REPUBLIC OF TURKEY
PRIME MINISTRY

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SOUTHEASTERN ANATOLIA PROJECT
REGIONAL DEVELOPMENT ADMINISTRATION

AGRICULTURAL COMMODITIES MARKETING SURVEY PLANNING OF CROP PATTERN AND INTEGRATION OF MARKETING AND CROP PATTERN STUDIES

VOLUME IV

Agricultural Production and Trade

TİPAŞ Tarım - Turizm - İnşaat
Pazarlama ve Ticaret A.Ş.
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4. THE WORLD TRADE MODEL (WTM)

4.1 Theoretical Conception of the World Trade Model

4.1.1 Introduction

With the completion of the irrigation projects agricultural production in the GAP region will increase heavily. At the moment insufficient water availability is the most important restriction in agricultural production. Changes are expected in two ways:

- increase in the existing production and
- production of new products.

The main objective of the market modelling system is to analyse world market developments with respect to these changes in the GAP region. Detailed information on the world trade model (WTM) has been included in the Interim-Report and, therefore, the following description of the model will concentrate on the most important points.

The World Trade Model (WTM) belongs to the type of conventional trade models, where all regions are described by behavioural supply and demand functions. The aim of the model is to forecast production, demand, trade and world market prices. The forecasts are based on various assumptions concerning supply and demand trends as well as policy scenarios. The results of the trade model serve as input to the Turkish agricultural sector model.

In the following chapter the basic characteristics and the structure of the model along with the regional and product disaggregation are described.

4.1.2 Basic Characteristics of the WTM Model

The World Trade Model (WTM) shows several basic characteristics which can be summarized as follows:

- The WTM model belongs to the class of multiregion world trade models. The main characteristic of these multiple-region models is to emphasize on interrelations and simultaneities among countries and regions through agricultural trade.

  Individual countries or regions are treated as single market places. In each region or individual country it is assumed that production and demand functions within this specific region are uniform. Further, it is presumed that each commodity is perfectly homogeneous, both concerning the physical characteristics of the product and the country of origin and destination respectively. This implies that domestic and traded goods are perfect substitutes in consumption. Importers and exporters are assumed to be indifferent about their trading partners disregarding bilateral trade agreements stemming from historical and political obligations.

Within the agricultural sector several primary and processed commodities are distinguished on the demand and supply side, the interdependences between single commodities are taken into account via cross-price elasticities.

- The WTM model represents a non-spatial trade model. Non-spatial net trade models capture the residual of imports and exports of each single country/region with all other trading regions on a net trade basis, but do not provide information on specific trade flows between countries. Like most non-spatial models the WTM model does not permit seperate identification of exports and imports in cases where a country is both an exporter and importer of the same commodity.

- The WTM model is a partial equilibrium model since other sectors of the economy are not represented in the model. Intersectoral and macroeconomic interdependences to and from the agricultural sector are not captured. Thus, intersectoral factor mobility of labour, land and capital as well as macroeconomic equilibria conditions are not endogenously inforced, and important macroeconomic variables such as exchange rates, growth in gross domestic product and interest rates are treated as exogenous variables.

- The WTM model is a price equilibrium model. Each region or country is represented in the model by internal supply and demand functions assuming that agents in domestic markets are price takers and perfect competitors, whereas in world markets each particular country/region can affect world market prices by changing its excess supply or demand structure. A new export supply or import demand schedule can be both, the result of a changed internal supply or demand behaviour and the effect of various policy actions.

  World market prices and regional market prices for goods are determined simultaneously by equating world net exports and world net imports, so that the sum of net trade across all regions is approaching zero. The model solution gives the world market-clearing prices, equilibrium quantities and the excess supply/demand of each country/region.

  Domestic producer and consumer price changes are linked to world market price changes through response coefficients. These price transmission elasticities define the degree of isolation of domestic markets from external markets. They are close to zero for those countries where domestic prices are distorted and bear little or no relationship to international prices. In those countries free trade flows are more or less restricted. On the opposite, price transmission elasticities are close to one for countries which have few trade restrictions for particular commodities. In this case, the agricultural sector responses to international scarcity and surplus and the domestic price of a commodity varies in the same direction and to the same degree as the world market price.

  Besides the linkage to world market prices, domestic prices are influenced by exogenously determined changes in domestic policies, which are usually represented as price wedges such as PSE, CSE or Nominal Protection Rates.

- The WTM model is used in a comparativ-static manner. However, compared to most other comparativ-static world trade models the WTM model contains two additional features: first of all the WTM model includes the influence of supply and demand trends and second the model is long-run in nature, which is implemented by simulating over several time periods.
- The WTM model is a synthetic model, since most model parameters have not been estimated but have been taken from other empirical studies. Several checks were carried out to guarantee that these parameters have a reasonable range and fit into the WTM model. These checks are described in Chapter 4.4.

4.1.3 Regional Differentiation

In the basic data system of the WTM model the total world, divided into 55 countries resp. country groups (Table 4.1.3.1) is included. These data are very specific in the case of European countries, the Near and Middle East and North Africa, whereas other countries of Africa, Asia and Latin America are considered as country groups. The grouping takes into account the importance of the countries with regard to Turkish imports and exports.

There are two levels of aggregation. The first level (I) contains the disaggregated version and the second level (II) consists of 12 regional aggregates. The model simulations are carried out at the disaggregated level (I), but the results can also be easily aggregated to the second aggregation level.

4.1.4 Product Differentiation

The product coverage of most multicommodity trade models has been limited to the main product categories. Compared to these models the product coverage of the WTM model has been extended considerably by exploiting additional data sources. In general all commodity elements, as stated in Table 4.1.4.1 are covered in the data base. For some products only trade data were available.

Table 4.1.3.1: Model-Regions

Countries or Country Groups	Aggregation-Level I	Aggregation-Level II
Turkey	TUR	TUR
Belgium, Luxembourg	BL	EC
Denmark	DK	
France	FRA	
Germany (East)	GER-E	
Germany (West)	GER-W	
Greece	GRE	
Irland	IRL	
Italy	ITA	
Netherlands	NL	
Portugal	PO	
Spain	SPA	
United Kingdom	UK	
Austria	A	RWE
Cyprus	ZP	
Finland	FIN	
Norway	NOR	
Sweden	SWE	
Switzerland	SWI	
Rest of Western Europe	RWE	
Albania	ALB	EE
Bulgaria	BUL	
Czechoslovakia	CZE	
Hungary	HUN	
Poland	POL	
Romania	ROM	
Yugoslavia	YUG	
UDSSR	USS	USS

Table 4.1.3.1: Model-Regions (cont.)

Countries or Country Groups	Aggregation-Level I	Aggregation-Level II
Jordan	JOR	
Lebanon	LEB	
Syria	SYR	
Rest of Non-Oilproducing Middle East	RNME	
Iran	IRN	ME
Iraq	IRQ	
Kuwait	KUW	
Saudi Arabia	SAU	
Rest of Oilproducing Middle East	ROME	
Israel	ISR	
Algeria	ALG	
Egypt	EGY	
Lybia	LYB	NAF
Morocco	MAR	
Tunisia	TUN	
South Africa	SA	
Rest of Africa	RAF	RAF
Bangladesh	BGD	
Pakistan	PAK	
India	IND	RAS
China	CHN	
Japan	JAP	
Rest of Asia	RAS	
United States	USA	NA
Canada	CAN	
Latin America	LA	LA
Australia and New Zealand	AUS-NZ	ANZ
World	WOR	WOR
Total Regions	55	12

Table 4.1.4.1: Final Commodity Elements and Commodity Differentiation in the basic data system

❒ Commodity elements:

a) Production- and Demand Data 1970 -1987

PRODUC:	Production ('000 T)
HCONSU:	Human Consumption ('000 T)
INDUST:	Processing for Food ('000 T)
FEED:	Feed Consumption ('000 T)
DEMAND:	Total Domestic Demand = HCONSU + INDUST + FEED + OTHERS ('000 T)
AREA:	('000 ha)
UNDEF:	no data available

b) Trade-Data 1970 -1987

IMPQUT:	Import Quantity ('000 T)
EXPQUT:	Export Quantity ('000 T)
UVIMP:	Unit Value Imports (US $/T)
UVEXP:	Unit Value Export (US $/T)
IMPVAL:	Import Values = IMPQUT x UVIMP ('000 US $)
EXPVAL:	Export Values = EXPQUT x UVEXP ('000 US $)
NETTRD:	Net Trade ('000 T)
UNDEF:	no data available

❒ Commodity Differentiation:

Wheat (Wheat, Wheat Flour)
Barley (Barley, Malt)
Maize
Other Cereals (Rye, Oats, Millet, Sorghum)

Potatoes (Potatoes fresh, Potatoes flour, Potatoes starch)

Dry Beans
Dry Chick Peas
Lentils

Sugar
Cotton Lint
Tobacco

Eggs (Eggs, Eggs Liquid, Eggs Dry)

