TURKEY: AGRICULTURAL SECTOR MODEL (TASM)

A Non – Technical Introduction

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Halûk Kasnakoğlu*

A. Introduction

As in most developing economies, agriculture plays a crucial role in the economic development of Turkey. The agricultural sector, hence, for a long period of time, has been subjected to direct and indirect government intervention. Among the specific objectives of Turkish agricultural development, the following can be identified as major ones :

i. To reduce price instability

ii. To reduce income instability

iii. To stimulate output and change output composition

iv. To increase incomes of producers and/or change or maintain income distribution

v. To satisfy domestic demand and/or protect consumers

vi. To improve employment

vii. To earn foreign exchange or reduce foreign exchange spendings.

To attain these objectives, various instruments of agricultural policy have been utilized and these can be classified under six broad categories:

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i. Intervention in output and input markets

   a. Output support prices

   b. Input subsidies

   c. Input and output quotas

   d. Tax policy

   e. Minimum wages and other input price policies

   f. Procurement and marketing policies.

ii. Intervention in credit markets

   a. Rates of interest on credit

   b. Availability of credit

iii. Intervention in the foreign trade

   a. Export and import taxes and subsidies

   b. Export and import restrictions and quotas

   c. Tariffs

   d. Exchange rate

iv. Research and extension activities

v. Intervention in the agricultural structure

   a. Land tenure

   b. Cooperatives

   c. New technology

vi. Investment activities

   a. Irrigation

   b. Machinery

c. Land improvement

d. Transportation network

An obvious implication of the multiplicity of targets and instruments available to achieve them is the problem of choice between various instruments to reach certain targets and more important than that, the problem of conducting *consistent* agricultural policies. The main reason is that not only the targets but also the policy instruments are not mutually exclusive. There are substantial overlaps, and often times conflicts (such as in the case of producer income and consumer welfare) and interactions are involved. Because of the complexities of the substitution and complementary effects inherent in the target and instrument packages, the consequence of a given policy measure on various targets is not obvious a priori. The impact of several policy measures cannot be approximated just by adding up the impact of such measures taken in isolation, and the side-effects of policy measures on non-targetted variables need not be neutral or positive. Due to the interaction effects, a piece-meal analysis of agricultural policies can be quite misleading. All variables in a full policy package, as well as their impacts in the whole spectrum must be analyzed simultaneously.

B. What is TASM?

TASM is an internally consistent, quantitative framework of analysis to evaluate the effects of policy interventions. TASM formulates the major aspects of micro-level and sectoral decision making, and can be employed by policy makers to evaluate future policy instruments in terms of various policy targets simultaneously.

TASM, the main characteristics (or structure) of which will be explained later, is implemented in four stages:

1. Data Consistency Check

Inevitably, model building is subject to the limitations of availability and reliability of data. Abstractions have to be made from the complexity of reality. Turkey, as in most developing countries, lacks reliable data for a comprehensive study of this sort. The available data, in many instances show important inconsistencies, especially when pieced together from different sources, or even from different publications of the same source. Many of these serious inconsistencies can be traced out from the results of the model, through the various accounting procedures which compare aggregate values with the aggregated values from micro-level data, internal to the model. The impilcations of the data employed can also give clues as to places to look for data improvement. (For example, data on individual fertilizer inputs by crops, when aggregated, should match the total fertilizer production - export + import $\mp$ stocks. The tractor power used in individual crop production activities, if greater than the availability of total tractor power in a given year, should warn as to problems with either micro-or macro-level data.) Finally, and more importantly, construction of a comprehensive model contributes to a proper data generation which requires a dialogue between the users and the suppliers of information. Data of better quality are likely to be generated only after their usefulness has been demonstrated, and proper data are generated only if it is known what data are necessary. Collecting data with no analytical framework in mind results in the generation of a lot of data which cannot be used by anyone and hence is

a waste of scarce resources. Rather than delay to take advantage of improved data, the TASM study proceeded via sensitivity analyses in areas of critical assumptions.

2. Simulation of the Base Year

Once the consistency check of the data is completed, the model is employed to simulate the agricultural economy for a specific base year, to test its behavioral specifications, such as the objectives of producers, consumers, market structures, etc. At this stage, further adjustments (calibrations) are made in data and behavioral specifications, if necessary, so that the model simulates the base year fairly closely. And finally, sensitivity analyses are also performed on certain critical subsets of the data to see their implications on the model's results.

3. Use of Base Year Results for Identifying Trade-Offs and Policy Formultions

The results of the model which simulate the base year, can be employed to identify the factors constraining growth, income and consumer welfare. The model will, in addition to the structure of crop rotations, technology and foreign trade, yield aggregate welfare indices for producers, consumers and government, as well as tabulations of resource use and demands, and such items of interest to agricultural planners and policy makers. The results of the base year simulation, in identifying the bottlenecks or problem areas (i.e., limiting resources, interregional and international compararative advantage), also aid in designing the policy packages to satisfy desired policy targets.

4. Policy Experiments and Future Projections

Now the model is ready to be used for future projections and policy experiments. TASM is designed to address questions of pricing policies, trade policies, employment programs, some categories of investment allocation, changes in technology and some structural changes. The future projections can either be performed under the changing policy measures or under the present policy.

C. What Kind of Questions Can be Addressed with TASM?

Below we present a partial list of questions that can be addressed, examples of policy packages that can be experimented and projections that can be performed with TASM. The list presented is not complete in two senses. First, it does not exhaust all possible questions that can be addressed with TASM. And second, TASM may need minor adjustments from the present version in its structure and coverage to be able to handle some of the questions (i.e., may need to be further digsaggregated, constraints altered, behavioral rules changed, additional data required, etc.). These types of questions are pointed out with an ★.

1. Is the data available from different sources and for different dimensions consistent? Where do inconsistencies exist and what are the possible sets of priorities for data improvement?

2. ★ What are the input requirements (land, labor, tractor, fertilizer, animal power, seed, feed, etc.) in agriculture by season and locality?

3. ★ What are the rates of unemployment in inputs and which inputs are limiting furtehr increases in production?

4. How much increases in the limiting factors increase consumer welfare and producer incomes? What are the economic returns of the constraining factors?

5. What are the cropping, consumption and trade patterns in agriculture, and what effect will changes in these patterns have?

6. Does agriculture have a comparative advantage in international trade? If so, in which products?

7.★ What are the comparative advantages of different regions in different production activities?

8. What are the trade-offs between various technologies in agriculture?

9. What are the trade-offs between domestic consumption and foreign trade of agricultural goods?

10. What are the trade-offs between foreign trade in processed and unprocessed agricultural commodities?

11. What policy instruments can be employed to increase output, producer income, consumer welfare, foreign earnings, etc.?

12.★ What will be the effects of inputs and output pricing policies on cropping patterns, input uses, producer incomes, domestic consumption, foreign trade, output prices, technology, income distribution?

13.★ What will be the effects of trade policies (exchange rate, tariffs, trades, premiums, quotas, free trade, etc.)?

14. What will be the effects of new investment (i.e., new irrigation, land conservation, etc.)?

15. What will be the effects of changes in demand conditions?

16. What will be the effects of changes due to changes in the foreign demand of tradable commodities?

17.★ What will be the effects of joining international trade agreements and/or economic communities?

18. What will be the impact of land and other input quotas?

19. What will be the impact of introducing new technologies, (i.e., high yield varieties)?

20.★ What are the budgeting outlays associated with different policy instruments?

21.★ What effect will a land-income distribution scheme have?

22. Where will the agricultural economy reach in a distant future, under the above policy changes and with no changes in policy?

D. Basic Structure of TASM

The basic structure of TASM is illustrated in Schema 1. The rectangles represent data given exogeneously to the model and represent either policy instruments or factors determined outside the agricultural sector. The information shown in circles represents information generated endogeneously by the model. Of course, Schema 1 represents only one specification of the model, and hence some of the information treated as exogenous may be made endogenous. The directions of the arrows show the

directions of causality. Basically, any information defined by a rectangle is a candidate as a policy instrument, of course some being more readily used in practice than others.

The objective function is specified such that the producers maximize profits subject to the constraints on inputs, related risk and given technology. Consumers, on the other hand, are assumed to be utility maximizers. Clearly these two objectives in general are conflicting, so that the objective function is specified to maximize the sum of consumers' welfare and producers' welfare jointly. This is achieved by specifying the objective function to yield a competitive equilibrium. The competitive market mechanism is proposed to be closer to the actual process which determines production and prices in Turkish agriculture and, therefore, has been adopted as the basis for the model. Government policies such as price support, import quotas, and input subsidies and their impacts on producers' incomes, employment and other variables are evaluated as intervenitons in a basically competitive market. However, it should be pointed out that the same structure can be utilized to represent non-competitive market structures.

Given the information on input prices, production technology, resource constraints and riskiness of various production plans, the model produces the farmers' supply function, which shows how the producers respond to different prices to maximize profits. The supply function, together with the domestic and foreign demand functions determine the levels, values of output, resource use, output prices in such a way as to ensure the maximization of the sum of producers' and consumers' welfares.

E. Basic Features of TASM

TASM is a sector-wide model in the sense that it describes national supply and use production, imports, domestic demand and exports for 23 short-cycle crops, 14 long-cycle crops and 20 livestock products, which constitute over 95 % of the value of production in Turkish agriculture. In this section, we expand on portions of Schema 1 to demonstrate the level of disaggregation and detail in the present version of TASM.

E.1 Production Activities

The production activities, which show the relationships between the inputs and outputs and which constitute the core of the model, consist of activities for short-cycle, perennial crops and livestock products. The production coefficients for single as well as multiple crop activities are specified for each of these crops or products. The number of these activities in the present version of TASM are illustrated in Schema 2.

E.2 Production Technology

The production activities, when relevant, are specified for two types of technology, namely mechanized and non-mechanized, so that the model can choose any one or a combination of the two technologies.

E.3 Inputs

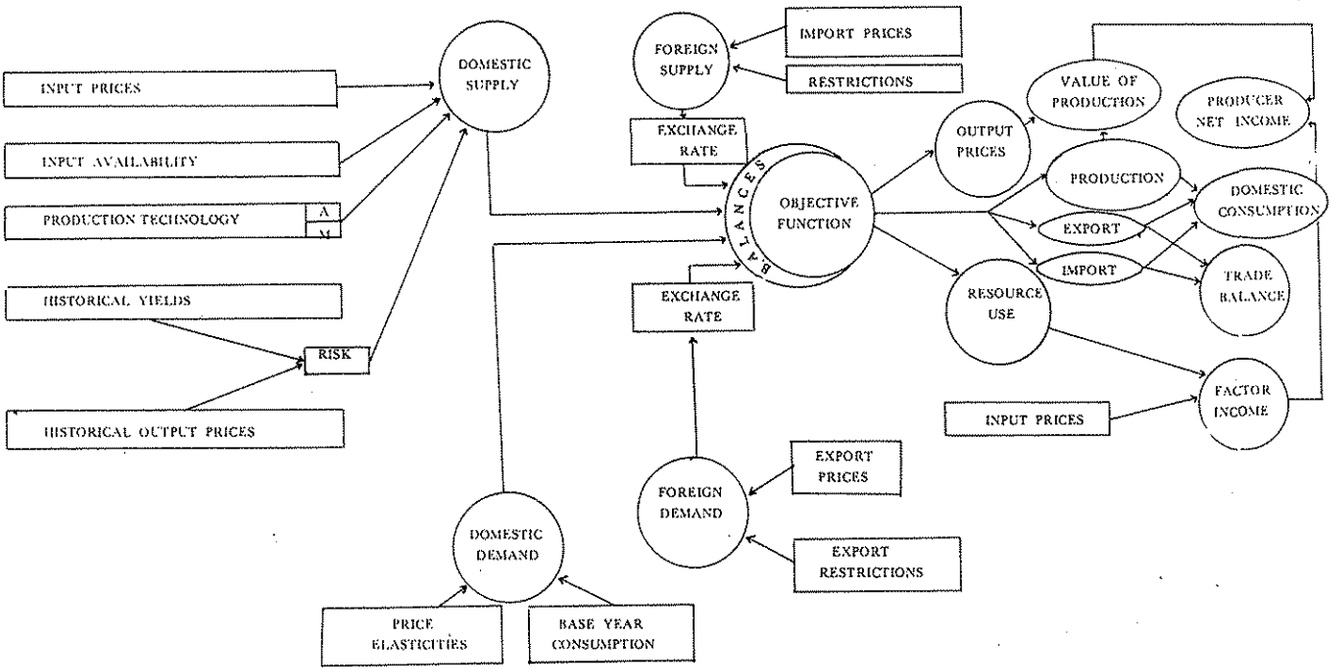
Six groups are incorporated in TASM, some on a yearly and some on a quarterly basis, with further classifications within themselves. Schema 3 illustrates the input groups employed in TASM.

E.4 Output

The outputs generated by the model are also allocated in several ways. Part of the output goes directly into domestic consumption or into international trade. Part of the output goes as inputs to livestock or crop production activities. Still another part goes into further processing before being allocated to domestic consumption, foreign trade, and to the livestock sector as inputs. Therefore, two important parts of the model are: its treatment of the trade-offs between unprocessed and processed output in domestic as well as international trade, and its treatment of the crop and livestock activities simultaneously and thus considering the trade-offs between these two broad lines of activities. Schema 4 illustrates the relationships between the livestock and production activities and the various uses and forms of output considered in the model.

