00	979.40
RICE	1146.75	1536.44	3682.33	3528.83	153.50	477.2	0.00	0.00
SESAME	1839.92	86.26	86.10	108.60	0.00	0.0	22.50	2767.00
SORGHUM	623.97	571.02	967.58	979.58	0.00	0.0	12.00	371.70
SOYBEAN	794.60	0.00	0.00	126.51	0.00	0.0	126.51	794.60
SUGAR	1075.58	319.13	1265.68	1957.68	0.00	0.0	692.00	1196.00
TOMATO	265.15	411.91	7743.88	7733.88	10.00	631.6	0.00	0.00
VEGET	244.83	487.87	10575.81	10464.31	116.00	1493.0	4.50	2267.00
VEG-OIL	2128.80	1254.28	121.95	980.44	0.00	0.0	858.49	2128.80
WHEATF	884.58	2297.77	4979.87	9599.87	0.00	0.0	4620.00	383.30
ANIMAL COMMODITIES								
BEEF	7673.66		983.46	1259.46	0.00		276.00	5342.00
MILK	802.91		5038.86	5171.36	22.00		154.50	4577.00
SGMEAT	4197.07		80.24	80.74	0.00		0.50	4573.00
PMEAT	3895.49		699.24	699.24	0.00		0.00	5514.00
EGGS	2126.19		314.04	314.04	0.00		0.00	2500.00

CONSUMER SURPLUS	45349.08 (million LE)	A MEASURE OF THE SATISFACTION OF CONSUMER
PRODUCER SURPLUS	11100.09 (million LE)	A MEASURE OF THE NET INCOME OF FARMERS
CONSUMER & PRODUCER SURPLUS	56449.17 (million LE)	

*PRICE: FARMGATE
*VEG-OIL: FROM SOYABEAN, SESAME, GROUNDNUT, CTONLS, CTONELS AND FLAX
*SUGAR: FROM SUGAR CANE AND SUGAR BEET
SOURCE: ASME97 AGRICULTRAL SECTOR MODEL OF EGYPT VERSION 1999

TABLE (T.9) PROJECTED FARM PRICES, AREA, PRODUCTION, CONSUMPTION
EXPORT AND IMPORT FOR COMMODITIES CONSUMED NATIONALLY
changing avaliable water. from 55.5 to 50.5

COMMODITIES	PRICE (LE/t)	AREA (000fed)	PRODUC. (000t)	CONSUM. (000t)	EXPORT (000t)	price (LE)	IMPORT (000t)	price (LE)
CROP COMMODITIES								
BARLEY	638.98	80.65	115.33	121.33	0.00	0.0	6.00	462.90
CITRUS	790.61	836.74	6671.22	6223.72	484.00	882.0	36.50	1796.00
CTONELS	8373.80	125.41	40.82	31.82	9.00	7130.9	0.00	0.00
CTONLS	6749.62	492.05	216.51	170.01	46.50	4228.2	0.00	0.00
FBEAN	1180.44	249.47	245.06	411.06	10.00	1875.4	176.00	1100.80
FXFIB	391.83	4.81	9.50	0.00	10.00	3330.6	0.50	7245.30
GRDNUT	1488.62	139.87	214.00	211.00	3.00	1445.4	0.00	0.00
LEGUME	1918.68	29.20	23.66	43.66	0.00	0.0	20.00	1572.00
LENTIL	1724.28	58.56	47.04	86.04	0.00	0.0	39.00	2197.70
MAIZE	537.90	2985.11	9894.54	11946.33	0.00	0.0	4730.00	358.40
ONION	185.42	105.33	1446.12	1150.12	296.00	305.3	0.00	0.00
POTATO	479.59	140.42	1599.92	1081.92	520.00	613.8	2.00	979.40
RICE	1135.30	1547.62	3716.48	3562.98	153.50	477.2	0.00	0.00
SESAME	1769.71	87.58	87.58	110.08	0.00	0.0	22.50	2767.00
SORGHUM	616.30	406.40	977.84	989.84	0.00	0.0	12.00	371.70
SOYBEAN	794.60	0.00	0.00	126.51	0.00	0.0	126.51	794.60
SUGAR	1066.81	322.90	1280.66	1972.66	0.00	0.0	692.00	1196.00
TOMATO	263.76	413.78	7763.83	7753.83	10.00	631.6	0.00	0.00
VEGET	241.30	469.24	10623.61	10512.11	116.00	1493.0	4.50	2267.00
VEG-OIL	2128.80	849.72	74.46	980.44	0.00	0.0	905.98	2128.80
WHEATF	879.93	2280.75	5023.90	9643.90	0.00	0.0	4620.00	383.30
ANIMAL COMMODITIES								
BEEF	7673.66		983.46	1259.46	0.00		276.00	5342.00
MILK	802.91		5038.86	5171.36	22.00		154.50	4577.00
SGMEAT	4197.07		80.24	80.74	0.00		0.50	4573.00
PMEAT	3843.56		704.42	704.42	0.00		0.00	5514.00
EGGS	2091.79		315.91	315.91	0.00		0.00	2500.00