Beef Meat (Beef and Veal, Beef and Veal Boneless, Beef Dried and Salted and Smoked, Beef Extracts, Beef Preparations, Beef and Veal Sausages, Beef Canned)
Mutton and Lamb
Pig Meat (Pig Meat, Pork, Bacon and Ham, Meat Preparations, Sausages)
Poultry Meat (Chicken Meat, Chicken Meat Canned, Goose Meat, Duck Meat, Turkey Meat)

Whole Milk Fresh (Milk Whole Fresh,Milk Skim Fresh, Whole Milk Condensed, SkimMilk Condensed, Whole Milk Evaporated, SkimMilk Evaporated)
Dry Milk (Dry Whole Cow Milk, Dry Skim Milk)
Butter
Cheese (Cheese Whole Cow Milk, Cheese Skim Cow Milk)

Soya Beans
Sunflower Seed
Groundnuts, shelled

Soymeal and Cake
Groundnut Cake
Sunflower Cake

Soyoil
Sunfloweroil
Olive Oil
Groundnut Oil

Fruits Fresh (Grapes, Pistachios, Olives)
Fruits Processed
Vegetables Fresh (Water Melons, Melons, Tomatoes, Dry Onions, Eggplants)
Vegetables Processed

4.1.5 Model Structure

Commodity models are quantitative representations of (agricultural) commodity markets. They are generally composed of production, consumption, stockpiling, trade and price linkage equations. In general, the model is concerned with the determination of prices and with the explanation of the behaviour of participants in the market. It should reflect typical interrelationships and feedback effects in domestic and international markets in order to simulate real world events. The modelling of particular commodity markets requires the integration of these model components to meet the above mentioned purposes.

In the WTM model four model components are distinguished:

- Production
- Demand
- Stock changes
- Trade/Objective Function

Production

In the WTM model, supply equations are functions of own- and cross prices, shift factors which are covered by trend coefficients and the vector Z which covers the policy influence:

$$S_{c,t} = f\ (P_{c,t}\ ,\ P_{c',t}\ ,\ T\ ,\ Z) \qquad (1)$$

with	S:	Supply
	P_c:	Own price of commodity c
	$P_{c'}$:	Prices of substitutes and joined products
	T:	Trend influence
	Z:	Policy influence
	c,t:	Commodity and time subscript

Production of commodity **c** in region **r** is explained as being dependent on the production in the previous year, multiplied by the trend coefficient $tS_{c,r}$ and the relative change in production induced by world market and/or administrated policy induced price changes. International price changes are transformed to regional price changes via price-transmission elasticities. The price-link relationship comprises two political features, the stabilization and the protection component. The stabilization aim of a single country is captured by the specification of price transmission elasticities. The protection or support component is covered by a price wedge between the domestic and the international price (PSE). The reduction of the support level can be considered by specifying the second term of equation (2) and (3) respectively. In addition to the stabilization and protection component exogenous quantity shifters are included to investigate the effect of e.g. land-set-aside programs on production. The mathematical expression of the supply equation is:

$$S^{1,1}_{c,r}\ (\Delta P^1_{c'}) = S^{1,0}_{c,r}\ \ (1 + \Sigma\varepsilon^s_{c,c',r}\ \ (\tau^s_{c',r}\ \frac{\Delta P^1_{c'}}{P^0_{c'}} \bullet \frac{PM^0_{c',r}}{PPI^0_{c',r}} + \frac{\Delta PSE_{c',r}}{PPI^0_{c',r}}))\tag{2}$$

Demand

The demand for commodity **c** in region **r** is explained as being dependent on the demand in the previous year, multiplied by the trend coefficient $\mathbf{t^D}_{c,r}$ and the relative change in demand induced by price changes. Price changes can stem from world market price changes and they can be the result of policy changes. The price-link between the domestic and international prices corresponds to the supply function with the exception of using CSEs as price wedges. The mathematical expression is:

$$D^{1,1}_{c,r}\ (\Delta P^1_{c'}) = D^{1,0}_{c,r}(1 + \Sigma\varepsilon^d_{c,c',r}\ \ (\tau^d_{c',r}\ \frac{\Delta P^1_{c'}}{P^0_{c'}} \bullet \frac{PM^0_{c',r}}{PCI^0_{c',r}} + \frac{\Delta CSE_{c',r}}{PCI^0_{c',r}}))\tag{3}$$

In the current WTM model demand $\mathbf{D}_{c,r}$ is the sum of human consumption, industrial use, feed demand, seed demand, other demand and waste.

Stocks

Stockholding behaviour is an important component of commodity modelling, especially in the case of cereals. In this context it has to be mentioned that world stocks for wheat in the period 85/86 to 88/89 reached an average amount of 27% of world wheat production. The USA hold about 30% of world wheat stocks, this covers about 60% of the yearly domestic wheat production.

The behavioural equation for stocks in the WTM model can be specified as:

$$ST^1_{c,r} = ST^0_{c,r} + \Delta ST^1_{c,r}\tag{4}$$

$$\Delta ST^1_{c,r} = EX_{c,r} + ST^0_{c,r}\ \ (\alpha\ (\frac{S^{1,1}_{c,r}}{S^{0,0}_{c,r}} - 1) + \beta\ (\frac{D^{1,1}_{c,r}}{D^{0,0}_{c,r}} - 1) + \gamma\ (\frac{P^1_c}{P^0_c} - 1))\tag{5}$$

This stock equation comprises a price component, a "pipeline" or quantity component and an exogenous term in order to cover stock changes induced by country specific policies.

The specification of the stock equation for a particular country will depend on its position in international trade. According to this, countries are often grouped in "surplus exporters", "residual exporters" and "net importers". This behaviour can be expressed by setting country specific stock elasticities. Refering to equation (5), this would imply that the elasticity of stock demand with respect to price changes (γ) would be very small or zero, if the country operates as a "surplus exporter". Accordingly, the amount of a commodity not consumed domestically will be exported. "Surplus exporters" will generally not accumulate stocks above a so called "pipeline" level, this implies that stocks of these exporters can be calculated as a function of current production.

On the other hand, countries like the USA (often modelled as a "residual exporter") will prevent prices falling below a minimum price (for example the US loan rate in the case grains). For these countries the stock elasticity with respect to price changes is high. In addition, such policies can be modelled by specifying the exogenous term of equation (5).

The implementation of an endogenous stock function as an additional demand component improves the quality of the model considerably, since the model would tend to overestimate price variability without the stabilization effect of stockholding.

Finally, it should be mentioned, that world stock statistics are weak and often not available. The FAO for example does not publish stock statistics for cereals, sugar, pulses, milkpowder and most of the oilseeds. Since endogenous stock changes should be considered in the model, we collected beginning stock data from various sources like FAPRI/CARD (Food and Agricultural Policy Research Institute/Center for Agricultural and Rural Development), the USDA (United States Department of Agriculture) and the WORLD BANK, but stock data are still incomplete. This fact causes high world market price changes for the respective products like rice, pulses and dairy products. Especially, there occured problems concerning the milk data.

Trade/Objective Function

In the WTM model, trade is the difference between domestic supply, demand and stock changes. As mentioned above, this approach does not permit a separate identification of exports and imports, if the country is an exporter and importer of the same product. The net trade is defined as:

$$N^{1,1}_{c,r} = S^{1,1}_{c,r} - D^{1,1}_{c,r} - \Delta ST^{1}_{c,r} \qquad (6)$$

The basic idea of the WTM model is to minimize net trade by finding the price vector that is related to minimum net trade. The world net trade N_c which is the sum over the regional net trade quantities $N_{c,r}$ for each commodity, depends simultaneously on all product price changes. Therefore, the vector of world market price changes has to be determined simultaneously for all products considered in a particular model-run.

To find this world market clearing-price vector, the WTM model employs an objective function, in which the sum of net trade quantities determines the objective function value F. The mathematical expression is given in equation (7) :

$$F = \sum_c (\sum_r N_{c,r}) = \sum_c (\sum_r (S_{c,r} - D_{c,r} - \Delta ST_{c,r})) \qquad (7)$$

For the base year we assume that world markets are in equilibrium. This implies that the excess supply/demand in world market equals zero and due to this, the base world reference price is the models initial equilibrium price, so that the condition in equation (8) is satisfied for the base year:

$$\sum_c (\sum_r N^{0,0}_{c,r}) = \sum_c (\sum_r (S^{0,0}_{c,r} - D^{0,0}_{c,r} - \Delta ST^{0}_{c,r})) = 0 \qquad (8)$$

The trend influence which covers shift factors as well as policy changes can cause a disequilibrium in the simulation period. These facts are expressed in equation (9) :

$$\sum_c (\sum_r N^{1,0}_{c,r}) = \sum_c (\sum_r (S^{1,0}_{c,r} - D^{1,0}_{c,r} - \Delta ST^{0}_{c,r})) > \text{or} < 0 \qquad (9)$$

This disequilibrium in world markets causes the solution algorithm in a next step to compute the new equilibrium price vector, for which the models objective function will reach a new optimum value:

$$\sum_c (\sum_r N^{1,1}_{c,r}) = \sum_c (\sum_r (S^{1,1}_{c,r} - D^{1,1}_{c,r} - \Delta ST^{1}_{c,r})) = 0 \qquad (10)$$

The solution is found by transmitting the equations of supply, demand and stocks into the objective function and solve the function to get the changes in world market prices. The mathematical operation to derive the equilibrium price vector is simple matrix inversion.