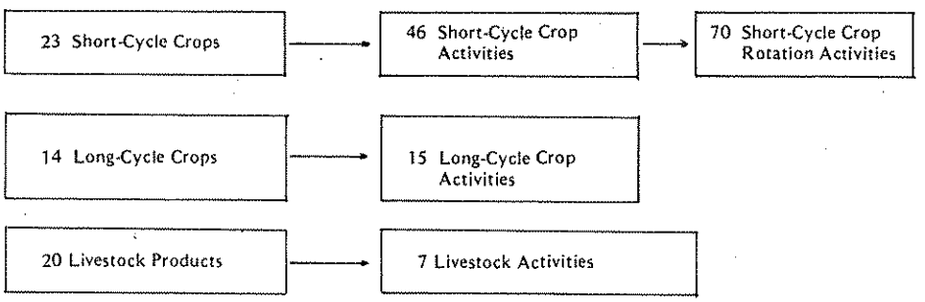
SCHEMA 1

BASIC STRUCTURE OF TASM



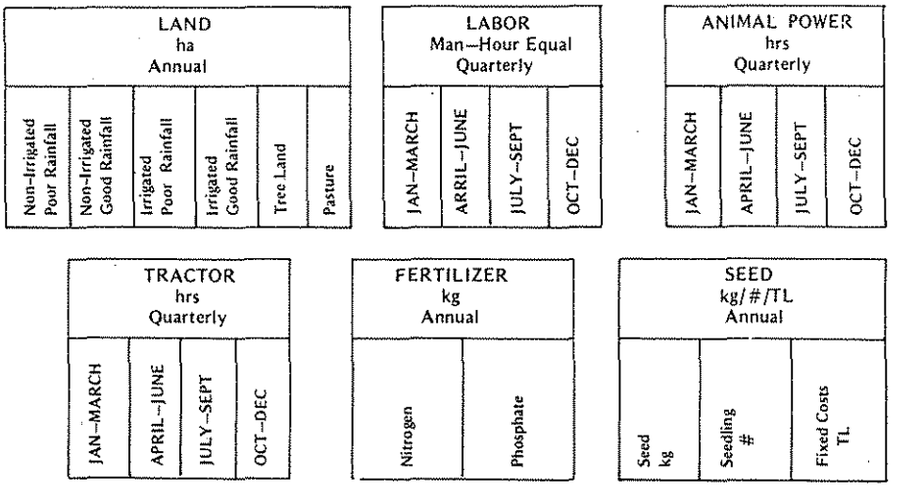
SCHEMA 2

PRODUCTION ACTIVITIES



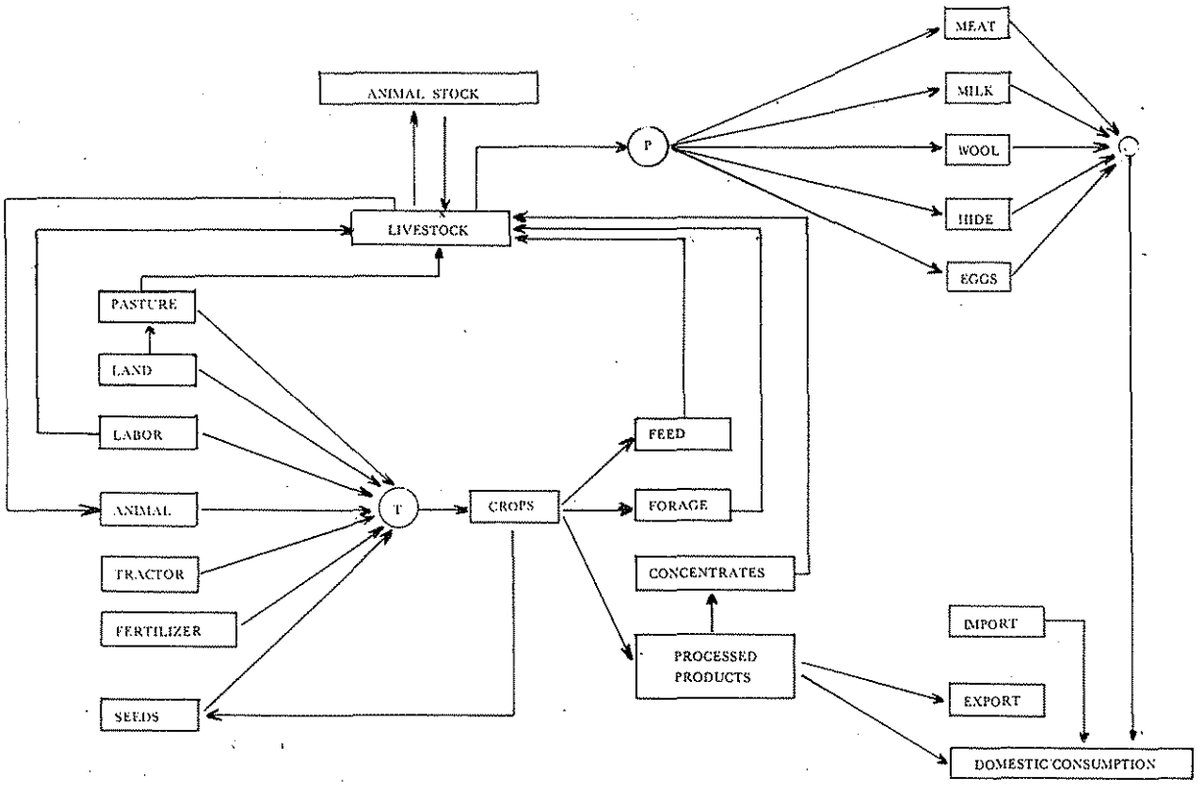
SCHEMA 3

INPUT STRUCTURE OF TASM



SCHEMA 4

THE INTERACTION OF CROP AND LIVESTOCK PRODUCTION ACTIVITIES



SIMULATIONS OF TURKISH AGRICULTURAL PRODUCTION, CONSUMPTION AND TRADE UNDER FREE TRADE CONDITIONS

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January 1984
Middle East Technical University
Ankara, Turkey

SIMULATIONS OF TURKISH AGRICULTURAL PRODUCTION, CONSUMPTION AND TRADE UNDER FREE TRADE CONDITIONS**

Halûk Kasnakoğlu*

I. INTRODUCTION

As in most developing economies, agriculture plays a crucial role in the economic development of Turkey. The agricultural sector for a long period of time has been subjected to direct and indirect government intervention. Various instruments of agricultural policy such us; output support prices, input subsidies, quotas, tariffs, credits, taxes, land distribution, extension services, etc. have been employed to achieve various objectives such as; reduction of income and price instability, stimulation of output and income, satisfaction of domestic demand, improving balance of payments, etc. An obvious implication of the multiplicity

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** The results presented in this paper are based on the agricultural sector model for Turkey developed jointly with P.L.Scandizzo and V.Le-Si of the World Bank. The research has been supported by the Rockefeller Foundation and the Agricultural and Rural Development Department of the World Bank. Of course they should not be held responsible for the views and interpretations expressed in this paper. The author is also grateful to Dr. T. Baysan, Dr. A.A. Gürkan, Dr. R. Burcroff, A. Sayer, and E. Çakmak for their contributions at various stages of this research.

of targets and instruments available to achieve them is the problem of choice between various instruments to reach certain targets and more important than that is the problem of conducting consistent agricultural policies. Because of the complexities of the substitution and complementary effects inherent in the target and instrument packages, the consequences of a given policy measure on various targets is not obvious a priori. The impact of several policy measures cannot be approximated just by adding up the impacts of such measures taken in isolation, and piece-meal analysis of agricultural policies can be quite misleading

The Agricultural Sector Model for Turkey (TASM) is developed to provide an internally consistent, quantitative framework of analysis to evaluate the effects of policy interventions. In this paper the resource allocations in Turkish agriculture, as a result of the shift of emphasis in Turkey's foreign trade regime in recent years towards "outward looking" and "liberalization" policies and the likelihood that Turkey may gain full membership in the EEC will be analyzed within the context of TASM.

II. THE BASIC STRUCTURE OF TASM

The model used to simulate the agricultural sector and the resource allocation effects of partially and completely liberalized foreign trade regime on agricultural production, consumption and trade patterns is a partial equilibrium, static, optimization model.

The objective function maximized in the model is the sum of the consumers' and producers' surplus, plus net export revenue, and minus the reservation wage of labor. Risk costs are included as part of the production costs. Given the structure of consumer demands, production activities and trade possibilities, optimality entails equating supply to domestic plus foreign demand and prices to marginal costs for all commodities, making provisions for risk and allowing for the reservation wages for labor, taking also into account of changes in income that any reallocation of resources implies and its effects on price responsive consumers' demand schedules.

The core of the model consists of the production activities and resource constraints. The input and output coefficients for single crop production and rotations are specified for each unit of land. In addition to land, other input requirements for production are labor, tractor, animal power, seed and capital. Animal power is supplied by livestock production activities, and seed is supplied by the crop production activities. Labor, tractor and animal powers are divided into four calendar quarters. The model is given a choice of two production techniques, animal or mechanized. It can assign any combination of weights to these two techniques to produce a single crop, depending on the optimal allocation of resources.

The livestock sub-sector works similar to the crop sub-sector. The explicit production cost for animal husbandry is labor. Other inputs required are cereals, straws and forage, which are by-products of crops; and concentrates which are derived from crops processed for human consumption. Pasture land is also required for animal grazing, with the exception of poultry to supplement livestock feeding. In addition meat, milk, hide, wool and eggs, the livestock production activities also provide animal power used in crop production activities.

The commodities produced by the production activities are then distributed between: (i) domestic demand generated through demand curves, (ii) demand for cereals used for feeding in the livestock sector, (iii) demand for seeds used in crop production activities, (iv) exports in raw form, (v) exports in processed form. On the supply side, besides the domestic production, some commodities are allowed to be imported at exogenous prices.

Since generally the data available are most reliable at the farmgate level, prices and some quantities used in the model are incorporated at this level. Import price is then CIF price plus the transportation and marketing margins, export price is FOB minus the margins, for all commodities in raw or processed forms. The domestic demand functions are also calculated at the farmgate level.

In addition to commodity balance equations, trade, production, area, etc. limit equations may be used for model validation, as market absorption constraints or for different policy experiments. The convexity constraints are used to ensure that at most two adjacent segments of the demand functions are selected by the model solution. The model also

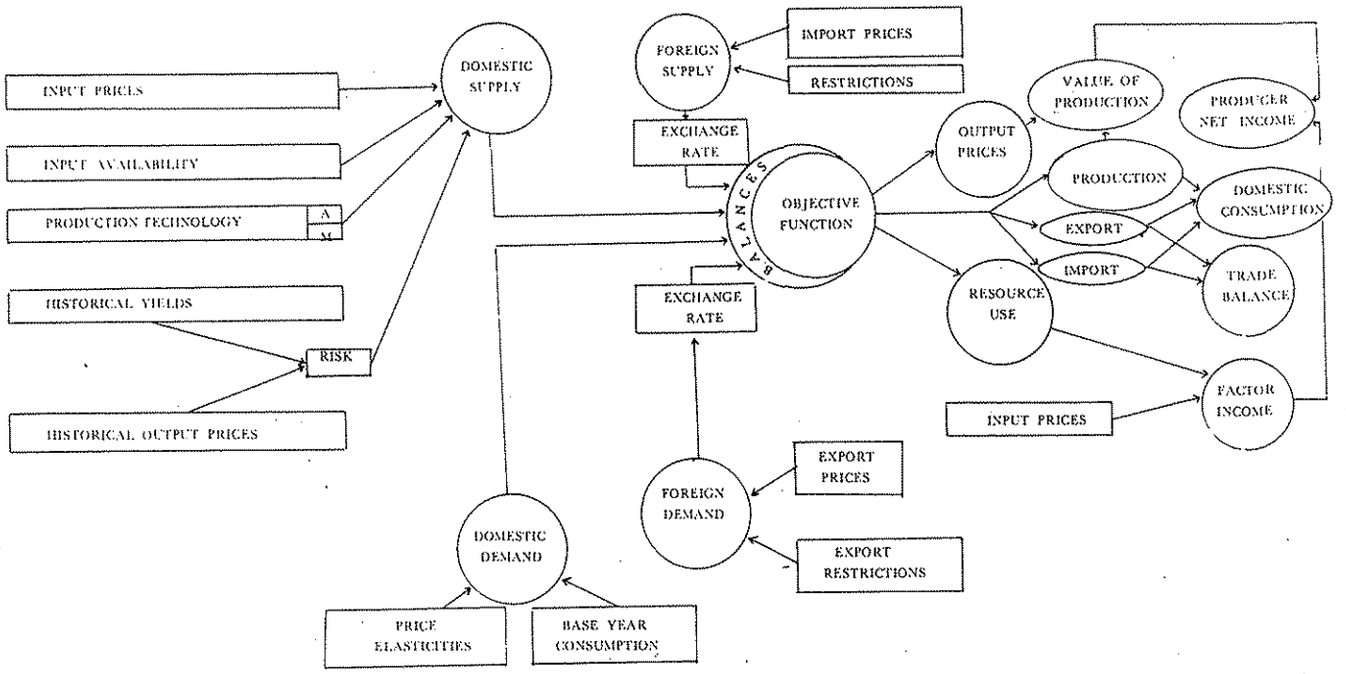
incorporates features such as (i) linearized demand functions, (ii) risk aversion, (iii) price-responsive input supply and (iv) income effects that improve its realism and bring its performance closer to a general equilibrium mode.

Various features of the model structure are presented in Schemas 1-4 and the algebraic statement of TASM are given in Equation sets (1)-(23) on the following pages.★

★ Further details on the model structure can be found in Le-Si, Scandizzo and Kasnakoğlu (1983) and Kasnakoğlu (1983).