CONSUMER SURPLUS	45513.70 (million LE)	A MEASURE OF THE SATISFACTION OF CONSUMER
PRODUCER SURPLUS	10407.36 (million LE)	A MEASURE OF THE NET INCOME OF FARMERS
CONSUMER & PRODUCER SURPLUS	55921.05 (million LE)	

*PRICE: FARMGATE
*VEG-OIL: FROM SOYABEAN, SESAME, GROUNDNUT, CTONLS, CTONELS AND FLAX
*SUGAR: FROM SUGAR CANE AND SUGAR BEET
SOURCE: ASME97 AGRICULTRAL SECTOR MODEL OF EGYPT VERSION 1999

TABLE (T.10) PROJECTED FARM PRICES, AREA, PRODUCTION, CONSUMPTION
EXPORT AND IMPORT FOR COMMODITIES CONSUMED NATIONALLY

water cost recovery = 0.03 le

COMMODITIES	PRICE (LE/t)	AREA (000fed)	PRODUC. (000t)	CONSUM. (000t)	EXPORT (000t)	price (LE)	IMPORT (000t)	price (LE)
CROP COMMODITIES								
BARLEY	567.22	88.49	126.54	132.54	0.00	0.0	6.00	462.90
CITRUS	774.17	858.85	6789.54	6342.04	484.00	882.0	36.50	1796.00
CTONELS	8135.41	138.15	44.97	35.97	9.00	7130.9	0.00	0.00
CTONLS	6573.19	584.71	254.96	208.46	46.50	4228.2	0.00	0.00
FBEAN	1114.13	268.73	264.69	430.69	10.00	1875.4	176.00	1100.80
FXFIB	391.83	4.81	9.50	0.00	10.00	3330.6	0.50	7245.30
GRDNUT	1478.24	140.46	214.90	211.90	3.00	1445.4	0.00	0.00
LEGUME	1830.13	31.83	25.78	45.78	0.00	0.0	20.00	1572.00
LENTIL	1644.04	62.70	50.48	89.48	0.00	0.0	39.00	2197.70
MAIZE	532.89	3012.47	9979.92	12026.45	0.00	0.0	4730.00	358.40
ONION	184.09	105.75	1451.97	1155.97	296.00	305.3	0.00	0.00
POTATO	478.27	139.26	1601.71	1083.71	520.00	613.8	2.00	979.40
RICE	1098.87	1591.53	3825.03	3671.53	153.50	477.2	0.00	0.00
SESAME	1733.06	91.05	88.35	110.85	0.00	0.0	22.50	2767.00
SORGHUM	598.08	504.27	1002.21	1014.21	0.00	0.0	12.00	371.70
SOYBEAN	794.60	0.00	0.00	126.51	0.00	0.0	126.51	794.60
SUGAR	1042.40	333.38	1322.32	2014.32	0.00	0.0	692.00	1196.00
TOMATO	262.17	415.23	7786.78	7776.78	10.00	631.6	0.00	0.00
VEGET	237.95	471.25	10669.02	10557.52	116.00	1493.0	4.50	2267.00
VEG-OIL	2128.80	959.18	86.63	980.44	0.00	0.0	893.81	2128.80
WHEATF	847.67	2432.27	5329.12	9949.12	0.00	0.0	4620.00	383.30
ANIMAL COMMODITIES								
BEEF	7673.66		983.46	1259.46	0.00		276.00	5342.00
MILK	802.91		5038.86	5171.36	22.00		154.50	4577.00
SGMEAT	4197.07		80.24	80.74	0.00		0.50	4573.00
PMEAT	3829.12		705.86	705.86	0.00		0.00	5514.00
EGGS	2082.07		316.44	316.44	0.00		0.00	2500.00

CONSUMER SURPLUS	46351.46 (million LE)	A MEASURE OF THE SATISFACTION OF CONSUMER
PRODUCER SURPLUS	8598.17 (million LE)	A MEASURE OF THE NET INCOME OF FARMERS
CONSUMER & PRODUCER SURPLUS	54949.64 (million LE)	

*PRICE: FARMGATE
*VEG-OIL: FROM SOYABEAN, SESAME, GROUNDNUT, CTONLS, CTONELS AND FLAX
*SUGAR: FROM SUGAR CANE AND SUGAR BEET
SOURCE: ASME97 AGRICULTRAL SECTOR MODEL OF EGYPT VERSION 1999