In the commodity groups fruit and vegetables difficulties arise to take the same model approach as for the other agricultural products. First of all the lack of differentiated world production and consumption data requires changes in the model structure of the WTM-model. Instead of projecting production and consumption individually and deriving exports or imports as the residual, exports and imports have to be projected directly. Second, since complete baseyear data and model parameters are only available for product aggregates (fresh vegetables, processed vegetables, fresh fruits, processed fruits) model simulations have to be based on these aggregates and estimates regarding individual products have to be derived using an additional methodology.

Therefore, the following approach is chosen to provide reliable results for the fruit and vegetable sector:

❒ Development of an export supply/import demand model. The individual equations are:

$$X_c = f(P_c\ ,\ P_{c'}\ ,\ T,\ Z) \qquad (11)$$

$$I_c = f(P_c,\ P_{c'}\ ,\ T,\ Z) \qquad (12)$$

$$\sum_c \sum_r (X_{c,r} - I_{c,r}) = 0 \qquad (13)$$

X	:	Export
I	:	Import
P	:	Price
T	:	Trend
Z	:	Policy Influence
c	:	Commodity Index
r	:	Country/Region Index

It is obvious, that the factors influencing export and import are the same as those influencing supply and demand in the basic model, since export and import are the residual of supply and demand. The model structure is in line with similar models constructed for the vegetable and fruit sector. Model parameters were mainly chosen from the most recent and comprehensive quantitative studies on fruits and vegetables. Since exports and imports fluctuate considerably a three-year average is chosen as "base year" (1985-1987). This average was chosen because it is the most up-to-date base period for which a consistent and complete data base can be constructed.

- Information on trade in individual products will be derived using the base year share and/or the projected share of individual products in exports or imports of the product aggregates.

The computer programmes with which the two models were solved are written in FORTRAN and are included in the Appendix A: Computer Programmes of the World Trade Model.

Abbreviations :

S	:	Supply
$S_{c,r}$	:	Supply of the commodity c in the region r
$S^{0,0}$	:	Supply without trend influence and no price adjustment
$S^{1,0}$	:	Supply with trend influence and price adjustment
$S^{1,1}$	:	Supply with trend influence and price adjustment
$S^{1,1}{}_{c,r}$	:	Supply of commodity c in region r with trend influence and price adjustment
D	:	Demand, which is the sum of human consumption, industrial use, seed demand, feed demand, other demand and waste
$D_{c,r}$	:	Demand of the commodity c in the region r
$D^{0,0}$	:	Demand without trend influence and price adjustment
$D^{1,0}$	:	Demand with trend influence and no price adjustment
$D^{1,1}$	:	Demand with trend influence and price adjustment
$D^{1,1}{}_{c,r}$	:	Demand of commodity c in region r with trend influence and price adjustment
ST	:	Stocks
$ST^{0}{}_{c,r}$	:	Stocks of the commodity c in the region r in the previous year
$ST^{1}{}_{c,r}$	:	Stocks of the commodity c in the region r in the current year
ΔST	:	Stock changes
$\Delta ST^{0}{}_{c,r}$	:	Stock changes of commodity c in the region r in the base year
$\Delta ST^{1}{}_{c,r}$	:	Stock changes of commodity c in the region r in the simulation period
$Ex_{c,r}$	:	Exogenous stock changes of commodity c in the region r

N	:	Net trade
N_c	:	World net trade
$N_{c,r}$	:	Regional net trade
$N^{0,0}{}_{c,r}$	:	Net trade of commodity c in the region r without trend influence and price adjustment
$N^{1,0}{}_{c,r}$	:	Net trade of commodity c in the region r with trend influence and no price adjustment
$N^{1,1}{}_{c,r}$	:	Net trade of commodity c in the region r with trend influence and price adjustment

c,c'	:	Commodity subscript
r	:	Regional subscript
1,1	:	The first upper subscript stands for the trend influence; the second upper subscript stands for price adjustment; (0: trends are not considered; price isn't adjusted; 1: trends are considered; price is adjusted)

τ	:	Price-Transmission elasticity (t^S,t^D with respect to supply and demand)
ε^S	:	Supply elasticity
ε^D	:	Demand elasticity
α	:	Stock elasticity with respect to supply changes
β	:	Stock elasticity with respect to demand changes
γ	:	Elasticity of stock demand with respect to price changes

ΔP^1	:	The unknown undelayed world market price change
P^0	:	The known base-year world market price
P^1	:	The unknown world market price after adjustment
ΔPSE^0	:	The change in producer price wedge (PSE)
ΔCSE^0	:	The change in consumer price wedge (CPSE)
PPI^0	:	The known base-year internal producer price (incentive price)
PCI^0	:	The known delayed internal consumer price (incentive price)
PM^0	:	The known base-year market price

4.2 Specification of the World Trade Model

In this chapter the theoretical background and the operational procedures for the empirical specification of variables and parameters of the WTM model will be discussed. All the model variables and parameters are presented in detail in the Appendix B: Database of the WTM model.

4.2.1 Statistical Data

Basic to a multi-country trade model is the set up of an ex-post data base which is comprehensive and ensures flexibility for the further development of the trade model. The steps to create the ex-post-data base are described in this chapter, whereas more detailed information on the data sources are discussed in Chapter 4.3.

A data system with the following main characteristics has been established:

- The main agricultural products in international trade are covered. The commodity breakdown takes into account that in some commodity groups trade in processed commodities is of considerable importance. Therefore, products mostly of the first processing level are included.
- The main data base of the system are FAO (Food and Agriculture Organization) production and trade statistics with Supply-Utilization Accounts (SUA) as the central part. This also ensures easy updating as the FAO provides regular updates on magnetic tape.
- The data are stored as a set of tables, each table being defined for a special world region, a special year and a special type. Products are stored as table lines, product elements as table columns. The data are arranged in a hierachical structure for the definition of product categories (primary products and derived products, product groups) and the regional break down. This allows easy and flexible aggregation, which is necessary for the model. Each aggregation procedure and/or data "treatment" generates new tables. This ensures full transparency of data origin, data processing and data flow.
- Completeness checks (time, regions, product coverage) and consistency checks are carried out at various levels of aggregation to ensure a reliable data base (see Chapter 4.4).

The time series for most commodities are managed in the form of supply/utilization accounts (SUAs). Each SUA consists of the essential elements regarding the origin or the use of a special commodity. Concerning the SUAs, one has to distinguish accounts containing information on primary commodities from those containing data on derived commodities. The derived products are linked to the primary products by extraction rates and conversion factors, respectively.

The trade domain covers export and import statistics in physical and in valued form. For all countries the value of trade is expressed in US$. For this purpose the national currencies have to be converted using an average annual exchange rate, which in general will be supplied by the International Monetary Fund (IMF). As published in the FAO Trade Yearbook, in most cases export values are f.o.b. and import values are c.i.f.. For the countries, where export and import values are both on f.o.b. base, the f.o.b. value has to be converted into c.i.f. by an assumed standard conversion factor of 112 percent.

For any trade model, a central decision concerns the selection of a most appropriate reference price. Having in mind the theoretical concept of this model and data availability, there exist two options:

❒ to use representative world market prices from literature or

❒ to rely on calculated import and export unit values to serve as reference prices.

Representative world market prices are published for various quality standards and locations and, therefore, show significant differences. Thus it is difficult to select the most appropriate reference price for our modeling purposes.

Using unit values avoids the problem of reduced comparability due to quality differentiation. As an aggregate term, they represent the average quality and cover the various levels of processing within a product group. Furthermore the unit values can be computed for almost all commodities covered in the WTM data base and technical realization is much easier using unit import and export values, because they are easily accessible from FAO trade domain.

In general unit values were considered - the most exhaustive and appropriate data source for our modeling purposes - and were chosen to be used as reference prices in the WTM model, but if not available or not plausible representative prices from literature were chosen.

4.2.2 Elasticities

Elasticities are an integral and critical element of any multi commodity trade model, because they reflect the response of supply and demand of each country/region to price changes resulting from changes of shift factors on the supply and demand side as well as from policy changes.

Principally, the specification of elasticities has to rely on empirical investigations. These can be based on analyses of different type, to mention are especially econometric time series and/or cross section analysis, the derivation of supply functions from representative farm models or agricultural sector models. An original, econometrically based estimation of complete sets of supply and demand elasticities for multi-commodity trade models becomes very time consuming and difficult, when models have a wide regional and commodity coverage. Therefore, many researchers rely on the broad variety of existing estimates from literature, as it is done for example in USDA's Static World Policy Simulation (SWOPSIM) framework and in the Ministerial Trade Mandate (MTM) model of the OECD. Our WTM model is as well a synthetic model.

The choise of elasticities is difficult for countries or regions, where the WTM definition differed considerably from the consulted other studies. There, a flexible approach had to be followed, depending on the available information. In some cases, elasticities for individual countries were available and could be aggregated according to their importance in the aggregate. In other cases due to different country coverage, figures for single countries were found, but they did not cover all the individual countries needed to compute elasticities for our regional breakdown. Further, in many cases only elasticities for aggregate regions were available.