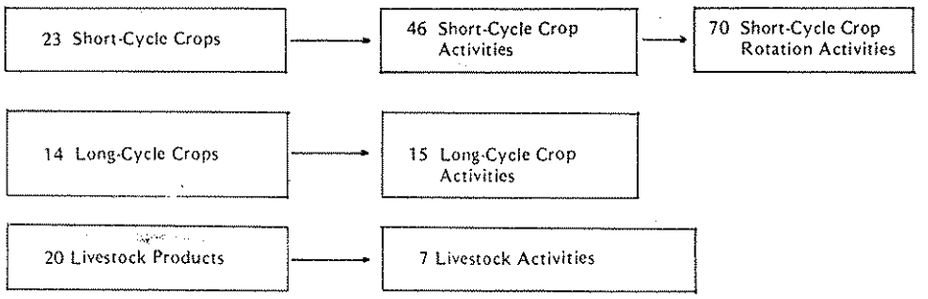
SCHEMA 1

BASIC STRUCTURE OF TASM



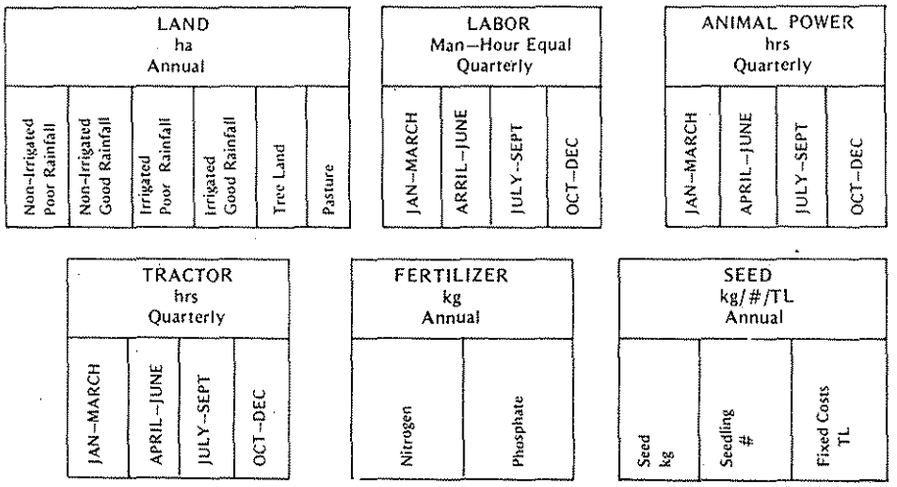
SCHEMA 2

PRODUCTION ACTIVITIES



SCHEMA 3

INPUT STRUCTURE OF TASM



SCHEMA 4

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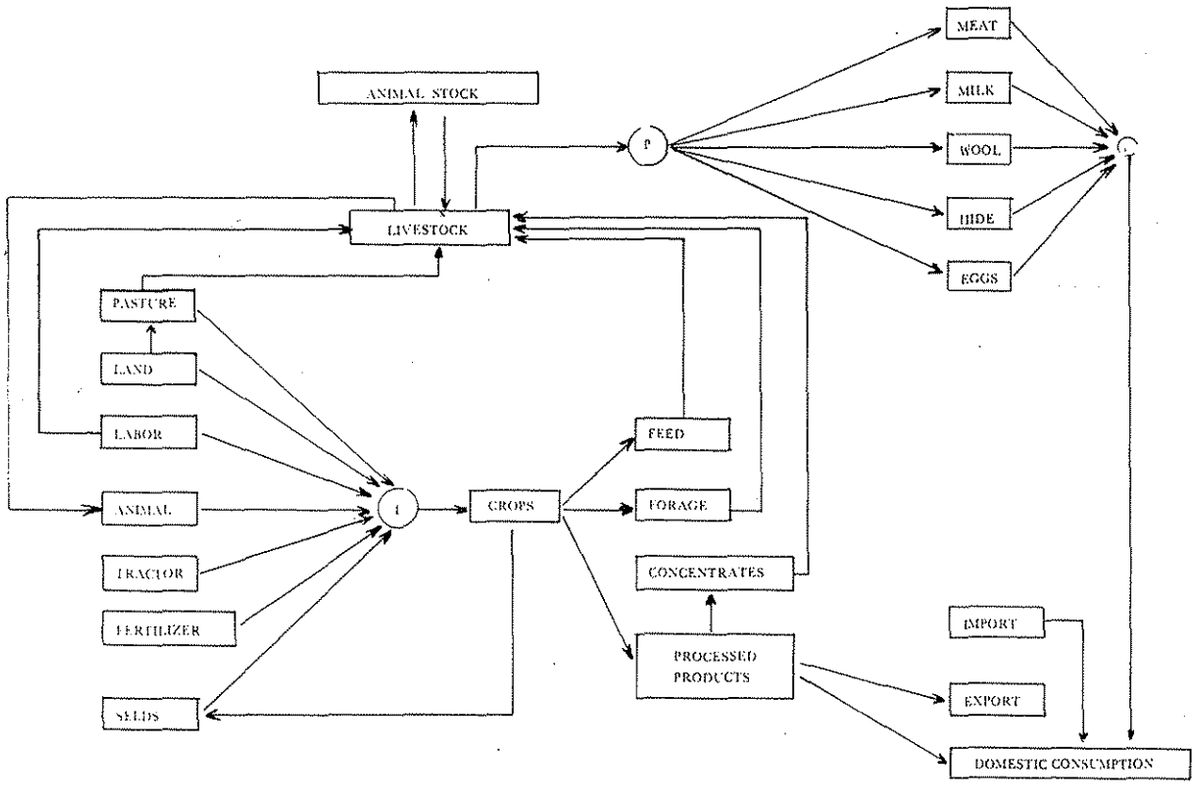

ALGEBRAIC STATEMENT OF THE MODEL

INDICES

s_1 Basic Land Types

Dry Poor Rainfall	Dry Good Rainfall
Irrigated Poor Rainfall	Irrigated Good Rainfall
Tree Area	Pasture

s_2 Land Types without Rainfall Distinction

Dry Either	Irrigated Either

l Labor (Divided into 4 quarters)

Labor 1Q	Labor 2Q
Labor 3Q	Labor 4Q

a Animal Power (Divided into 4 quarters)

Animal 1Q	Animal 2Q
Animal 3Q	Animal 4Q

m Tractor Power (Divided into 4 quarters)

Tractor 1Q	Tractor 2Q
Tractor 3Q	Tractor 4Q

f Fertilizer

Nitrogen	Phosphate

d Seeds

Wheat	Corn
Rye, Oats, Millet, etc.	Rice
Barley	Chick Pea
Dry Bean	Lentil
Potato	Onion
Green Pepper	Tomato
Cucumber	Sunflower
Groundnut	Cotton
Sugar Beet	Tobacco
Melon	Pistachio
Alfafa	Fodder

o Output

Wheat	Corn
Rye, Oats, Millet, etc.	Rice
Barley	Chick Pea
Dry Bean	Lentil
Potato	Onion
Green Pepper	Tomato
Cucumber	Sunflower
Olive	Groundnut
Cotton	Sugar Beet
Tobacco	Tea
Citrus	Grape
Apple	Peach
Apricot	Cherry
Wild Cherry	Melon
Strawberry	Banana
Quince	Pistachio
Hazelnut	Soybean
Sesame	
Sheep Meat	Sheep Milk
Sheep Wool	Sheep Hide
Goat Meat	Goat Milk
Goat Wool	Goat Hide
Angora Meat	Angora Milk
Angora Wool	Angora Hide
Beef	Cow Milk
Cow Hide	Buffalo Meat
Buffalo Milk	Buffalo Hide
Poultry Meat	Eggs

g Livestock Inputs from Crop By-Products*

F - Wheat	F - Corn
F - Rye	F - Rice
F - Barley	F - Pulses
F - Alfalfa	Fodder
F - Fodder	C - Wheat
C - Rye	C - Barley
C - Sugar Beet	

t Production Technique

Animal	Mechanized

* F Stands for straws and C stands for concentrates or pulps.

c Land Choices (Either poor or good rainfall)

Dry Poor Rainfall	Dry Good Rainfall
Irrigated Poor Rainfall	Irrigated Good rainfall

i Crop Production Activities

15 tree crops and 70 rotations

j Livestock Production Activities

Sheep	Goat
Angora	Cattle
Buffalo	Mules, Camels, Horses, etc.
Poultry	

y Year

1974 to 1979

n Segment

0 to 10

po Processed Products

Wheat Flour	Tomato Paste
Sunflower Oil	Olive Oil
Dry Tea	Raisin
Shelled Hazelnut	

e Production Cost Structure

Labor	Tractor
Fertilizer	Seed
Capitals	

e_1 As e less Labor

PARAMETERS (DATA)

P	Crop production coefficients
Q	Livestock production coefficients
Ioc	Land Matrix for undifferentiated rainfall
Pcost	Crop production costs
Qcost	Livestock production costs
Qq	Crop used for feed index (1 = yes, 0 = no)
Proctrade	Conversion factor for processed products
Qdem	Quantity under demand curves
Odem	Area under demand curves
Rdem	Gross revenue under demand curves
Concentrate	Concentrate coefficients derived from crop processing
Revcrop	Negative deviation for crop production activity
Revlive	Negative deviation for livestock production activity
Exprice	Export prices
Imprice	Import prices
Negdevobj	Risk costs
Ppprice	Processed product prices
Resav	Resource availability
Iel	Income elasticities
Basenetagr	Base year net agricultural income
Mu	Agricultural income multiplier
Sr	Savings rate
BaseGNP	Base year GNP
Basecons	Base year consumption

ACTIVITIES (VARIABLES)

CROPS	Crop production activities
PRODUCT	Livestock production activities
LANDC	Land choice between poor and good rainfall
PFERT	Fertilizer use
PRCOST	Production costs
TOTALPROD	Total production
TOTALCONS	Total consumption
IMPORT	Import
EXPORT	Export
PPTRADE	Processed product trade (both import and export)
DEMFCN	Demand function
TNEGDEV	T negative deviation counters
SUMNEGDEV	Sum of negative deviation z
DCONS	Change in consumption
CONS	Consumption
DAGRINCOME	Change in agricultural income
AGRINCOME	Agricultural inocme
DGNP	Change in GNP

Land Constraints

(1) $\sum_i \sum_t P_{s_1,i,t} * CROPS_{i,t} + \sum_j Q_{s_1,j} * PRODUCT_j + \sum_c Ioc_{s_1,c} * LANDC_c \leq Resav_{s_1}$ for all s_1

[Land use by crop and livestock production] [Undifferentiated* land use] [Land availability]

(2) $\sum_i \sum_t P_{s_2,i,t} * CROPS_{i,t} = \sum_c Ioc_{s_2,c} * LANDC$ for all s_2

[Undifferentiated* land use by crop production] [Total undifferentiated* land use]

Labor and Tractor Constraints

(3) $\sum_i \sum_t P_{l,i,t} * CROPS_{i,t} + \sum_j Q_{l,j} * PRODUCT_j \leq Resav_l$ for all l

[Labor use by crop and livestock production] [Labor availability]

Equation (3) with index m instead of l refers to tractor constraints.

Animal Constraints

(4) $\sum_i \sum_t P_{a,i,t} * CROPS_{i,t} \leq \sum_j Q_{a,j} * PRODUCT_j$ for all a

[Animal power required by crop production] [Animal power provided by livestock production]

* Undifferentiated land refers to poor and good rainfall land.

(5) $PRODUCT_j \leq Resav_j$ for all j

[Livestock production] [Animal inventory]

Fertilizer Accounting

(6) $\sum_i \sum_t P_{f,i,t} * CROPS_{i,t} = PFERT_f$ for all f

[Fertilizer used by crop production] [Total fertilizer use]

Production Costs

(7) $\sum_i \sum_t Pcost_{e,i,t} * CROPS_{i,t} + \sum_j Qcost_{e,j} * PRODUCT_j = PRCOST_e$ for all e

[Cost of production by crop and livestock] [Total production cost]

Production Balances

(8) $\sum_i \sum_t P_{o,i,t} * CROPS_{i,t} + \sum_j (1-Qq_o) * Q_{o,j} * PRODUCT_j = TOTALPROD_o$ for all o

[Products produced by crop and livestock production] [Total production]

Commodity Balances

(9) $TOTALPROD_o + IMPORT_o = TOTALCONS_o + \sum_j Qq_o * Q_{o,j} * PRODUCT_j + EXPORT_o + \sum_{po} (1/Proctrade_o) * PPTRADE_o$ for all o

[Total production] [Import] [Total consumption] [Crops used as livestock feed] [Export] [Trade of processed products]

Consumption Balances

(10) $TOTALCONS_o + \sum_{po} Impppind_{po,o} * PPTRADE_o \geq \sum_n Qdem_{o,n} * DEMFCN_{o,n}$ for all o

[Total consumption] [Import of processed products] [Quantity under the demand curves]

Feed Balances

(11) $\sum_i \sum_t P_{g,i,t} * CROPS_{i,t} + \sum_o Concentrate_{g,o} * TOTALCONS_o \geq \sum_j Q_{g,j} * PRODUCT_j$ for all g

[Feed produced by crop production] [Concentrates derived from human consumption] [Feed required by livestock]

Trade Limits

(12) $IMPORT_o \leq$ Historical Quantity

(13) $EXPORT_o \leq$ Historical Quantity

(14) $PPTRADE_{po} \leq$ Historical Quantity

Convexity Constraints

(15) $\sum_n DEMFCN_{o,n} \leq 1$ for all o

[Sum of all segments]