As a consequence the following principles were applied to chose elasticities for countries or regions, where the WTM definition differed considerably from the consulted studies:

- weighted aggregates of several country aggregates were constructed
- in some cases, the elasticities of a regional aggregate were taken over for an individual country
- in other cases the elasticities of an individual country were taken over for a regional aggregate, if it complied a considerable share of the aggregate.

The level of commodity aggregation is also different across studies. Therefore, elasticities of commodities and commodity groups have to be transferred to the aggregation level needed in the GAP study. These procedures are applied within the cereals, pulses and oilseeds group.

Elasticities are stored in a separate easily accessible "Input Elasticity File". These sequential files use a standard format and can be edited by any system editor.

4.2.3 Policy Assumptions

Trade policy assumptions are incorporated in the WTM model via price transmission elasticities and price wedges (PSE/CSE).

Price transmission elasticities specify barriers to trade by characterizing the degree of connection of domestic and world market prices. Price transmission elasticities are usually bounded by 0 and 1. A fixed-price policy in a country for example would be implemented by a price transmission elasticity of 0. In other words, a change in the world market price would not cause any change in the domestic price. On the other hand, a free market policy is characterized by an elasticity of 1. In this case a change in the world market price is fully transmitted to the domestic market causing a comparable change in the domestic price.

Price transmission elasticities have not explicitely been estimated for our modeling exercise, they are assumed on the bases of estimates from literature. The subject of price transmission elasticities is, as mentioned, an area of disagreement among economists. Some of the areas where studies disagree are for example the need for shortrun and longrun estimates, separate estimates for producers and consumers, separate estimates for upward and downward price movements, separate estimates for importers and exporters, or figures to be bounded by 0 and 1.

To calculate price wedges in the WTM model the Producer and Consumer Subsidy Equivalent (PSE/CSE) concept used by the OECD and SWOPSIM has been considered.

This concept has been developed by Josling and adopted by the OECD and SWOPSIM. It summarizes, in a single quantitative indicator, the level of assistance to farmers resulting from a wide variety of agricultural support policies and programmes. The PSE is defined as the payment that would be required to compensate farmers for the loss of income resulting from the removal of a given policy measure. The CSE corresponds to the implicit tax on consumers resulting from a given policy measure.

Two basic methods for measuring agricultural assistance have to be distinguished. One is to measure the price wedge between the domestic price and an observed border or world market price. For other less market oriented policies, direct or implicite budgetary payments to agriculture are measured.

Policy coverage defined in OECD PSE calculations:

Policies Included:	*Policies Excluded:*
Market price support	Administrative costs
Direct income support	Social Security benefits
Indirect income support	
Extention and research	
Structural policies	
Sub-national measures	

4.2.4 Trend Developments

The behavioral equations for both, production and demand contain trend parameters besides the price elasticity parameters. The basic idea behind this distinction is to seperate the effects of price changes from those of shift factors. As known from economic theory, the impact of price changes are represented by a move *on* the production/demand curve, whereas shift factors cause a move *of* the production/demand curve itself.

Most relevant shift factors for the supply and demand functions are:

- Technological change and input change with regard to supply.
- Population growth and per-capita income growth with regard to demand.

Because of time constraints and the lack of data and regional background information the identification of the influence of shift factors was only partly possible.

For Turkey trends of supply and demand could be directly taken from the crop pattern model, for all other countries trends for aggregated demand as well as for aggregated production were calculated as a starting point in order to represent the influence of the shift factors as a whole. The trends were estimated based on the reference period 1970-88. A best-fit trend was selected according to either Theil coefficient or determination coefficient as statistical criteria. However, each of the trends resulting from this procedure was further checked for plausibility using the following guidelines:

- Are there obvious changes in trend during the reference period?
- Are there extreme values or variations that disturb trend estimation?
- Do the trends of interrelated items correspond (e.g. livestock production and feed demand)?
- Are the expected gaps between production and demand at the world level acceptable?

In cases where inplausibilities according to these guidelines were very obvious, other functional forms and reference time periods were tested to obtain more plausible results. If the new estimates appeared more plausible and the statistical values did not differ too widely from the trends chosen first, the new results were used.

For the demand side additional trend calculations were carried out by identifying the influence of the shift factors population growth and income growth.

Finally, for important commodities and important regions WTM-projections based on the trend estimates were compared with projections from other institutions.

4.3 Data Base of the World Trade Model

Though all the data needed for a trade model are not covered by the data base of one single institution, the FAO data are considered the most exhaustive and adequate main data source for the purposes of the WTM model. It has to be supplemented by data from other sources, which are mainly used for consistency checks and as parameters in the model.

In the FAO data base all countries of the world (about 250 countries) and a wide range of commodities at different processing levels are included. From this extensive data base the basic data system of the WTM model was constructed using various selection and aggregation procedures.

According to the FAO data description most of the data are based on official sources. The data have been either supplied by governments directly, or additionally annual, quarterly and monthly questionnaires have been used to obtain the required data. The FAO data are complemented by statistics from various other sources. Common sources are national publications, data banks of other international organizations and national institutions (Statistical Office of UN, USDA, IMF), as well as reports from FAO field officers. Data for the EC member states in particular are supplied by EUROSTAT.

As mentioned by FAO there are significant differences in the source and quality of the statistics according to the commodity and commodity group, respectively. For cereals, for instance, official statistics and estimates account for a much higher percentage than for any other commodity group. Eventhough most countries have improved their national agricultural statistics during the last years, FAO estimates account for a high share of the data on domestic utilization elements of particular commodity accounts. Especially for the processed product accounts FAO estimates represent a high proportion of the data set, but details are not given on the exact percentage of estimates for different commodity groups.

For the commodity groups fruits and vegetables FAO data are not sufficient for model analysis. The basic source for these commodities are statistical data from the United Nations Statistical Office concerning imports and exports of fruit and vegetables in metric tons and in values. These data are supplemented by export data from Turkey to derive information at a more detailed commodity level.

In addition to model variables data on model parameters like elasticities and price wedges are required.

The main sources for *supply and demand elasticities* for the WTM model are the SWOPSIM (Static World Policy Simulation Model) of the USDA and the OECD (Organization for Economic Cooperation and Development) MTM Model (Ministerial Trade Mandate). Other sources (the FAO World Food Model, the Anderson & Tyers Model of an Australian University) were used for the purpose of comparison and to fill up missing values. The following rules for selecting elasticities from the different sources were employed:

- The SWOPSIM database was the main source of elasticities for the USA, the developing countries and in the case of some commodities also for other industrialized countries.
- For some commodities in developing countries FAO data were chosen.
- For industrialized countries, other than the U.S., elasticities from the MTM model were consulted as another basic source.

Export supply and import demand elasticites for the fruit and vegetable model were taken from models by the USDA and IFPRI (International Food Policy Research Institute).

For stock elasticities the only available source is the World Food Model developed by the FAO. Only a relatively small commodity group is covered. Stock elasticities are available for cereals, rice, dairy products, oils as an aggregate and oil meals as an aggregate. Products like sugar and livestock products are not covered.

As described in Chapter 4.2.4 *trend parameters* are based on own estimates. Since trend parameters are a very crucial element for the model results, they were cross-checked with projections of other organisations like the WORLD BANK, CARD/FAPRI, SWOPSIM and a model by IFPRI. In the case of the fruit and vegetable model projections of IFPRI were used for comparison. For the demand side the influence of the underlying shift factors (population growth, income growth) were explicitly taken into account.

As for supply and demand elasticites the SWOPSIM model is the major source for *policy parameters* (price transmission elasticites, PSE/CSE). In the case of price transmission elasticites, SWOPSIM data was complemented by elasticities from the Anderson & Tyers model, which seemed to be more adequate for some products and countries. For the fruit and vegetable model policy data were taken from the IFPRI study.

Though all the data needed for the WTM model can not be derived from one single model or study, the SWOPSIM data base proved to be the most exhaustive and useful source for our modeling purposes. This is due to three major features:

- the very broad commodity and country coverage,
- the SWOPSIM model, which is itself a synthetic model, has consulted a wide range of models in the construction of its data base,
- critical testing of model parameters.

Some problems arised with regard to the regional and product disaggregation of the WTM model since it differs somewhat from the disaggregation of the models, from which the model parameters were derived. Therefore, aggregation procedures had to be employed and in cases where model parameters were missing for individual countries or products they were taken over from countries/products with similar characteristics.

4.4 Test and Fine Tuning of the World Trade Model

This chapter intends to give an overview of the applied measures to guarantee reliable model results. Three levels can be distinguished at which various tests were employed to improve the quality of the model:

- Design of the model structure,
- Establishment of the basic data system,
- Model simulations.

4.4.1 Design of the Model Structure

During the design of the model structure it is important to include all major factors influencing the developments in the particular world commodity markets. The importance of individual determinants can be tested by ex-post model runs with and without these factors and by comparing the model results with real developments in the past. This procedure proved to be very useful to find out about the significance of the stockholding equation and the cross-commodity effects in the WTM model. Both the inclusion of the stockholding equation and the cross-price effects improved the ability of the model to predict world market developments considerably.

4.4.2 Establishment of the Basic Data System

The reliability of the basic data system is an indispensable requirement to yield satisfactory model results. Therefore, particular attention was given to completeness and consistency of the data base. As mentioned in previous chapters the basic data system consists of the model variables and the model parameters. For both groups extensive data checks were carried out:

Model variables

For the model variables inconsistencies were identified by comparing the FAO data and the UN data with other data sources (USDA, EUROSTAT) or by checking internal consistency of the data on the basis of inherent identities. Such identities are:

- Supply has to correspond to demand for each product in each country or country group, taking into account the other positions of the SUA's (Supply-Utilization-Account) like imports, exports etc..
- Production of a processed product has to be equal to the input of the primary product multiplied with the extraction rate.
- World exports should be identical to world imports

Completeness checks dealt with completeness of product elements (e.g. extraction rates) and time series.

A common problem with changes to the data base due to incomplete data is the fact that these changes can again affect the consistency of the data base. Therefore, the principles to complete data and to ensure data consistency were built up in the following way:

- In a first step all Supply and Utilization Accounts (SUAs) as well as the extraction rates of the FAO data base were checked for consistency. Necessary changes were made to the accounts and the extraction rates.
- In a second step it was tried to identify incomplete time series. Based on the fact that already consistent SUAs should not be affected by changes, completion of time series was only considered if all SUA elements of a specific year contained zero values.
- Finally some missing product elements like unit values and extraction rates had to be calculated from other existing data.
- For both consistency and completeness, modification of data were only realized for those product elements that did not affect the interrelationship between primary products and processed products. If a trade balance at the world level was not fulfilled, changes to the data base preferably affected exports and imports to narrow the gap at the world level. Remaining imbalances at the world level were corrected via stock changes. A further guideline for the modification of the data base was the fact that production data are usually more reliable than utilization figures.

Model parameters

The WTM model is a synthetic model, that uses information from various other models to derive its model parameters. Taking model parameters from a variety of statistical and literature sources can lead to severe problems unless a careful selection procedure is chosen.

A precondition for a careful selection is an indepth-study of the sources from which the parameters are chosen. Only those sources should be taken into consideration, for which a detailed documentation with regard to the parameter composition exists, the underlying assumptions are clearly stated and the model parameters are not outdated. Furthermore it should be avoided to use too many different sources because usually it can be assumed that parameter sets of a model have some kind of internal consistency.

Once reliable sources have been identified, further tests can be used to check some crucial model parameters. This applies in particular to supply and demand elasticities and the trend parameters.

Supply and demand elasticites were submitted to tests derived from economic theory to ensure consistency:

Symmetry condition

The symmetry condition can be expressed by

$$E_{ij} * (p_i * x_i) = E_{ji} * (p_j * x_j)$$

where E_{ij} is the price elasticity of product x_i with respect to price p_j of product x_j and vice versa for E_{ji}.

To ensure that the compiled set of elasticites does not violate the symmetrie condition only one triangle of the elasticity matrix is initially filled up and the elasticities in the remaining triangle are generated using the above mentioned equation.

Homogenity condition

The homogenity condition for the supply elasticites can be expressed as

$$E_{i1} + E_{i2} + \dots + E_{in} = 0$$

This equation simply states that, when taking into consideration all variable outputs and inputs, the sum of all price elasticities should equal zero. That means that the output-supply and factor demand functions according to prices are homogeneous of the degree zero.

For consumer demand, the homogenity condition can be expressed by

$$E_{i1} + E_{i2} + \dots + E_{in} + E_{iy} = 0$$

where E_{iy} = income elasticity of product i.

This means that the sum of all price elasticities and the income elasticity should be zero for demand.

Since no inputs and not all outputs are considered in the WTM model, the homogenity conditions has to be modified as follows:

$\Sigma (E_{ij})$ > 0 for supply

$\Sigma (E_{ij}) + E_{iy}$ < 0 for demand

The sum of the price elasticites in each supply equation should be greater than zero, while the sum of the price elasticities and the income elasticity in each demand equation should have a negative value.

In summary, calibrating the elasticities should help to obtain a consistent set of elasticities.

Particular emphasis was given to the compilation of the *trend parameters* since they are of crucial importance for the forecasting ability of the model. A variety of sources was collected to provide a sound basis for the parameter selection:

- own trend estimates based on ex-post time series,
- own trend estimates for the demand side based on an explicit consideration of the shift factors population growth and income growth:

$$T_i = (1 + W_{Pop}) * (1 + (E_{iy} * W_{GDP}))$$

with

T_i	=	Trend parameter for commodity i
W_{Pop}	=	Population growth

W_{GDP}	=	Per capita income growth
E_{iy}	=	Income elasticity for commodity i,

- projections of other models (WORLD BANK, CARD/FAPRI, IFPRI),
- background information from the ex-post world market analysis.

The various sources were cross-checked and the most plausible trend parameters were selected for each country and commodity.

Finally, for all the model parameters extensive sensitivity tests were undertaken to examine their impact on prices, production, consumption and trade adjustment. Criteria for the evaluation of sensitivity tests include the plausibility of results in terms of direction and magnitude of change for each commodity and region, as well as the stability of the results. Another aspect to be checked is the plausibility of cross-commodity effects.

4.4.3 Model Simulations

Once it is ensured that all relevant factors have been included in the model and a consistent and complete data base exists, model simulations can proceed. At this stage it is important to compare the model results with ex-post developments and results of other trade models. If significant differences exist the reasons should be traced back. Usually the discrepancies can be found among the model parameters. If it appears plausible, further modifications are made to the model parameters before the final simulations are carried out.

In general the model results of the WTM model did correspond rather well to past developments and other level of model results. In particular the WTM model seems to be very reliable with regard to the prediction of the relative price differences among commodities. More uncertainty exist with regard to the absolute magnitude of price changes, which is, however, a common problem of world trade models. Based on the extensive study of past market developments we found most of the other model results to be too optimistic and did, therefore, retain our somewhat lower model results. Furthermore most of the other models did not take into account the more recent developments in the world economy and actual changes in agricultural policies.

For the policy simulations it was possible to build up on the long experience with previous versions of the WTM model in this field. The results of the WTM policy simulations are, therefore, very much in line with outcomes from other trade models and trade policy theory.

In summary it should be stressed that a wide variety of measures was taken to improve the ability of the WTM model to predict developments in the commodity markets. Because of the broad country and product coverage of the model as well as the uncertainties that always remain in the world economy it is of course impossible to exclude inaccuracies. Nevertheless it is hoped that by the test and fine tuning of the model the factors that could cause implausible results are minimized.

4.5 Scenarios for the Model Runs

4.5.1 Background: International Agricultural Policies

Almost all governments in the world intervene in the determination of agricultural production and prices. Main objectives of agricultural policies in the world are:

- to guarantee a safe, secure and sufficient supply of food for domestic consumers at reasonable prices,
- to ensure a satisfactory and stabilized income of farmers,
- to improve regional developments and to protect the environment,
- and - mainly in developing countries - to increase agricultural exports to improve the balance of payments.

Agricultural trade policies are designed to fulfill these domestic policy objectives. On the other hand the domestic policies themselves, through their impact on production and consumption, generate major effects on trade. The degree of intervention in the agricultural sector is very much determined by the overall economic system (market economies, centrally planned economies). Other important determinants for the various agricultural measures are the natural resources and the strength of the farming and the food processing industry lobby.

The priority given to the various objectives and the nature and extent of measures affects the domestic situation but also the international obligations and the size of a country's trade in relation to the world markets. Many countries are both net-importers and net-exporters in agriculture depending on the commodities.

When a country is net-importer of a commodity national measures are applied to control imports, to increase domestic agriculture, to improve the balance of payments and food security. Exporting countries are primarily trying to increase exports and use measures like export subsidies, deficiency payments and two price systems to compensate farmers when world market prices are low. Sometimes production controls (set-aside programmes) are used to stabilize quantities and prices of agricultural products.

The major traded agricultural products in the world are cereals, livestock products, oilseeds and their processed products and sugar. Apart from sugar, developed countries are the major exporters of these products, whereas very few developing countries are overall net exporters. The developed countries or country groups which are dominating international agricultural trade policies are the USA, Canada, Australia/New Zealand, the EC, Japan and the EFTA-Countries. The main characteristics of their most recent policies are as follows:

USA

With the food security act of 1985 agricultural policies were changed significantly, support prices were reduced, domestic farm incomes were supported by direct budgetary payments, the subsidization of exports was introduced via EEP (Export Enhancement Program) and TES (Targeted Export Adjustment Program) and the incentives for stock accumulations were reduced. Farmers' incomes were maintained by large deficiency payments. The U.S. has also continued to use and intensify a number of quantitative import restrictions.

Canada

Canada's agricultural sector is largely export oriented. During the last few years subsidies have increased substantially as a result of both the rapid decline in world market prices and the subsidy policies of the USA and the EC. Canada has also used duties on beef imports from the EC and corn imports from the U.S market to protect the own producers.