Risk Constraints

(16) $\sum_i \sum_t Revcrop_{y,i,t} * CROPS_{i,t} + \sum_j Revliv_{y,j} * PRODUCT_j + TNEGDEV_y \geq 0$ for all y

[Negative revenue from crop and livestock production] [T negative deviation counters]

(17) $\sum_{y} 2 * TNEGDEV_{y} = SUMNEGDEV$

[T negative deviation counters] [Sum of negative deviation z]

Objective Function

(18) $\sum_{o}\sum_{n} Odem_{o,n} * DEMFCN_{o,n} + \sum_{o} Exprice_{o} * EXPORT_{o} - \sum_{e} PRCOST_{e} - \sum_{o} Imprice_{o} * IMPORT_{o} -$

[Area under demand curves] [Export revenue] [Production costs] [Import costs]

$Negdevobj * SUMNEGDEV + \sum_{po} Ppprice_{po} * PPTRADE_{po}$

[Risk costs] [Net revenue from processed products trade]

FORMULATION OF DEMAND CURVE SHIFT

Convexity Constraints

(15') $\sum_{n} DEMFCN_{o,n} \leq 1.257 + Iel_{o} * (0.292 + DCONS)$ for all o

[Sum of all segments] [Shift due to income and consumption]

Agricultural Income

(19) $\sum_{o}\sum_{n} Rdem_{o,n} * DEMFCN_{o,n} = \sum_{e_1} PRCOST_{e_1} + 1000 * AGRINCOME$

[Gross revenue under demand curves] [Non-labor production costs] [Agricultural income]

Change in Agricultural Income

(20) AGRINCOME - DAGRINCOME = Basenetagr

[Agricultural income] [Change in agricultural income] [Base net agricultural income]

Marginal Agricultural Income

(21) (1 + Mu) * DAGRINCOME = DGNP

[Change in agricultural income [Change in GNP]

Change in Consumption

(22) [1 / (1 - Sr)] * CONS = BaseGNP + DGNP

[Consumption rate] [Base GNP] [Change in GNP]

Consumption Growth

(23) (1 / Basecons) * CONS = 1 + DCONS

[Consumption growth] [Change in consumption]

III. THE DATA

TASM is based on 15 types of orchards, 70 crop rotations and 7 livestock activities. Taking into arcount the two production techniques, namely mechanized and non-mechanized for crop production, the total number of production activities specified in the model in 176.

The data used in the model are gathered mainly from SIS, SPO, FAO, TOPRAKSU and WORLD BANK sources. The lack of Turkish statistics suitable for this kind of modelling exercises forced the researchers to piece together the required data from differenent sources, and in many cases to employ not yet published raw data. In what follows we briefly state the nature of the data employed in this paper★.

Crop Production Activities

In TASM there are 46 annual crop and 15 perennial crop activities★★. The input-output coefficients corresponding to these activities, with the exception of rice, hazelnuts, tea, soyabean and sesame for mechanized technology are based on the ongoing "Production Inputs and Costs of Agricultural Crops in Turkey" research conducted by TOPRAKSU. The data collected by TOPRAKSU using daily bookkeeping method is the most reliable data of its kind currently available in Turkey despite its limitations of coverage and biases towards mechanized technology. The non-mechanized activity coefficients are calculated using a conversion factor of 1/10 for tractor power and animal power, from the mechanized activity coefficients reported in TOPRAKSU data.

★ Further details on the data can be found in Le-Si, Scandizzo, Kasnakoğlu (1983) and Kasnakoğlu (1983).

★★ See the algebraic statement of TASM for the crops incorporated in TASM.

Crop Rotation Activities

70 crop rotations practiced or feasible in Turkey are generated from the 46 crop activities for each of the two technologies as linear combinations of the single crop activities. The introduction of rotation activities on the one hand frees TASM to some extent from the limitation of fixed production technology inherent in linear programming models and on the other hand makes possible the incorporation of agronomic constraints that cannot easily be specified by mathematical equations★.

Livestock Activities

The 7 livestock activities specified in TASM include sheep, ordinary goat, Angora goat, cattle (cow, oxen, bull, young cattle), buffalo, mule (horse, mule, donkey) and poultry (hens, cocks, turkey). On the input side, besides outputs and by-products from crop activities (feed grains, forage, fodder and concentrates), pasture land and labor are required. The output of the livestock activities include meat, milk, wool, hide and eggs in addition to animal power provided to crop production activities★★.

Inputs

Six groups of inputs (land, labor, animal power, tractor, fertilizer and seeds) are incorporated in TASM. Labor, animal power and

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★ For example certain crops like sugarbeet which cannot be planted on the same land continuosly can be introduced as rotation activities rather than single crop activities.

★★ See Le-Si, Scandizzo, Kasnakoğlu (1983) and Evans, Le-Si (1983) for an Alternative Livestock Version of TASM.

tractors are introduced on a quarterly basis. Land is classified in to 7 classes distinguishing between various combinations of irrigation and rainfall. The labor input is measured in man-hour equivalents and shows the actual time required for a given activity on the field. The tractor hours correspond to the usage of tractors in actual production and transportation related to these production activities. The two kinds of fertilizers, namely Nitrogen and Phosphate are measured in terms of nutrient contents. In the case of annual crops, amounts of seed or seedling requirements are introduced as production costs. For non-annual or perennial crops fixed investment costs are assigned instead.

Crop Yields

Output from crop production activities is divided into three: crop yield for human consumption, feed yield for animal consumption and forage yield or crop by-product for animal consumption. In addition concentrates are derived from the processing of raw materials for human consumption. The forage yield is imputed using(feed yield/total yield) and(forage yield/total yield)ratios. The historical yields for tree crops and vegetable crops are also imputed, since they are given per tree in the case of the former and for aggregate of vegetables in the case of the latter.

Livestock Yields

The outputs of the livestock activities include animal power, meat, milk, wool, hides and eggs. The animal power is estimated using the ratios of cattle, buffale and mules employed as draft animals and assuming 500 working hours per year per pair. The meat yields for all

animals and milk yields for cattle and buffalo are from the Wolrd Bank's Agricultural Sector Study Mission estimates. The remaining milk, wool and egg yields are based on SIS statistics. The hide yields are obtained by converting numbers of hides to kg using conversion factors 2.6 for sheep and goat and 20.5 for cattle and buffalo.

Output and Input Prices

Output prices used in TASM are farmgate prices, and are based on SIS figures. The costs of labor, tractor, fertilizer, seed for annual crops and fixed capital for perennial crops are based on TOPRAKSU estimates.

Resource Availability

The labor resource availability for the base year is computed by converting the agricultural labor force in 1979 to man-hour equivalents with the assumption that there are 294 working days in a year and 5 working hours' in a day. Available tractor hours for 1979 are calculated by assuming 300 working days and 5 working hours a day for each tractor, and multiplying these with the number of tractors in 1979. The livestock inventory is based on the numbers of livestocks in 1979. The land resource availabilities by types of land are pieced together from TOP-RAKSU data which distinguishes between irrigated and rainfed land but not by rainfall and SIS data which distinguishes land by rainfall but not by irrigation. The tree stock in 1979 covers the area under both bearing and non-bearing trees.

Processing Factors, Costs and Concentrate Coefficients

Wheat, corn, rye, rice, sunflower, olive, soybean, sesame, sugarbeet and tea are processed for consumption, and concentrates are obtained as a by-product of this processing for animal consumption. The processing costs are computed using the following formula, with the assumption that the profit margin in processing is 20 % for all crops:

Processing Cost = [(Export Price in Processed Form)-(Export Price in Raw Form)] ★ (0.80) (Processing Factor).

Crop and Livestock Production

The crop and livestock production data used in TASM validation are taken mainly from official statistic reported by SIS. However, production data for wheat, dry beans, barley, corn and rye-oat-millet were deflated and those for lentils and chick peas were inflated slightly due to biases discovered in these statistics, when compared to the results of various other studies and censuses. For meat and milk output of the livestock activities, estimated figures are based on SPO figures rather than underestimated SIS figures, which cover only meat produced from animals processed in municipal slaughterhouses, are employed★.

Foreign Trade

The data related to foreign trade involves trade and prices in unprocessed as well as processed products. The quantity of exports and imports of unprocessed products, with the exception of wheat, chich pea, lentil, rye-oats-millet and meat are based on official statistics. The

★ A more detailed discussion on the nature of biases in SIS data and methods of adjusting employed can be found in Le-Si, Scandizzo, Kasnakoğlu (1983) and Kasnakoğlu (1983).

trade prices are FOB and CIF at farmgate, adjusted for marketing and transportation costs·Foreign trade is allowed for the following processed products; wheat flour, tomato paste, sunflower oil, olive oil, dry tea, raisins and shelled hazelnuts.

Consumption and Demand

The domestic consumption is defined as: Production + Imports - Exports - Feed ± Change in Stocks. Wheat, corn, rye, paddy, sunflower, olive, soyabean, sesame, sugarbeet and tea are processed for human consumption. The demand functions relate observed consumption quantities to observed prices net of processing costs. The price elasticities are calculated from FAO income elasticities using the Frisch Method.

IV. MODEL VALIDATION

Before the model can be used to simulate the effects of policy interventions and projections into the future, it has to be validated Although there are no rules for accepting or rejecting a model of the type used in this study, the most common procedure is to estimate the model for a base year and compare the simulated results on important variables with observed values in the base year. In this study, the validation of the model is based on the comparisons of production, consumption, trade, factor use and prices simulated by the model with those observed in 1979.

The model for the base period is solved with two exchange rates: US $ 1 = 35 TL and US $ 1 = 47 TL, which were the prevailing foreign exchange rates during the calendar year 1979. The base year model is as specified in the algebraic statement of TASM in equation sets (1)-(18). In addition, in order to reflect the trade constraints imposed by import quotas, export licensing and foreign exchange management, imports and exports of all commodities are restricted to actual quantities traded in 1979 (Equation sets 12-14).

Production, Prices and Gross Value of Production

The observed and simulated productions, prices and gross values of production are presented in Tables 1 and 2 for the two exchange rates.

The simulated productions tend to slightly over-predict in most crops and under-predict in meat, milk and wool. With the exception of rice and Angora goat however,simulated quantities are within the 25 %

TABLE 1

OBSERVED AND SIMULATED

PRODUCTIONS AND PRICES IN THE BASE YEAR

	PRODUCTION (1000 MT)			PRICES (US$/MT)			
		US $ 1 = 35 TL	US $ 1 = 47 TL	——TL35 = US$1——		——TL47 = US$1——	
	Observed 1979	Simulated 1979	Simulated 1979	Observed 1979	Simulated 1979	Observed 1979	Simulated 1979
Wheat	13,205	12,371.5	13,373.2	150.86	125.60	112.34	109.81
Corn	1,242	1,242.2	1,233.8	168.86	121.52	125.75	96.69
Rye, etc.	807	697.1	722.4	120.86	127.92	90.00	112.02
Rice	225	278.5	269.6	540.57	216.01	402.55	173.48
Barley	5,000	4,227.2	4,389.9	136.57	88.77	101.70	47.80
Chick Pea	285	328.4	328.4	648.86	389.35	483.19	313.00
Dry Bean	69	75.1	71.6	1,107.43	505.41	824.68	410.68
Lentil	285	320.9	320.9	550.57	358.67	410.00	299.23
Potato	2,870	3,121.4	3,121.4	296.00	152.28	220.43	119.48
Onion	1,000	1,108.2	1,076.8	204.86	93.45	152.55	71.97
Green Pepper	545	590.3	590.3	315.14	175.19	234.68	135.04
Tomato	3,500	3,896.3	3,896.3	236.29	93.75	175.96	72.91
Cucumber	500	558.6	558.6	297.43	120.36	221.49	93.73
Sunflower	590	644.2	610.0	334.86	215.92	249.36	173.43
Olive	430	436.7	436.7	801.14	639.94	596.60	496.79
Groundnut	57.5	61.9	61.9	809.43	620.24	602.77	489.62
Cotton	476.2	451.5	448.9	1,417.43	1,686.74	1,055.53	1,371.80
Sugar Beet	8,760	8,768.2	9,055.6	31.71	35.90	23.62	28.81
Tobacco	206.4	209.7	209.7	1,748.00	1,642.30	1,301.70	1,276.39
Tea	555	623.3	623.3	414.29	271.72	308.51	202.61
Citrus	1,147	1,271.1	1,271.1	287.14	103.09	213.83	77.79
Grape	3,500	3,682.9	3,682.9	544.00	265.60	405.11	207.22
Apple	1,350	1,431.3	1,431.3	388.57	188.21	289.36	148.20
Peach	220	239.0	239.0	540.47	187.85	402.55	143.36
Apricot	110	114.0	114.0	434.29	288.46	323.40	228.86
Cherry	92	95.3	93.0	494.57	400.48	368.30	312.52
Wild Cherry	50	50.6	49.3	448.00	438.29	333.62	345.05
Melon	5,220	5,829 0	5,829.0	242.00	82.53	180.21	64.06
Strawberry	22	23.3	23.3	1,514.29	764.68	1,127.66	572.75
Banana	23.3	25.3	25.3	2,305.43	766.41	1,716.81	574.16
Quince	45	48.9	48.9	412.29	158.61	307.02	123.84
Pistachio	20	19.2	19.2	3,186.29	3,529.84	2,372.77	2,654.63
Hazelnut	300	300.6	300.6	1,128.29	1,035.42	840.21	778.63
Soybean	3.3	3.2	3.0	295.43	280.97	220.00	229.00
Sesame	26	30.9	30.9	2,094.57	795.42	1,559.79	637.67
Sheep Meat	338	338.0	338.0	1,625.71	1,056.71	1,210.64	786.92
Sheep Milk	1,102.2	1,105.5	1,105.5	508.86	513.94	378.49	382.72
Sheep Wool	59.3	59.4	59.4	4,842.29	4,890.68	3,605.96	4,315.80
Sheep Hide	16.2	18.0	18.0	1,714.86	1,114.66	1,277.02	830.06
Goat Meat	103.5	103.5	103.5	1,293.14	1,306.07	962.98	972.61
Goat Milk	571.1	579.0	579.0	357.14	360.71	265.96	268.62
Goat Wool	9.2	9.1	9.1	2,836.57	2,354.35	2,112.34	1,753.24
Goat Hide	3.8	4.2	4.2	1,714.86	1,114.66	1,277.02	830.06
Angora Meat	6.5	5.1	4.7	1,354.29	1,855.37	1,008.51	1,563.19
Angora Milk	54.9	42.9	40.0	357.14	617.86	265.96	507.98
Angora Wool	5.8	4.5	4.2	7,681.14	5,768.34	5,720.00	6,082.26
Angora Hide	0.3	0.3	0.2	1,714.86	2,349.37	1,277.02	1,979.38
Beef	391	391.0	391.0	1,775.14	1,792.89	1,321.92	1,335.13
Cow Milk	3,386.4	3,385.8	3,385.8	408.57	412.66	304.26	307.30
Cattle Hide	51.6	51.4	51.4	75.43	76.18	56.17	56.73
Buffalo Meat	34	34.0	34.0	1,727.43	1,433.77	1,286.38	1,140.00
Buffalo Milk	296.6	296.6	296.6	366.00	369.66	272.55	275.28
Buffalo Hide	2.7	3.1	3.1	75.43	35.45	56.17	26.40
Poultry Meat	132	132.0	132.0	4,614.29	2,999.29	3,436.17	2,233.51
Eggs	4,322.7	4,501.1	4,501.1	94.29	95.23	70.21	70.92