Australia/New Zealand

Agriculture in Australia and New Zealand receives relatively little support from government programmes. Both countries want to reduce the assistance economy wide in accordance with the overall government policy. In Australia significant support is given to the dairy industry and minor products such as vine fruits and tobacco. In New Zealand agricultural support policies are characterized by subsidized credits, direct price supports and some tax concessions.

EC-12

In the European Community the Common Agricultural Policy (CAP) provides the main framework for agricultural support, which is determined by domestic price support with intervention and stock holding, variable import levies and - resulting from growing surpluses - expanding export subsidies. The high costs of this policy and the problems with exporting surpluses lead to reform measures of the agricultural policy. In the last few years price restraints, a guarantee threshold, set-aside-programmes and reduction of intervention obligations were introduced. Border protection is lowered for some countries by tariff preferences. On the other side sanitary and phytosanitary regulations are sometimes used to restrict imports as also done by the U.S.. Severe problems on international markets result from the export subsidy policy of the EC.

Japan

Japan supports agricultural production heavily. Producer prices are set at a high level to encourage production and to ensure adequate incomes to farmers. Despite recent reductions in the administered prices of all major products, import restrictions have raised the domestic prices to up to ten times of the world market prices. Other main budgetary spendings for agriculture are related to structural policies and rural infrastructure development. Japan reached some bilateral agreements with the United States and Australia in the last years on lower import restrictions. Access to the Japanese agricultural market, however, remains a major issue of international policies.

EFTA

The members of the European Free Trade Association (EFTA) provide extensive support for their agricultural sectors through quotas on domestic production and variable levies on imports. The dairy sector is an important sector in all of these countries, meat production is also important in the Scandinavian countries, whereas Austria has a surplus production of grains.

Developing Countries

The group of developing countries is very heterogenous. In these countries domestic support measures are essential, such as the supply of inputs at reasonable costs, research and extension services, availability of cheap credits, adequate agricultural prices and favourable treatment of exports. Also import restrictions are sometimes necessary to stimulate domestic agriculture and to reach higher food security.

As seen in this short overview agricultural policies in the world are very heterogenous. These existing policies are the base line of the following international agricultural policy scenarios.

4.5.2 Base Scenario

The base scenario of the model is characterized by status quo on agricultural policies as discussed in Chapter 4.5.1 and trends which are based on the various shift factors of supply and demand.

Status quo of agricultural policies means a continuation of national agricultural policies with high levels of support by most of the important participants in agricultural trade. Agricultural support is characterized primarily by market price support, direct and indirect income support and structural policies with different levels in the various countries or country groups. These policies are incorporated in the WTM model via price transmission elasticities and price wedges (PSE/CSE).

In the base scenario run we assume, that price transmission elasticities will stay at the same level as in the base period (1987). Also price wedges will not change. Detailed information regarding the values of these coefficients is included in the Appendix B: Database of the WTM model. The supply and demand elasticities remain unchanged in the projection period, too.

Additional to the policy and elasticity assumptions trend developments of supply and demand are considered in the world market model system. The assumptions on trend developments are based on own trend estimates and the world market analysis prepared by Kersten (Working-Paper I/5.1) for individual countries and regions. These trend developments have been cross-checked with forecasts from the WORLD BANK, FAPRI/CARD and other publications. An overview of the trend parameters used in the model is given in the Tables 4.5.2.1 to 4.5.2.5. Detailed information can be found in Appendix B: Database of the WTM model.

It should be noted that the following discussion is not referring to the model results, but to the supply and demand shifts as they could be observed in the past and will probably prevail in the future. In the model supply and demand are afterwards brought to an equilibrium via the price clearing function and calculating supply and demand depending on price changes.

All trend developments discussed in this chapter with respect to Turkey do not include the changes of agricultural production after implementation of the GAP irrigation projects. The discussed supply and demand developments are only a guideline for expected changes according to the same development as in the past. Model results for Turkey and the GAP region after implementation of GAP irrigation projects are discussed in Chapter 5.

Table 4.5.2.1: Growth Rates of Cereal and Sugar Supply and Demand in Country Groups 1987-2010

	Growth rates of supply (%)					
	WHEAT	BARLEY	MAIZE	OTHER CEREALS	RICE	SUGAR
EC	1,34	-0,22	1,00	-0,19	0,82	0,45
NA	1,63	1,29	1,20	0,50	2,00	0,49
AUS/NZ	1,60	1,60	2,10	1,60	2,20	1,10
RWE	1,01	1,17	0,20	-0,20	0,00	0,78
LA	2,00	0,50	3,50	1,80	1,80	1,80
ME	2,44	1,90	1,15	0,10	2,18	1,05
RAS	2,77	0,03	2,61	0,88	2,17	2,73
NAF	1,95	1,54	1,50	1,47	1,79	2,40
RAF	2,37	2,08	2,07	2,10	2,10	1,95
TUR	1,50	1,90	2,50	1,00	0,00	1,00
USS	1,30	1,50	1,40	1,50	2,00	1,50
EE	1,26	1,23	1,75	0,57	1,34	0,80
WOR	1,87	0,98	1,87	1,05	2,07	1,62

	Growth rates of demand (%)					
	WHEAT	BARLEY	MAIZE	OTHER CEREALS	RICE	SUGAR
EC	1,00	0,20	0,80	-0,17	1,00	0,26
NA	1,48	0,50	1,49	0,66	1,70	0,40
AUS/NZ	1,20	1,00	0,90	1,00	2,00	1,10
RWE	0,68	0,35	1,50	0,06	0,19	0,03
LA	2,30	2,00	1,80	2,20	2,30	1,70
ME	3,13	2,95	3,08	1,04	2,91	2,85
RAS	2,76	0,81	2,61	1,09	2,44	2,64
NAF	2,60	2,19	2,45	2,19	2,60	2,69
RAF	2,57	2,25	2,29	2,48	2,39	2,47
TUR	1,90	1,90	2,50	0,50	2,20	1,50
USS	1,20	1,00	1,40	1,10	1,50	0,80
EE	1,57	1,37	1,50	0,86	0,75	0,86
WOR	1,95	0,97	1,77	1,06	2,46	1,53

EC	European Community	NAF	North Africa
NA	North America	RAF	Rest of Africa
AUS/NZ	Australia/New Zealand	TUR	Turkey
RWE	Rest of Western Europe	USS	Soviet Union
LA	Latin America	EE	Eastern Europe
ME	Middle East	WOR	World
RAS	Rest of Asia		

Table 4.5.2.2: Growth Rates of Oilseed (-products) and Oliveoil Supply and Demand in Country Groups 1987-2010

	Growth rates of supply (%)									
	SOYA	SOYOIL	SOYCAKE	SUNFLOWER	SUNFL.OIL	SUNFL.CAKE	GROUNDNUT	GRN.OIL	GRN.CAKE	OLIVEOIL
EC	2,00	2,00	2,00	1,64	1,64	1,66	1,00	1,00	1,00	1,24
NA	1,79	1,79	1,79	1,98	1,98	1,99	1,10	1,10	1,10	1,00
AUS/NZ	1,50	1,50	1,50	2,00	2,00	2,00	1,00	1,00	1,00	1,00
RWE	0,00	1,50	1,50	0,80	0,80	0,80	0,00	0,00	0,00	1,00
LA	2,40	2,40	2,40	2,50	2,50	3,00	0,40	0,40	0,40	2,00
ME	3,00	2,25	2,24	1,39	1,31	1,28	1,15	0,50	0,50	0,51
RAS	2,18	1,81	1,85	3,99	4,11	3,92	2,33	2,36	2,36	2,80
NAF	2,50	2,50	2,50	2,64	2,70	2,69	1,32	0,70	0,70	2,16
RAF	2,56	2,60	2,61	1,36	1,27	1,36	0,69	0,69	0,69	0,00
TUR	2,50	2,50	2,50	3,00	3,00	3,00	3,00	3,00	3,00	1,50
USS	1,50	2,50	2,50	1,50	1,50	1,50	2,50	2,50	2,50	0,00
EE	2,50	2,50	2,50	1,77	1,74	1,74	1,88	1,40	1,40	0,95
WOR	1,95	1,99	2,05	2,02	2,07	2,18	1,87	1,92	1,93	1,31