TABLE 2

OBSERVED AND SIMULATED

GROSS VALUE OF PRODUCTION (million US $)

IN THE BASE YEAR

	TL35		TL47	
	Actual	Simulated	Actual	Simulated
Grains	3,104	2,888	2,311	2,277
of which: Wheat	1,992	1,866	1,483	1,502
Others	1,112	1,022	828	775
Pulses	418	473	311	349
Vegetables	3,465	3,834	2,580	2,851
Fruits and Nuts	3,500	3,687	2,607	2,745
Oil Crops	644	681	480	499
Industrial Crops	1,543	1,543	1,149	1,153
Livestock Products	5,135	5,143	3,824	3,827
$\Sigma P_o Q_o$	17,809		13,262	
$\Sigma P_o Q$	18,249		13,701	
$\Sigma P Q_o$	12,770		9,937	
$\Sigma P Q$	12,873		10, 27	

Note: P_o and Q_o are observed prices and quantities. P and Q are model generated.

range of the observed quantities. To test the results of TASM with respect to production, we use the following regression test: $\log Q_E^S = a + b \log Q^o$, where Q_E^S is the simulated production at exchange rate E, Q^o is the observed production, and a and b are the parameters to be estimated by regression. If apart from random error, the model perfectly simulated the production levels, the intercept a and the slope b should not differ from zero and unity respectively.★ The regression results presented below indicate that for both exchange rates, the R^2's are over 0.95 and a and b do not significantly differ from 0 and 1 respectively, at the 95 percent level of signifance.

$$\log Q_{35}^S = 0.05 + 0.975 \log Q^o \; ; \; R^2 = 0.99$$
$$\log Q_{47}^S = -0.03 + 1.016 \log Q^o \; ; \; R^2 = 0.998$$

The results of simulated prices, which reflect the marginal costs of production are much less satisfactory than those for production. The simulated prices are in general below the observed prices for crops and above the observed prices for livestocks. While the shadow prices of cereals and some livestock products are fairly close to their observed levels, the vegetable and fruit prices are underestimated and prices of sheep wool, Angora hide, cow milk and cow hide are overestimated. A regression test for prices, similar to that for production is performed:

$$\log P_{35}^S = -0.2 + 1.04 \log P_{35}^o \; ; \; R^2 = 0.83$$
$$\log P_{47}^S = -0.2 + 1.04 \log P_{47}^o \; ; \; R^2 = 0.88$$

The test results suggest that the simulated prices on the overall don't significantly deviate from the observed prices, at the 95 % level.

★ The log transformation is used to abstract the b coefficient (through not the constant) from the scale and unit differences among the crops.

Moreover, the simulated price deviations from the observed prices is less serious in relative prices than in absolute prices, as suggested by the values of a and b* .

The underestimation in prices and overestimation in production affect the gross value of production in the opposite directions,Table 2 shows the overall indices of quantity and prices and their effects on the gross value of agricultural production, for the two exchange rates. The gross value of production simulated at the observed prices is overestimated by 2.5 % and 3.3 % in the cases of the two exchange rates. On the otherhand due to low shadow prices, the simulated gross value of production at shadow prices is underestimated by 28 % and 24 % for the two exchange rates.

Consumption and Trade

The simulated levels of domestic consumption which is computed as the residual of domestic production and foreign trade compare very well to the observed levels. The predicted domestic consumption levels are within the range of plus or minus 12 % of their observed levels (with the exceptions of sheep mutton and Angora milk), with more commodities over-predicted as in production than under-predicted. As expected the degree of over-prediction decreases as the rate of exchange of TL decreases.

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* Further discussions on the reasons for underestimation in prices and its implication can be found in Kasnakoğlu (1983).

In the base year solution, the model is restricted in foreign trade with the realized exports and imports in 1979. With the exception of wheat, rice, sheep wool, goat wool, beef, bowine meat, poultry meat and wheat flour, the model hits the upper bounds in both exchange rates. In the cases of wheat, wheat flour and sheep wool upper bounds are reached at the exchange rate $ 1 = 47 TL. The model contrary to the base year does not import rice and goat wool, and does not export poultry meat at the two exchange rates. Finally sheep wool is imported below the bound at $ 1 = 47 TL and at the bound at $ 1 = 35 TL.

Resource Use

Table 3 compares resources used in the model with observed resource use or availability in 1979. The simulated area sown, fallow area and hence total cultivated area for both exchange rates are substantially below the officially reported areas. This is basically due to the overestimation in wheat area and production in official statistics. In this study, as mentioned in Part III, wheat production and area have been revised down by about 25 % from official statistics, which in turn would also reduce the fallow area. With this adjustment 1979 figures for area sown, fallow and total cultivated areas would fall down to approximately 14.6, 5.4 and 20 million hectars. Comparing simulated results with the above revised stocks, the model's performance is satisfactory. The irrigated land as expected is the only binding resource in the model.

Labor which is measured in terms of adult male equivalents is underestimated in the model by about 20%. This result is basically due to the model's definition of labor as actual time spent in production,

TABLE 3

OBSERVED AND SIMULATED

RESOURCE USES IN 1979

Resource		Unit	1979 Stocks	1979 Simulated $1 =35 TL	1979 Simulated $1 =47 TL.
Land(★)	Area Sown	.000 ha	16,605	12,007	12,586
	Fallow	"	8,796	5,946	6,426
	Total Cult.Area	"	25,401	17,953	19,012
	Irrigated Area	"	2,794	2,794	2,794
	Tree Area	"	2,749	2,280	2,279
	Pasture	"	21,746	19,795	20,377
Labor(★★)	Quarter 1	.000 hrs	3,088,451	1,237,917	1,256,423
	" 2	"	"	2,000,955	2,033,635
	" 3	"	"	2,469,856	2,527,650
	" 4	"	"	1,594,002	1,609,331
	Total Labor	.000 pers.	6,863	5,489	5,617
Tractor(★★★)	Quarter 1	.000 hrs	165,188	5,314	5,486
	" 2	"	"	27,455	23,897
	" 3	"	"	21,854	19,703
	" 4	"	"	19,987	18,159
	Total Tractors	Number	440,502	73,213	63,725
Fert.	Nitrogen	MT of Nutrients	778,938	763,631	792,013
	Phosphate		659,781	781,338	816,692

Notes: (★) SIS or TOPRAKSU statistics

(★★) Total labor is calculated in terms of adult male equivalents of 1800 hours per year, from the number of hours worked during peak season.

(★★★) Total tractor figures are calculated at 1500 hours per year from the number of hours worked during peak season.

as compared to the official statistics' definition which assume that the entire rural population is participating in agricultural production. Furthermore, the model points to the seasonality of underemployment in agriculture. Unemployment of 20 % during the second and third quarters which involve the labor intensive activities, increases to 40 % during the first and fourth quarters will involve very little field work in most crops.

The tractor requirement calculated from the model is well below the full employment level. This again is partly due to the inclusion of only tractor hours required for activities directly related to field work in the model. However this cannot fully justify an unemployment rate of around 80 % for tractors. The model's deviation in tractor use may be due partly to incorrect assumptions about the tractor costs, wage rates or the animal power-tractor power conversion coefficients employed. The sensitivity tests performed for the reasonable ranges of these parameters, do not fully alleviate the unemployment in tractors★.

The fertilizer requirements simulated from the model are within the ranges of 5 % and 20 % in the cases of nitrogen and phosphate respectively, of their actual use in 1979.

An Overall Evaluation

On the overall the validations performed on the above variables (production, consumption, prices, foreign trade and resource use) and variables other than these (rotations, land use by crops, yields) which

★ For results of the sensitivity tests, see Kasnakoğlu (1983).

are not presented here, with the exception of simulated production technology which is biased against mechanized technology, can be considered as satisfactory★. Therefore the model in its present structure can be employed to simulate the resource allocation effects of policy changes in directions and relative terms if not in absolute terms.

★ Validations on variables not given here can be found in Kasnakoğlu (1983).

V. ALTERNATIVE TRADE POLICY SIMULATIONS

To examine empirically the likely resource reallocation effects of partially and completely liberalized foreign trade regimes for the Turkish economy the following simulations are conducted with TASM★:

POLICY I Imports and exports of commodities are restricted to those actually traded in 1979, but the historical trade limits (equations 12-14) are removed from the model.

POLICY II Same as POLICY I except to account for physical limitations and other considerations, production is allowed to move only within the range of 50 % to 200 % of the observed levels and areas under tree crops cannot move beyond plus or minus 25 % of the base solution areas.

POLICY III Same POLICY II except import possibilities are opened in most of the commodities.

POLICY IV Same as POLICY III, with quantity restrictions imposed on exported commodities (equations 13-14 are inserted back) to represent the absorption capacity of foreign markets for Turkish products. In addition, for wheat and barley, it is assumed that marginal export revenues decline sharply after a certain quantity has been reached.

★ For a detailed discussion on the similarities of Turkey's entry into EEC and a unilateral move towards free trade see Baysan (1974; Chapter 1) and Baysan (1983).

The results of the policy simulations are summarized in Tables 4-11. Tables 4 and 5 show the percentage changes in production and consumption of individual crops and livestock products from their base solution values, and presents net trades in these activities as ratios of their net trades in the base solution, for the two exchange rates. Tables 6 and 7 summarize the production effects of the four policies, by categorizing the activities by the directions and magnitudes of the changes in their production from the base year for easier evaluation. Similarly Tables 8 and 9 classify the crops and livestock products by the directions and magnitudes of changes in their foreign trades. Finally, Tables 10 and 11 further summarize the production, consumption and trade affects of policies II-IV by considering aggregated crop groups (grains, pulses, vegetables, fruits and nuts, industrial crops) and livestock products and show the effects of these policies on total values of agricultural production, consumption and net trade. Based on the results presented in these tables one can make the following observations :

Grains : Grains which include *wheat, corn, rye, rice* and *barley* on the overall show a considerable expansion in production and net trade as a result of the lifting of trade restrictions, except in Policy I where specialization is permitted as no quantity restrictions are imposed on area. The values of grain production increase by 16-27 % compared to their base values in Policies II-IV under both exchange rates. The devaluation of TL does not seem to have a significant effect on grain production. The net trades in grains under liberalized trade conditions range between 5-11 times their base values. The devaluation of TL slows down the overall expansion in grain foreign trade. On the overall domestic

grain consumption suffers a slight loss, ranging between 0.7 - 4 % due to the expansion in exports. The loss in consumption as expected is slightly higher when TL is devaluated, as domestic consumption competes with exports. The domestic grain consumption registers a gain when exports are restricted in Policy IV for US $ 1 = 35 TL and a negl gible loss for US $ 1 = 47 TL.

As far as individual crops are concerned, compared to their base solution quantities expansions in production are highest for rye and barley followed by wheat. Corn and rice productions don't expand or contract with liberalized trade conditions. Corn production registers a slight expansion, when exports are restricted in Policy IV for the devaluated TL case. While exports of barley show substantial and consistent expansions in Policies II-IV for both exchange rates, wheat exports either contract or expand slightly. Rye exports expand significantly, except in Policy III for the US $ 1 = 35 TL, where exports contract due to contraction in rye output. Corn and rice are not traded under any of the policy simulations.

Pulses : Pulses which include *chick peas, dry beans* and *lentil* on the overall show the largest expansion in production as a result of lifting trade restrictions. The expansion in the value of production ranges between 59-78 % showing a very similar pattern in the cases of the two exchange rates. Domestic consumption suffers on the overall 0.5-13 % due to expansion in exports. Contraction in consumption is relatively larger in the cases of chick peas and dry beans than lentil. Exports of pulses under free trade conditions is 4-6 times the exports in the base year, with dry beans registering the largest expansion and lentil the lowest.

Vegetables : Vegetables which include *potato, onion, green pepper, tomato, cucumber* and *melon*, on the overall show time largest export expansion and as a result the second largest value of production expansion in Policies I-III where no quantity restrictions on exports are impossed. Value of vegetable production increases by 48-74 % in Policies II and III and 7 % in Policy IV, with larger increases registered at US $ 1 = 47 TL since production expansions are export oriented. Value of exports in vegetables show substantial gains ranging from 15-85 times in various policy simulations. Consumption shows a slight contraction in Policies I-III, and a slight expansion in Policy IV. As far as individual crops within this group are concerned, except cucumber which was treated as non-tradeble in this model, all the vegetables show an expansion in production, with green pepper and melon leading, followed by onion, tomato and potato which compete for the same limited irrigated area. Largest consumption losses are registered by green peppers. Green pepper leads the vegetables in export expansion, followed by potato as a result of liberalized trade conditions. In Policy IV all the vegetables except cucumber show expansions in their exports over the base year. Furthermore, tomato exports in raw form are replaced by expanding tomato exports in the form of tomato paste, with reduced trade restrictions.

Fruits and Nuts : Fruits which include *citrus, grape, apple, peach, apricot, cherry, wild cherry, strawberry, banana, quince* and nuts which include *pistachio* and *hazelnut* like grains, pulses and vegetables show on the overall expansion in production ranging between 10-24 %, contraction in consumption ranging between 0.3-3.3 % led by expanding exports to 4-6 times the base exports in the liberalized trade simulations

for the two exchange rates. The largest gains in production and trade are registered in citrus, apple, peach, quince, strawberry, grape, hazelnut and pistachio. In the export market, shelled hazelnuts replace un-shelled hazelnuts and raisins replace fresh grapes. The productions of cherry, wild cherry and banana which are treated as non-tradebles in the model and apricot show either no change or slight contraction in production.

Oil Crops : Oil crops which include *sunflower, olive, groundnut, soyabean* and *sesame* show a sharp drop in production when import restrictions are removed in Policies III and IV and appear as a net importing group. The decrease in the value of oil crop production ranges between 26-44 % for the exchange rate US $ 1 = 35 TL and between 15-16 % for the exchange rate US $ 1 = 47 TL. Furthermore in Policies III and IV oil crop consumption show an expansion in consumption, as contracting domestic production is more than offset by imports. The largest drop in domestic production is registered in groundnut and olive (25-54 %) and the smallest drop is registered in soyabean and sesame (5-6 %) in Policies III and IV under both exchange rates. Sunflower, which shows a sharp reduction in production due to the substitution of domestic production with cheaper imports at US $ 1 = 35 TL, on the otherhand, shows a slight expansion in production at US $ 1 = 47 TL, when sunflower imports contract, and domestic demand is to be met by domestic production. At US $ 1 = 35 TL while soyabean, sesame and sunflower oil remain as non-traded when import restrictions are reduced in Policies III and IV, olive and groundnut exports in the base year switch to imports, olive-oil exports contract to no trade and sunflower switches from no trade to imports. At US $ 1 = 47, while soyabean, sesame, sunflower oil and olive- oil remain as non-traded and groundnut is imported, sunflower imports cease and olive becomes

profitable as an export crop. Despite the contraction in domestic production and expansion in exports, domestic consumption in olive registers a gain in Policies III and IV due to contraction in olive oil exports, which more than offsets the production and trade effects of raw olive.

Industrial Crops : Industrial crops which include *cotton, sugarbeet, tobacco* and *tea* on the overall show a modest expansion in production and exports and a less modest contraction in domestic consumption at both exchange rates when compared with other crop groups, under liberalized trade conditions. Industrial crop production expands by 13-14 % when no export bounds are employed in Policies II and III and by 23 % when export bounds are enforced in Policy IV. The trade gains under all policy simulations range between 1-2 times the base solution values. Tobacco and tea account for the production and export expansion in this group. Cotton shows a contraction in production and exports although it remains as an export crop when import restrictions are removed in Policies II and III and shows an expansion in both production and exports when export bounds are introduced in Policy IV. Sugarbeet like cotton contracts in production and becomes an import crop unless export restrictions are introduced.

Livestock Products : Livestock products include *meat, milk, wool* and *hides* of *sheep, ordinary goat, angora goat, cow* and *buffalo, poultry meat* and *eggs*. Livestock products due to the animal stock constraint responds to changing trade conditions through domestic consumption and trade substitution rather than through production expansion or contraction. On the overall the change in the value of livestock products production is

within a range of 2 %. With the reductions in trade restrictions, both the domestic consumption and net trade of this group expand. Within this group, sheep mutton registers substantial expansion in production and exports over the base solution. The only other livestock product which shows any expansion in production is angora goat hide at the exchange rate of US $ 1 = 47 TL. The rest either don't change or contract slightly over their base year levels. In foreign trade, exports of all livestock meats expand and imports in sheep wool and angora goat wool increase under liberalized trade conditions.

Total Effects : When all crops and livestock products are taken together, agricultural production expands by 23-28 % as a result of the removal of historical trade limits in Policy II and opening of import possibilities for most of the commodities in Policy III Net trades in these policies expand by 5-6 times of their base solution levels. As expected domestic consumption suffers a slight loss (3-7 %) due to the expansion of exports in Policy II. The loss in consumption due to expanding exports are more than offset by the gain in consumption due to availability of imports in Policy III at exchange rate US $ 1 = 35 TL. At the exchange rate US $ 1 = 47 TL however, export effect is larger than the import effect thus resulting in a contraction in domestic consumption. When export bounds are imposed on most of the commodities to portray a more realistic picture of the world's absortion of Turkish products in Policy IV , the production and net trade expansions are slowed down to 9-10 % and 3-4 times respectively. Domestic consumption on the otherhand shows an improvement over the base year, gaining by 3 % for US $ 1 = 35 TL and 0.3 % for US $ 1 = 47 TL.

TABLE 4

CHANGES IN PRODUCTION, CONSUMPTION

AND TRADE UNDER ALTERNATIVE TRADE POLICIES

(US $ 1 = 35 TL.)

	POLICY I			POLICY II			POLICY III			POLICY IV		
	PROD.	CONS.	X-M	PROD.	CONS.	X-M	PROD.	CONS.	X-M	PROD.	CONS.	X-M
WHEAT	-10.3	-5.0	0.0	-0.5	-0.5	1.0	-0.8	-0.5	0.9	2.8	2.3	1.1
CORN	-10.3	-10.6	-	-0.3	0.0	-	-0.5	0.0	-	1.3	0.0	-
RYE	6.9	-9.6	486.0	7.3	-0.5	6.4	-2.3	-0.8	0.0	83.9	2.3	57.7
RICE	-6.4	-6.4	-	-3.2	-3.2	-	-3.2	-3.2	-	0.0	0.0	-
BARLEY	-10.2	-10.8	0.0	136.6	-10.8	11816.8	136.6	-10.8	11840.8	0.2	-2.5	5000.0
CHICKPEA	1596.7	-9.8	106.6	73.6	-9.8	6.4	73.6	-9.8	6.4	60.9	0.0	5.0
DRYBEAN	388.6	-9.4	997.2	83.8	-9.4	234.2	83.8	-9.4	234.2	83.8	-9.4	234.2
LENTIL	-37.1	-5.2	0.0	77.6	0.0	3.3	77.6	0.0	3.3	47.7	5.2	2.3
POTATO	-3.7	-3.3	0.0	83.9	0.0	204.0	83.9	0.0	204.0	7.6	0.0	19.4
ONION	210.9	0.0	31.5	-9.8	-3.0	0.0	-9.8	-3.0	0.0	15.7	0.0	3.3
GRPEPPER	773.8	-18.8	11698.3	84.7	-18.8	1528.2	84.7	-18.8	1528.2	42.3	0.0	625.0
TOMATO	-6.0	-3.1	0.0	79.7	-3.0	0.0	79.7	-3.0	0.0	9.8	0.0	9.8
CUCUMBER	-12.2	-12.2	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-
SUNFLOWER	-10.6	-10.6	-	0.0	0.0	-	-28.7	0.0	0→M	-54.2	0.0	0→M
OLIVE	-100.0	-100.0	0.0	6.9	0.0	34.0	-25.0	16.1	X→M	-25.0	16.1	X→M
GROUNDNUT	-22.1	-20.4	0.0	85.8	-5.1	41.1	-53.6	5.1	X→M	-53.6	5.1	X→M
COTTON	-49.5	-24.3	0.0	-33.9	-0.9	0.0	-26.6	-0.9	0.2	10.4	-0.9	1.3
SUGARBEET	-10.0	-10.0	-	-0.5	-0.5	-	-16.1	-0.9	0→M	2.3	2.3	-
TOBACCO	-40.2	-10.6	0.0	96.9	-5.3	4.0	96.9	-5.3	4.0	62.2	0.9	2.9
TEA	-35.1	-31.9	-	25.0	-15.9	-	25.0	-15.9	-	25.0	-15.9	-
CITRUS	2965.0	-3.2	287.9	25.0	-3.2	3.7	25.0	-3.2	3.7	25.0	-3.2	3.7
GRAPE	-16.5	-8.9	0.0	25.0	0.0	0.0	25.0	0.0	0.0	3.8	0.0	6.2
APPLE	-11.4	-9.5	0.0	25.0	0.0	13.1	25.0	0.0	13.1	11.9	0.0	6.7
PEACH	-5.0	-4.6	0.0	23.1	0.0	62.4	23.1	0.0	62.4	23.1	0.0	62.4
APRICOT	-12.2	-12.2	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-
CHERRY	-12.1	-12.1	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-
WILDCHERRY	-15.0	-15.0	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-
MELON	-3.4	-3.1	0.0	13.5	0.0	3408	42.4	0.0	107.6	0.5	0.0	2.2
STRAWBERRY	-2.6	-2.4	0.0	18.3	0.0	43.1	18.3	0.0	43.1	18.3	0.0	43.1
BANANA	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-
QUINCE	-9.5	-9.3	0.0	25.0	0.0	128.0	25.0	0.0	128.0	25.0	0.0	128.0
PISTACHIO	-100.0	-100.0	0.0	25.0	0.0	9.1	25.0	0.0	9.1	25.0	0.0	9.1
HAZELNUT	-100.0	-100.0	0.0	25.0	-7.0	0.0	25.0	-7.0	0.0	25.0	-7.0	0.0
SOYABEAN	-17.0	-17.0	-	-5.7	-5.7	-	-5.7	-5.7	-	0.0	0.0	-
SESAME	-9.2	-9.2	-	-4.6	-4.6	-	0.0	0.0	-	0.0	0.0	-
WHEATFLOUR			-			-			-			-
TOMATPASTE			0.0			35.1			35.1			1.7
SUNF-OIL			-			-			-			-
OLIVE-OIL			0.0			0.0			0.0			0.0
DRY-TEA			0.0			9.4			9.4			9.4
RAISIN			0.0			4.1			4.1			1.3
SH-HAZELNT			0.0			1.3			1.3			1.3

TABLE 4

(cont.)

	POLICY I			POLICY II			POLICY III			POLICY IV		
	PROD.	CONS.	X-M	PROD.	CONS.	X-M	PROD.	CONS.	X-M	PROD.	CONS.	X-M
S.MUTTON	0.0	-26.0	2.4	0.0	-26.0	4.0	0.0	-26.0	4.0	0.0	-26.0	-4.0
S- MILK	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-
S- WOOL	0.0	1.5	-1.2	0.0	1.5	-1.2	0.0	1.5	-1.2	0.0	1.5	-1.2
S- HIDE	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-
G- MEAT	0.0	-32.0	12.5	0.0	-32.0	12.5	0.0	-32.0	12.5	0.0	-32.0	12.5
G- MILK	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-
G- WOOL	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-
G- HIDE	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-
A- MEAT	-10.8	-12.0	1.3	0.0	-12.0	3.9	-11.1	-12.0	1.3	-11.1	-12.0	1.3
A- MILK	-10.2	-10.3	-	0.0	0.0	-	-10.4	-10.5	-	-10.4	-10.5	-
A- WOOL	-9.8	-10.3	-	0.0	0.0	-	-10.4	3.4	0→M	-10.0	3.4	0→M
A- HIDE	-22.9	-10.4	-	0.0	0.0	-	-23.0	-10.5	-	-23.0	-10.5	-
BEEF	-14.0	-14.0	-	0.0	0.0	-	0.0	-7.0	0→X	0.0	-7.0	0→X
COW-MILK	-14.0	-14.0	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-
C-HIDE	-14.0	-14.0	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-
B-MEAT	0.0	0.0	-	0.0	0.0	-	0.0	-13.4	0→X	0.0	-13.4	0 → X
B-MILK	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-
B- HIDE	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-
P- MEAT	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-
EGGS	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-

Notes: Production and Consumption are percentage changes from the base solutin. Trade is the ratio to the base solution.