	Growth rates of demand (%)									
	SOYA	SOYOIL	SOYCAKE	SUNFLOWER	SUNFL.OIL	SUNFL.CAKE	GROUNDNUT	GRN.OIL	GRN.CAKE	OLIVEOIL
EC	1,15	0,75	2,26	1,85	0,92	2,37	1,06	0,63	0,78	1,37
NA	1,60	1,78	1,73	2,37	1,68	1,58	1,42	1,79	1,40	1,02
AUS/NZ	2,00	1,20	3,00	2,00	2,00	1,00	1,00	1,00	0,00	2,00
RWE	1,82	0,53	0,62	1,90	0,19	1,40	0,50	0,50	0,20	0,85
LA	3,40	3,20	3,00	3,50	2,90	3,00	-0,20	0,20	0,00	2,00
ME	3,16	3,01	3,88	1,39	3,13	2,45	1,86	1,13	1,88	1,33
RAS	2,60	2,90	2,57	3,77	4,01	3,30	2,51	2,55	2,61	2,70
NAF	3,99	3,23	4,00	3,39	3,72	2,84	1,96	0,00	0,50	2,42
RAF	3,38	3,22	4,00	2,25	3,00	1,42	0,81	0,82	0,64	2,87
TUR	3,00	3,00	3,50	3,00	3,00	3,00	2,80	2,80	2,70	2,50
USS	2,80	2,20	3,20	2,50	2,00	2,00	2,50	2,50	1,50	2,00
EE	2,60	1,16	2,36	1,57	1,60	2,09	1,86	1,67	1,00	1,38
WOR	2,14	2,32	2,35	2,60	2,21	2,36	2,02	2,07	1,98	1,54

Table 4.5.2.3: Growth Rates of Pulses, Potatoes, Tobacco and Cotton Supply and Demand in Country Groups 1987-2010

	Growth rates of supply (%)					
	LENTILS	CHICKPEAS	DRYBEANS	POTATOES	TOBACCO	COTTON
EC	0,31	0,35	0,52	-0,22	0,87	0,52
NA	0,30	0,00	0,00	0,15	0,00	1,20
AUS/NZ	0,00	0,00	1,00	1,20	0,00	2,50
RWE	0,00	0,00	0,00	-0,71	0,00	0,00
LA	1,00	0,70	0,50	1,10	1,00	0,90
ME	0,63	1,80	0,33	2,94	0,82	0,70
RAS	2,25	1,43	0,40	1,84	1,94	1,74
NAF	0,53	0,15	0,67	3,23	1,06	1,21
RAF	1,10	1,10	0,90	2,43	1,31	1,53
TUR	2,50	2,50	3,00	2,20	0,30	1,10
USS	1,00	0,00	0,00	1,50	1,00	-0,40
EE	1,52	0,00	0,00	0,30	0,20	-0,31
WOR	1,83	1,47	0,54	0,91	1,32	1,14

	Growth rates of demand (%)					
	LENTILS	CHICKPEAS	DRYBEANS	POTATOES	TOBACCO	COTTON
EC	1,16	0,47	1,28	0,13	-0,09	1,36
NA	1,17	0,50	1,50	0,81	0,03	0,92
AUS/NZ	2,00	0,50	1,00	0,70	0,50	1,40
RWE	0,01	0,00	0,00	0,03	-0,49	1,35
LA	2,30	1,00	1,00	1,80	0,50	1,20
ME	2,84	2,72	1,50	2,97	2,22	2,57
RAS	2,55	1,57	0,50	2,43	2,22	1,65
NAF	2,56	2,41	1,56	3,49	2,58	1,95
RAF	3,00	2,50	1,20	2,64	1,77	1,90
TUR	3,50	3,00	2,00	2,50	1,00	1,50
USS	1,50	0,00	0,00	0,60	0,50	0,20
EE	0,99	0,80	0,50	0,60	0,67	0,51
WOR	2,50	1,69	0,91	1,05	1,37	1,32

EC	European Community	NAF	North Africa
NA	North America	RAF	Rest of Africa
AUS/NZ	Australia/New Zealand	TUR	Turkey
RWE	Rest of Western Europe	USS	Soviet Union
LA	Latin America	EE	Eastern Europe
ME	Middle East	WOR	World
RAS	Rest of Asia		

Table 4.5.2.4: Growth Rates of Fruit and Vegetable Export and Import in Country Groups 1987-2010

	Growth rates of export (%)			
	FRESH VEG.	PROC. VEG.	FRESH FRUIT	PROC. FRUIT
EC	1,30	1,59	1,64	1,85
NA	0,62	0,76	1,00	0,11
AUS/NZ	2,00	2,50	1,50	2,00
RWE	0,24	0,04	2,23	1,32
LA	1,50	3,50	1,50	2,00
ME	1,16	2,21	2,00	2,05
RAS	3,24	3,07	2,52	2,93
NAF	2,22	2,09	1,52	1,00
RAF	3,14	2,50	1,85	2,66
TUR	2,70	2,70	2,70	3,00
USS	1,00	1,00	1,00	1,00
EE	1,33	1,17	1,36	1,38
WOR	1,52	1,92	1,74	1,88

	Growth rates of import (%)			
	FRESH VEG.	PROC. VEG.	FRESH FRUIT	PROC. FRUIT
EC	2,58	2,31	2,33	2,23
NA	2,69	2,90	2,90	2,50
AUS/NZ	4,20	4,20	2,50	2,50
RWE	2,48	2,00	2,00	2,50
LA	3,50	4,20	4,00	4,00
ME	3,03	3,06	3,02	2,98
RAS	3,73	3,73	3,79	3,76
NAF	3,72	4,09	3,00	2,11
RAF	4,00	4,00	4,14	4,08
TUR	4,20	4,20	5,00	4,50
USS	3,00	3,00	3,20	3,20
EE	3,70	3,70	3,30	3,30
WOR	2,90	2,80	2,79	2,56

Table 4.5.2.5: Growth rates of Meat, Eggs and Milk Supply and Demand in Country Groups 1987-2010

	Growth rates of supply (%)								
	BEEF	PMEAT	MUTTON	POULTRY	EGGS	MILK	BUTTER	MILKDRY	CHEESE
EC	0,16	0,80	1,52	1,30	0,71	0,29	0,29	0,29	0,28
NA	0,41	0,31	0,01	1,62	0,41	1,00	1,00	1,00	1,00
AUS/NZ	0,90	2,10	0,00	2,50	1,00	1,50	1,50	1,50	1,50
RWE	0,30	0,77	1,03	1,50	0,82	0,40	0,35	0,35	0,41
LA	1,30	1,90	0,50	2,60	2,50	2,00	1,90	1,90	1,90
ME	1,27	1,94	2,20	3,32	2,93	2,42	2,55	2,00	2,31
RAS	1,89	2,95	3,62	2,79	3,53	2,67	3,15	1,64	2,88
NAF	2,37	1,70	1,74	2,90	2,50	2,70	2,70	2,70	2,70
RAF	1,91	2,22	1,62	2,59	2,62	2,34	2,31	0,86	1,83
TUR	2,00	0,50	1,00	2,50	3,50	1,30	1,30	0,00	1,30
USS	0,80	1,00	0,60	2,00	1,50	1,30	1,30	1,30	1,30
EE	0,86	0,79	0,61	1,50	1,09	0,94	0,94	0,94	0,94
WOR	0,83	1,60	1,35	2,06	2,13	1,16	0,97	0,86	0,99

	Growth rates of demand (%)								
	BEEF	PMEAT	MUTTON	POULTRY	EGGS	MILK	BUTTER	MILKDRY	CHEESE
EC	0,37	0,86	0,50	1,38	0,49	0,61	0,21	0,14	0,82
NA	0,78	0,89	0,51	2,04	0,50	1,09	0,42	0,22	1,10
AUS/NZ	1,20	1,30	0,80	1,30	0,60	1,50	0,50	0,60	1,70
RWE	0,31	0,52	0,84	0,87	0,64	0,20	0,07	0,05	1,18
LA	1,90	2,30	0,50	2,80	3,00	1,40	1,40	1,20	2,20
ME	3,00	1,62	2,94	3,27	2,90	2,88	3,11	2,29	2,94
RAS	2,84	2,96	3,74	3,07	3,29	2,71	2,82	1,37	2,11
NAF	3,49	2,47	3,57	3,99	3,60	2,55	2,61	2,44	3,01
RAF	2,86	2,40	1,89	2,80	2,86	2,64	1,74	2,75	2,17
TUR	2,00	0,50	1,00	2,50	4,00	2,20	1,30	1,70	2,00
USS	1,00	1,00	0,50	2,00	1,20	1,20	1,20	0,80	1,20
EE	0,88	1,00	0,65	1,84	1,07	1,00	1,21	1,00	1,34
WOR	1,25	1,69	1,64	2,26	2,03	1,25	0,95	0,87	1,13

According to the development in the past *wheat* production will increase by 1.63% p.a. in North America, whereas in some countries of Europe and the former USSR the expected growth rate is below 1.5%. The expansion will be largest in the USA as land-set-aside programmes become less restrictive. On the other side the development of demand differs from the trends in production for most of the countries/country groups. We can observe a lower growth rate in the use of wheat than in production in Europe and North America. Contrary in Turkey wheat production will increase less than wheat demand because the expected population growth is high for Turkey. In many developing countries demand will change with more than 3% per anno. Although production will increase, too, the deficit in self-sufficiency will rise in these countries.

Barley is primarily used for animal feed and brewing. Traditionally most of the world production is found in Europe, the former USSR and Canada. Production will decrease in the EC-12 (-0.22%) and increase in all other countries of the world. The overall growth rate of barley production will be much lower than for wheat. The higher values in the Middle East, Australia, New Zealand and in Asia are only of minor importance since these regions do not produce large quantities. In Turkey the growth rate of barley production and demand will be high. Also high increases in barley demand will occur in the Middle East, North Africa and Latin America. Contrary the demand for barley in the industrial countries will increase only by about 0.5%.