(-) No Trade in the base and in the simulation

(0→M) No Trade in the base, Import in the simulation

(0→X) No Trade in the base,Export in the simulation

(M→X) Import in the base, Export in the simulation

(X→M) Export in the base, Import in the simulation

TABLE 5

CHANGES IN PRODUCTION , CONSUMPTION

AND TRADE UNDER ALTERNATIVE TRADE POLICIES

(US $ 1 = 47 TL)

	POLICY I			POLICY II			POLICY III			POLICY IV		
	PROD.	CONS.	X-M	PROD.	CONS.	X-M	PROD	CONS.	X-M	PROD.	CONS.	X-M
WHEAT	-29.6	-25.7	0.3	-5.4	-2.2	0.6	-4.2	-0.9	0.7	9.0	-0.1	2.0
CORN	-24.2	-22.3	-	-3.7	-5.6	-	-5.2	0.0	-	-0.1	0.0	-
RYE	830.0	-23.2	14.9	123.4	-2.2	91.7	123.4	-0.9	90.9	123.4	-0.1	90.2
RICE	-9.9	-9.9	-	-3.3	-3.3	-	-3.3	-3.3	-	0.0	0.0	-
BARLEY	-26.9	-30.1	0.0	127.8	-23.2	11911.7	127.8	-23.2	11826.9	53.8	-11.4	5000.0
CHICKPEA	1842.5	-19.6	123.1	73.6	-19.6	6.9	73.6	-19.6	6.9	59.2	-2.0	5.0
DRYBEAN	912.6	-9.8	2202.6	92.7	-9.8	245.8	92.7	-9.8	245.8	92.7	-9.8	245.8
LENTIL	-43.9	-15.5	0.0	77.6	-5.2	3.4	77.6	-5.2	3.4	44.2	0.0	2.3
POTATO	-7.0	-6.6	0.0	83.9	-3.3	212.0	83.9	-3.3	212.0	7.6	0.0	19.4
ONION	482.3	0.0	68.9	18.14	0.0	3.5	27.9	0.0	4.9	16.1	0.0	3.3
GREPPER	885.0	-25.1	13431.9	84.7	-25.1	1620.8	84.7	-25.1	1620.8	42.3	0.0	625.0
TOMATO	-0.3	-6.1	0.0	79.7	-6.1	0.0	79.7	-6.1	0.0	9.8	0.0	9.8
CUCUMBER	-21.3	-21.3	-	0.0	0.0	-	-3.1	-3.0	-	0.0	0.0	-
SUNFLOWER	-28.0	-28.0	-	0.0	0.0	-	5.6	5.6	-	5.6	5.6	-
OLIVE	-100.0	-100.0	0.0	7.3	-10.7	39.2	-25.0	10.7	2.6	-25.0	10.7	2.6
GROUNDNUT	-32.0	-30.5	0.0	85.8	-10.2	43.3	53.6	0.0	X→M	-53.6	0.0	X→M
COTTON	-49.2	-23.6	0.0	-32.5	-11.8	0.3	-10.4	-11.8	0.9	11.0	0.0	1.3
SUGARBEET	-25.7	-25.7	-	-2.2	-2.2	-	-48.2	-0.9	0→M	-0.1	-0.1	-
TOBACCO	-47.3	-21.1	0.0	96.9	-15.8	4.2	96.9	-15.8	4.2	62.2	0.0	2.9
TEA	-59.9	-55.8	-	25.0	-39.8	-	25.0	-39.8	-	25.0	-39.8	-
CITRUS	3130.6	-9.5	304.4	25.0	-9.5	4.3	25.0	-9.5	4.3	25.0	-3.8	3.8
GRAPE	-22.6	-15.5	0.0	25.0	-2.2	0.0	25.0	-2.2	0.0	3.8	0.0	6.2
APPLE	-18.3	-16.6	0.0	25.0	-2.4	14.4	25.0	-2.4	14.3	11.9	0.0	6.7
PEACH	-9.6	-9.3	0.0	23.1	-2.3	68.6	23.1	-2.3	68.6	23.1	-2.3	68.6
APRICOT	-17.0	-17.0	-	-2.4	-2.4	-	0.0	0.0	-	0.0	0.0	-
CHERRY	-14.9	-14.9	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-
WILDCHERRY	-12.8	-12.8	-	-2.6	-2.6	-	-2.6	-2.6	-	0.0	0.0	-
MELON	-6.5	-6.1	0.0	79.1	-3.0	207.4	79.1	-3.0	207.4	0.5	0.0	2.2
STRAWBERRY	-5.0	-4.7	0.0	18.3	-2.4	48.7	18.3	-2.4	48.7	18.3	-2.4	48.7
BANANA	-2.2	-2.2	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-
QUINCE	-14.1	-13.9	0.0	25.0	-2.3	139.3	25.0	-2.3	139.3	25.0	-2.3	139.3
PISTACHIO	-100.0	-100.0	0.0	25.0	-22.5	16.0	25.0	-22.5	16.0	25.0	-22.5	16.0
HAZELNUT	-100.0	-100.0	0.0	25.0	-20.9	0.0	25.0	-20.9	0.0	25.0	-20.9	0.0
SOYABEAN	-5.4	-5.4	-	-23.5	-23.5	-	-5.4	-5.4	-	0.0	0.0	-
SESAME	-13.8	-13.8	-	-9.2	-9.2	-	-4.6	-4.6	-	0.0	0.0	-
WHEATFLOUR			0.0			0.0			0.0			0.0
TOMATPASTE			3.7			37.3			37.3			2.7
SUNF-OIL			-			-			-			-
OLIVE-OIL			0.0			0.0			0.0			0.0
DRY-TEA			0.0			14.2			14.2			14.2
RAISIN			0.0			4.3			4.3			1.3
SH-HAZELNT			0.0			1.3			1.3			1.3

TABLE 5

(Cont.)

	POLICY I			POLICY II			POLICY III			POLICY IV		
	PROD.	CONS.	X-M	PROD.	CONS.	X-M	PROD,	CONS.	X-M	PROD.	CONS.	X-M
S- MUTTON	0.0	-49.3	5.1	0.0	-49.3	6.7	0.0	-49.3	6.7	0.0	-49.3	6.7
S- MILK	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-
S- WOOL	0.0	0.0	-1.0	0.0	0.0	-1.0	0.0	0.0	-1.0	0.0	0.0	-1.0
S- HIDE	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-
G- MEAT	-4.3	-50.0	17.4	0.0	50.0	19.0	0.0	-50.0	19.0	0.0	-50.0	19.0
G- MILK	-4.3	-4.3	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-
G- WOOL	-4.7	-4.3	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-
G- HIDE	-3.6	-4.3	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-
A- MEAT	-14.3	-30.3	4.4	-3.5	-30.3	6.9	-3.5	-30.3	6.9	-3.5	-30.3	6.9
A- MILK	-14.7	-14.7	-	-3.9	-3.9	-	-3.9	-3.9	-	-3.9	-3.9	-
A- WOOL	-14.4	-14.7	-	-3.6	-3.9	-	-3.6	7.4	0 → M	-3.6	-7.4	0 → M
A- HIDE	2.4	-14.7	-	15.5	-3.8	-	15,5	-3.8	-	15.5	-3.8	-
BEEF	-41.0	-41.0	-	-5.0	-5.0	-	0.0	-28.6	0 → X	0.0	-28.6	0 → X
COW-MILK	-41.0	-41.0	-	-5.0	-5.0	-	0.0	0.0	-	0.0	0.0	-
C- HIDE	-41.0	-41.0	-	-5.0	-5.0	-	0.0	0.0	-	0.0	0.0	-
B- MEAT	-13.4	-8.7	0.0	0.0	0.0	1.0	0.0	-26.0	5.8	0.0	-26.0	5.8
B- MILK	-13.4	-13.4	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-
B- HIDE	-12.2	-13.4	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-
P- MEAT	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-
EGGS	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0	-

Notes : See notes to Table 4.

TABLE 6

CHANGING PRODUCTION PATTERNS

(US $1=35 TL)

% CHANGE	POLICY I	POLICY II	POLICY III	POLICY IV
51 +	CHICKPEA,DRYBEAN GRPEPPER,ONION CITRUS	BARLEY,CHICKPEA LENTIL,POTATO DRYBEAN,GRPEPPER TOMATO,GROUNDNUT TOBACCO	BARLEY,CHICKPEA DRYBEAN,LENTIL POTATO,GRPEPPER TOMATO,TOBACCO	RYE, BARLEY CHICKPEA,DRYBEAN TOBACCO
11-50		TEA,CITRUS GRAPE,APPLE PEACH,MELON STRAWBERRY,QUINCE PISTACHIO HAZELNUT,S-MUTTON	TEA,CITRUS GRAPE,APPLE PEACH,MELON STRAWBERRY,QUINCE PISTACHIO HAZELNUT,S-MUTTON	LENTIL,ONION GRPEPPER,TEA CITRUS,APPLE PEACH,STRAWBERRY PISTACHIO,SOYABEAN HAZELNUT,S-MUTTON
0-10	RYE	RYE,OLIVE		WHEAT,CORN POTATO,TOMATO COTTON,SUGARBEET GRAPE,MELON
NO CHANGE	BANANA,S-MUTTON S-MILK,S-WOOL S-HIDE,G-MEAT G-MILK,G-WOOL G-HIDE,B-MEAT B-MILK,B-HIDE P-MEAT,EGGS	CUCUMBER,SUNFLOWER APRICOT,CHERRY WILDCHERRY,BANANA S-MILK S-WOOL,S-HIDE G-MEAT,G- MILK G-WOOL,G-HIDE BEEF,COW-MILK C-HIDE,B-MEAT B-MILK,B-HIDE P-MEAT,EGGS	CUCUMBER,APRICOT CHERRY,WILDCHERRY BANANA,SESAME S-MILK S-WOOL,S-HIDE G-MEAT,G-HIDE G-WOOL,G-HIDE COW-MILK,C-HIDE B-MEAT,B-MILK B-HIDE,P-MEAT EGGS	RICE,CUCUMBER APRICOT,WILDCHERRY BANANA,SESAME S-MILK S-WOOL,S-HIDE G-MEAT,G-MILK G-WOOL,G-HIDE COW-MILK,C-HIDE B-MEAT,B-MILK B-HIDE,P-MEAT EGGS
-(0-10)	WHEAT,CORN RICE,BARLEY POTATO,TOMATO SUGARBEET,PEACH MELON,STRAWBERRY QUINCE,SESAME A-WOOL	WHEAT,CORN RICE,ONION SUGARBEET,SESAME SOYABEAN,A-MILK A-WOOL	WHEAT,CORN RICE,RYE ONION,SOYABEAN A-MILK,A-WOOL	A-MILK,A-WOOL
-(11-50)	LENTIL,CUCUMBER SUNFLOWER,TOBACCO TEA,GRAPE APPLE,APRICOT CHERRY,WILDCHERRY SOYABBEAN,A-MILK A-MEAT,A-HIDE BEEF,COW-MILK C-HIDE	COTTON,A-MEAT A-HIDE	SUNFLOWER,OLIVE COTTON,SUGARBEET A-MEAT,A-HIDE	OLIVE,A-MEAT A-HIDE
-(51+)	OLIVE,GROUNDNUT COTTON,PISTACHIO HAZELNUT		GROUNDNUT	SUNFLOWER GROUNDNUT

TABLE 7

CHANGING PRODUCTION PATTERNS

(US $1=47 TL)

% CHANGE	POLICY I	POLICY II	POLICY III	POLICY IV
51+	RYE,CHICKPEA DRYBEAN,ONION GRPEPPER,CITRUS	RYE,BARLEY CHICKPEA,DRYBEAN LENTIL,POTATO GRPEPPER,TOMATO GRDONDNUT,TOBACCO MELON	RYE,BARLEY CHICKPEA,DRYBEAN LENTIL,POTATO GRPEPPER,TOMATO TOBACCO,MELON	RYE,BARLEY CHICKPEA,DRYBEAN TOBACCO
11-50		ONION,TEA CITRUS,GRAPE APPLE,PEACH STRAWBERRY,QUINCE PISTACHIO,HAZELNUT A-HIDE,S-MUTTON	ONION,TEA CITRUS,GRAPE APPLE,PEACH STRANBERRY,QUINCE PISTACHIO,HAZELNUT A-HIDE, S-MUTTON	LENTIL,ONION GRPEPPER,COTTON TEA,CITRUS APPLE,PEACH STRAWBERRY,QUINCE A-HIDE ,S-MUTTON
0-10	A-HIDE	OLIVE	SUNFLOWER	WHEAT,POTATO TOMATO,SUNFLOWER GRAPE,MELON
NO CHANGE	S-MUTTON,S-MILK S-WOOL,S-HIDE P-MEAT,EGGS	CUCUMBER,SUNFLOWER CHERRY,BANANA S-MILK S-WOOL,S-HIDE G-MEAT,G-MILK G-WOOL,G-HIDE B-MEAT,B-MILK EGGS	APRICOT,CHERRY BANANA, S-MILK,S-WOOL S-HIDE,G-MEAT G-MILK,G-WOOL G-HIDE,BEEF COW-MILK,C-HIDE B-MEAT,B-MILK B-HIDE,P-MEAT EGGS	RICE,CUCUMBER APRICOT,CHERRY WILDCHERRY,BANANA SOYABEAN,SESAME S-MILK S-WOOL,S-HIDE G-MEAT,G-MILK G-WOOL,G-HIDE A-MEAT,A-MILK A-WOOL,BEEF COW-MILK,C-HIDE B-MEAT,B-MILK B-HIDE,P-MEAT EGGS
-(0-10)	RICE,POTATO TOMATO,PEACH MELON,STRAWBERRY BANANA,SOYABEAN G-MEAT,G-MILK G-WOOL,G-HIDE	WHEAT,CORN RICE,SUGARBEET APRICOT,WILDCHERRY SESAME,A-MEAT A-MILK,A-WOOL BEEF,COW-MILK C-HIDE	WHEAT,CORN RICE,CUCUMBER COTTON,WILDCHERRY SOYABEAN,SESAME A-MEAT,A-MILK A-WOOL	CORN,SUGARBEET
-(11-50)	WHEAT,CORN BARLEY,CUCUMBER SUNFLOWER,GROUNDNUT COTTON,SUGARBEET TOBACCO,APPLE APRICOT,CHERRY WILDCHERRY,QUINCE A-MEAT,A-MILK A-WOOL,BEEF COW-MILK,C-HIDE B-MEAT,B-MILK B-HIDE	COTTON,SOYABEAN	OLIVE,SUGARBEET	OLIVE
-(51+)	OLIVE,TEA PISTACHIO,HAZELNUT		GROUNDNUT	GROUNDNUT -(51+) PISTACHIO,HAZELNUT

TABLE 8

CHANGING TRADE PATTERNS

(US $1=35 TL)

CHANGE	POLICY I	POLICY II	POLICY III	POLICY IV
EXPANDING EXPORTS	RYE,CHICKPEA DRYBEAN,ONION GRPEPPER,CITRUS S-MUTTON,G-MEAT A-MEAT	WHEAT,RYE,BARLEY CHICKPEA,DRYBEAN LENTIL,POTATO GRPEPPER,OLIVE GROUNDNUT,TOBACCO CITRUS,APPLE PEACH,MELON STRAWBERRY,QUINCE PISTACHIO,S-MUTTON G-MEAT,A-MEAT TOMATPASTE,DRY-TEA	BARLEY,CHICKPEA DRYBEAN,LENTIL POTATO,GRPEPPER TOBACCO,CITRUS APPLE,PEACH MELON,STRAWBERRY QUINCE,PISTACHIO S-MUTTON,G-MEAT A-MEAT TOMATPASTE,DRY-TEA RAISIN,SH-HAZELNUT	WHEAT,RYE BARLEY,CHICKPEA DRYBEAN,LENTIL POTATO,ONION GRPEPPER,TOMATO COTTON,TOBACCO CITRUS,GRAPE APPLE,PEACH MELON,STRAWBERRY PISTACHIO,QUINCE S-MUTTON,G-MEAT A-MEAT TOMATPASTE,DRY-TEA RAISIN,SH-HAZELNUT
DECREASING EXPORTS			WHEAT,COTTON	
NO TRADE TO EXPORTS			BEEF,B-MEAT	BEEF,B-MEAT
EXPORTS TO NO TRADE	WHEAT,BARLEY LENTIL,POTATO TOMATO,OLIVE GROUNDNUT,COTTON TOBACCO,GRAPE APPLE,PEACH MELON,STRAWBERRY QUINCE,PISTACHIO HAZELNUT TOMATPASTE,DRY-TEA RAISIN,SH-HAZELNUT OLIVE-OIL	ONION,TOMATO COTTON,GRAPE HAZELNUT OLIVE-OIL	RYE,ONION TOMATO,GRAPE HAZELNUT OLIVE-OIL	HAZELNUT OLIVE-OIL
EXPORTS TO IMPORTS			OLIVE,GROUNDNUT	OLIVE,GROUNDNUT
NO TRADE TO IMPORTS			SUNFLOWER SUGARBEET,A-WOOL	SUNFLOWER,A-WOOL
IMPORTS TO IMPORTS	S-WOOL	S-WOOL	S-WOOL	S-WOOL
NO TRADE TO NO TRADE	CORN,RICE CUCUMBER,SUNFLOWER SUGARBEET,TEA APRICOT,CHERRY WILDCHERRY,BANANA SOYABEAN,SESAME S-MILK,S-HIDE G-MILK,G-WOOL G-HIDE,A-MILK A-WOOL,A-HIDE BEEF,COW-MILK C-HIDE,B-MEAT B-MILK,B-HIDE P-MEAT,EGGS WHEATFLOUR SUNFLOWER-OIL	CORN,RICE CUCUMBER,SUNFLOWER SUGARBEET,TEA APRICOT,CHERRY WILDCHERRY,BANANA SOYABEAN,SESAME S-MILK,S-HIDE G-MILK,G-WOOL G-HIDE,A-MILK A-WOOL,A-HIDE BEEF,COW-MILK C-HIDE,B-MEAT B-MILK,B-HIDE P-MEAT,EGGS WHEATFLOUR SUNFLOWER-OIL	CORN,RICE CUCUMBER,TEA APRICOT,CHERRY WILDCHERRY,BANANA SOYABEAN,SESAME S-MILK,S-HIDE G-MILK,G-WOOL G-HIDE,A-MILK A-HIDE,COW-MILK C-HIDE,B-MILK B-HIDE,P-MEAT EGGS WHEATFLOUR SUNFLOWER-OIL	CORN,RICE CUCUMBER,SUGARBEET TEA,APRICOT CHERRY,WILDCHERRY BANANA,SOYABEAN SESAME,S-MILK S-HIDE,G-MILK G-WOOL,G-HIDE A-MILK,A-HIDE COW-MILK,C-HIDE B-MILK,B-HIDE P-MEAT,EGGS WHEATFLOUR SUNFLOWER-OIL

TABLE 9

CHANGING TRADE PATTERNS

(US $1=47 TL)

CHANGE	POLICY I	POLICY II	POLICY III	POLICY IV
EXPANDING EXPORTS	RYE,CHICKPEA DRBEAN,ONION GRPEPPER,CITRUS S-MUTTON,G-MEAT A-MEAT TOMATPASTE	RYE,BARLEY CHICKPEA,DRYBEAN LENTIL,POTATO ONION,GRPEPPER OLIVE,GROUNDNUT TOBACCO,CITRUS APPLE,PEACH MELON,STRAWBERRY QUINCE,PISTACHIO S-MUTTON,G-MEAT A-MEAT,B-MEAT TOMATPASTE,DRY-TEA RAISIN,SH-HAZELNUT	RYE,BARLEY CHICKPEA,DRYBEAN LENTIL,POTATO ONION,GRPEPPER OLIVE,TOBACCO CITRUS,APPLE PEACH,MELON STRAWBERRY,QUINCE PISTACHIO,S-MUTTON G-MEAT,A-MEAT B-MEAT TOMATPASTE,DRY-TEA RAISIN,SH-HAZELNUT	WHEAT,RYE BARLEY,CHICKPEA DRYBEAN,LENTIL POTATO,ONION GRPEPPER,TOMATO OLIVE,COTTON TOBACCO,CITRUS GRAPE,APPLE PEACH,MELON STRAWBERRY,QUINCE PISTACHIO,S-MUTTON G-MEAT,A-MEAT B-MEAT TOMATPASTE,DRY-TEA RAISIN,SH-HAZELNUT
DECREASING EXPORTS	WHEAT	WHEAT,COTTON	WHEAT,COTTON	
NO TRADE TO EXPORTS			BEEF	BEEF
EXPORTS TO NO TRADE	BARLEY,LENTIL POTATO,TOMATO OLIVE,GROUNDNUT COTTON,TOBACCO GRAPE,APPLE PEACH,MELON STRAWBERRY,QUINCE PISTACHIO,HAZELNUT B-MEAT,WHEATFLOUR DRY-TEA,RAISIN SH-HAZELNUT,OLIVE-OIL	TOMATO,GRAPE HAZELNUT WHEATFLOUR OLIVE-OIL	TOMATO,GRAPE HAZELNUT WHEATFLOUR OLIVE-OIL	HAZELNUT WHEATFLOUR OLIVE-OIL
EXPORTS TO IMPORTS			GROUNDNUT	GROUNDNUT
NO TRADE TO IMPORTS			SUGARBEET,A-WOOL	A-WOOL
IMPORTS TO IMPORTS	S-WOOL	S-WOOL	S-WOOL	S-WOOL
NO TRADE TO NO TRADE	CORN,RICE CUCUMBER,SUNFLOWER SUGARBEET,TEA APRICOT,CHERRY WILDCHERRY,BANANA SOYABEAN,SESAME S-MILK,S-HIDE G-MILK,G-WOOL ,G-HIDE A-WOOL,A-HIDE ,A-MILK BEEF,COW-MILK C-HIDE,B-MILK B-HIDE,P-MEAT EGGS SUNFLOWER-OIL	CORN,RICE CUCUMBER,SUNFLOWER SUGARBEET,TEA APRICOT,CHERRY WILDCHERRY,BANANA SOYABEAN,SESAME S-MILK,S-HIDE G-MILK,G-WOOL ,G-HIDE A-WOOL,A-HIDE ,A-MILK BEEF,COW-MILK C-HIDE,B-MILK B-HIDE,P-MEAT EGGS SUNFLOWER-OIL	CORN,RICE CUCUMBER,SUNFLOWER TEA,APRICOT CHERRY,WILDCHERRY BANANA,SOYABEAN SESAME,S-MILK S-HIDE,G-MILK G-WOOL,G-HIDE A-MILK,A-HIDE COW-MILK,C-HIDE B-MILK,B-HIDE P-MEAT,EGGS SUNFLOWER-OIL	CORN,RICE CUCUMBER,SUNFLOWER SUGARBEET,TEA APRICOT,CHERRY WILDCHERRY,BANANA SOYABEAN,SESAME S-MILK,S-HIDE G-MILK,G-WOOL G-HIDE,A-MILK A-HIDE,COW-MILK C-HIDE,B-MILK B-HIDE,P-MEAT EGGS SUNFLOWER-OIL

TABLE 10

ALTERNATİVE TRADE POLICIES AT US $ =35 TL.

(US $ Million)

	Policy II			Policy III			Policy IV		
	Production	Consumption	Net Trade	Production	Consumption	Net Trade	Production	Consumption	Net Trade
Grains	3,669 (+27)	2,087 (-1.4)	924.8 (11)	3,654 (+26.5)	2,085 (-1.5)	913.4 (11)	3,362 (+16.4)	2,150 (+1.6)	520.2 (6)
Pulses	837 (+76.9)	355 (-6.8)	388.0 (5)	837 (+76.9)	355 (-6.8)	388.0 (5)	757 (+60)	379 (-0.5)	304.9 (4)
Vegetables	5,668 (47.8)	3,712 (-1.8)	825.2 (56)	6,077 (+58.5)	3,713 (-1.8)	971.9 (66)	4,115 (+7.3)	3,781 (0)	224.6 (15)
Fruits and Nuts	4,563 (23.8)	3,129 (-0.3)	215.7 (5)	4,563 (+23.8)	3,129 (-0.4)	215.7 (5)	4,065 (+10.3)	3,129 (-0.4)	186.8 (4)
Oil Crops	746 (+9.5)	550 (+5.2)	165.7 (32)	505 (-25.9)	596 (+6.8)	-53.6 (-)	450 (-33.9)	596 (+6.8)	-87.6 (-)
Industrial Crops	1,745 (+13.1)	1,141 (-4.7)	534.5 (1)	1,749 (+13,3)	1,137 (-5)	541.7 (2)	1,909 (+23.7)	1,159 (-3.2)	731.9 (2)
Livestock Products	5,225 (+1.6)	4,321 (-4.2)	524.6 (5)	5,219 (+1.5)	4,954 (+9.8)	380.2 (6)	5,219 (+1.5)	4,954 (+9.8)	380.2 (5)
Total	22,453 (+23)	15,295 (-2.5)	3,378.5 (5)	22,604 (+23.9)	15,969 (+1.8)	3,357.3 (5)	19,876 (+8.9)	16,148 (+3)	2,261.2 (3)

Note: Numbers in parentheses represent percentage change from base solution. Under net trade these numbers represent ratios.

TABLE 11

ALTERNATİVE TRADE POLICIES AT US $= 47 TL.

(US $ Million)

	Policy II			Policy III			Policy IV		
	Production	Consumption	Net Trade	Production	Consumption	Net Trade	Production	Consumption	Net Trade
Grains	2,830 (+24.3)	1,547 (-4)	1,054.4 (7)	2,861 (+25.6)	1,571 (-2.5)	1,056.3 (7)	2,734 (+20.1)	1,600 (-0.7)	784.1 (5)
Pulses	623 (+78.5)	244 (-12.9)	411.4 (6)	623 (+78.5)	244 (-12.9)	411.4 (6)	556 (+59.3)	272 (-2.9)	307.9 (4)
Vegetables	4,952 (+73.7)	2,679 (-4.5)	1,234.7 (84)	4,964 (+74.1)	2,677 (-4.6)	1,244.7 (85)	3,060 (+7.3)	2,811 (+0.2)	224.6 (15)
Fruits and Nuts	3,396 (+23.7)	2,296 (-1.7)	253.9 (6)	3,397.7 (+23.7)	2,259 (-3.3)	253.9 (6)	3,026 (+10.2)	2,313 (-1)	205.8 (5)
Oil Crops	545 (+9.2)	360 (-11.5)	189.6 (40)	420 (-15.8)	431 (+5.9)	-9.4 (-)	422 (-15.4)	433 (+6.4)	-9.5 (-)
Industrial Crops	1,307 (+13.4)	750 (-15)	632.6 (2)	1,314 (+14)	753 (-14.6)	639.4 (2)	1,423 (+23.4)	821 (-6.9)	731.9 (2)
Livestock Products	3,809 (-0.5)	2,995 (-10.1)	572.5 (7)	3,887 (+1.6)	3,434 (+3.1)	794.6 (10)	3,887 (+1.6)	3,434 (+3.1)	794.6 (10)
Total	17,462 (+27.5)	10,871 (-6.7)	4,349.1 (6)	17,466 (+27.5)	11,369 (-2.5)	4,390.9 (6)	15,107 (+10.3)	11,684 (+0.3)	3,039.3 (4)

Note: Numbers in parentheses represent percentage change from base solution. Under net trade these numbers represent ratios.