On the *maize* market the increase of production and demand will be in total higher than on the barley market. The expected growth rates of production vary from 1.4% in the countries of the former USSR to 2.6% in Asia. The demand of maize will roughly speaking change in a similar way like barley with low growth rates in the industrial countries and higher rates in other countries. The growth rate for Turkey is expected to reach a level above world average.

The market analysis of *other cereals* includes rye, oats, sorghum and millet. Therefore, the picture of future developments is very different according to the importance of these cereals in specific countries. In Turkey primarily oats and rye are produced and consumed. On these markets supply will increase by 1% per anno and demand by 0.5%.

The *rice* market is very important with regard to human consumption in the world. According to the specific production conditions in the countries of the world differences in the production growth result. The increase in demand will correspond closely to population growth in many countries of the world. More than 90% of rice is produced and consumed in Asia. In these countries there will be a deficite in rice supply due to a lower growth rate of supply (2.17%) in relation to the growth rate of demand (2.44%).

On the *sugar* market production and demand will grow with a low rate in the industrial countries, whereas in Africa and Asia both supply and demand will increase with a rate of nearly 2.5%. Asia and North Africa are projected to remain the main source of increased world demand. Production is affected by government intervention in many countries and will be in line with the slower consumption growth in the world.

In Table 4.5.2.2 the development on the markets of soya, sunflower, groundnuts and oliveoil are presented. On the supply side of *soya* the growth rate will be very high in many regions of the world (2-3%) and the development will be similar at the level of raw and processed products. Differences only exist if in specific countries soya is not produced at all. The demand for soya as raw and processed product will vary much more than on the production side. In industrialized countries the growth rates will be lower than in other countries resulting on the saturation of livestock production and consumption in these countries. Contrary in many developing countries the demand for soya will increase much more, because the demand for livestock products will be higher due to high increases in income and population. In Turkey a high growth rate for supply of soya, soyoil and soycake are expected. Demand for soya and the processing products will also increase considerably, because human and feed consumption show an increasing tendency.

Sunflowerseed is the third most traded oilseed after soybeans and rapeseed. Growth rates for supply and demand range between 0.8% and 4% a year. Most important countries with growth rates above average are for both supply and demand Latin America, Asia, North Africa and Turkey.

In many countries, especially industrialized countries, *sunflower oil* is considered to be a very valuable oil. The global development of growth rates will reach approximately 2% a year. It is striking that mainly in industrialized countries, such as Europe and North America the growth rates for supply exceed these for demand. In all other countries the increase of demand will be - partly much - higher than the increase of supply. Therefore, a growing importance of trade on this market can be expected.

On the market for *sunflower cake* we nearly expect the same development. Only in the EC demand will increase more than supply. This is quite important because already now the European Community purchases about 90% of world market supplies in sunflower cake. For Turkey we assess for both supply and demand the same high growth rate.

The *groundnut sector* contributes less than 10% to the total oilcrop production. The global growth rates for supply and demand are lower in relation to these of the other oilcrop sector. For groundnuts we notice on the supply side growth rates above the global average in the countries and country groups Asia, Turkey, the former USSR and Eastern Europe. Above average growth rates are expected on the demand side in the Middle East, Asia, North Africa, Turkey and the former USSR.

The market for *groundnut oil* and *groundnut cake* will develop similarly. Growth rates for supply and demand in industrialized countries will increase modestly. We expect the highest growth rates in Asia and Turkey (up to 3% a year).

The market for *oliveoil* will be a less expanding market than the other oilcrop markets. The global increase of supply will be 1.3%, this of demand 1.5% per anno. On the supply side we will only have few countries, which have a growth rate of supply above the global average. These are Latin America, Asia, North Africa and Turkey. Contrary on the demand side we will have more countries with high growth rates. These are additionally to those mentioned above Australia/New Zealand and the countries of the former USSR. Turkey will have a growth rate of demand above average.

Table 4.5.2.3 shows the estimated supply and demand development for pulses, potatoes, tobacco and cotton.

International trade in *pulses* is relatively small and reaches only about 10% of the global production of pulses. We can notice that for the whole group (lentils, chickpeas and drybeans) the global growth rate of demand will exceed the growth rate of supply.

The market for *lentils* will have the most dynamic development of all pulses up to the year 2010. The highest growth rates of supply will be in Turkey, Asia and Eastern Europe. In all other countries supply either will remain constant or will slightly increase. Contrary on the demand side we have many countries and country groups which show high growth rates. Turkey will have the highest rate with 3.5% a year (without GAP).

On the market for *chickpeas* and *drybeans* development will be similar. In general, industrialized countries will have lower growth rates than developing countries. Supply will even remain constant in many countries such as North America, Australia and New Zealand, Eastern Europe, the former USSR and the Rest of Western Europe. Turkey will reach the highest growth rates both in supply (2.5% and 3%) and demand (3% and 2%).

The market for *potatoes* is a slowly growing market. The global average for supply increase will be 0.9%, this for demand 1.1% a year. Roughly speaking we have the highest growth rates of supply and demand in developing countries. Growth rates of supply in industrialized countries will stagnate or even decrease (EC: -0.22%, RWE: -0.71%). On the demand side we can notice nearly the same phenomenon which is due to the change of consumer habits and the use of potatoes as an inferior good. In the countries of the Middle East, North Africa and Turkey we will have the highest growth rates.

For the *tobacco* market changes of supply and demand will be both negative and positive. In many industrial countries the tobacco market is stagnant. There are no big changes in supply and demand growth rates. We may observe different developments in other countries. The highest increase in supply will appear in Asia (+1.9%). In Turkey demand will change by 1% and supply only by 0.3%. Highest growth rates of demand will occur in North Africa (2.6%).

The *cotton* sector is characterized by increases at a relative low level. In the average of the whole world the growth rate of supply will be 1.1% with a range from -0.4% in supply in the former USSR to +2.5% in Australia and New Zealand. Demand development will vary from +0.2% in the countries of the USSR to +2.6% in the Middle East. On the cotton market traditionally the USA is the largest producer, exporter and stockholder, followed by China and the former USSR and on the export side by Australia. The implementation of new agricultural policies in the USSR at the end of the 1980's will reduce cotton production primarily in Uzbekistan. For Turkey, without implementation of GAP, demand (+1,5%) will increase more than supply (+1.1%). Like other cotton producing countries (Brazil, China, India, Pakistan) Turkey gives priority to exporting cotton textiles rather than raw cotton. Therefore, the demand for cotton is increasing more than production in Turkey.

Table 4.5.2.5 gives a survey of the development of export and import growth rates up to the year 2010 on the market for fruit and vegetables. The market for fruit and vegetables was devided into four different segments of aggregation:

- fresh vegetable,
- processed vegetable,
- fresh fruit,
- processed fruit.

Generally, higher growth rates of trend could be expected for imports than for exports on all market segments. It is striking that the projected global export growth rate for processed vegetable and fruit will exceed those of fresh vegetable and fruit. Contrary on the import side fresh fruit and vegetable growth rates will exceed those of the processed segments.

In the segment of *fresh vegetable* exports will grow by 1.5% whereas imports will increase by 2.9%. On the export side we will have high deviations from the world average in Asia, Africa and Turkey. In Turkey the export growth rate will reach 2.7% per anno without realization of the GAP irrigation projects. The average of import growth rates will reach 2.9% yearly. For Turkey we estimate a growth rate of 4.2% per anno (the absolute value of vegetable imports is very low).

On the market for *processed vegetable* growth rates of export vary from 0.24% in Western Europe (without EC) and 3.1% in Asia (without Middle East). The average growth rate is projected to reach 1.9%. Turkey will have an increase of 2.7% in its exports yearly. But the growth rate of Turkish imports will even be higher: With 4.2% annual change Turkey will have the highest import growth rate of all country groups in the world, but the absolute level is still very low in Turkey.

On the market for *fresh and processed fruit* we assess small variations from the average export growth rate of 1.7% or 1.9% respectively. Export increase of *fresh fruit* will be largest in Western Europe, Asia and Turkey (2.7%), whereas import growth rates will be very high in Latin America, Asia, Africa and Turkey. Similarly to the market of processed vegetables, Turkey will have the highest annual import growth rate of 5%. The market for *processed fruit* will in general develop like the market for fresh fruit. The export growth rate will reach 3.0% and the growth rate for Turkish imports is expected to increase by 4.5% per anno.

For the *livestock sector* the most probable developments up to 2010 are shown in Table 4.5.2.5. In Europe, the former USSR and North America *beef* supply will increase moderately and beef demand will grow by a rate up to 1% a year. Contrary in Asia and Africa the increase will be very high with demand growth rates of about 3.5% and supply growth rates between 1.9% to 2.4%. Turkish beef production and demand will grow by 2.0% yearly (without GAP).

The *poultry* market is expected to increase in all regions of the world. In many countries the growth rate of demand will be between 3 and 4% per anno. Supply and demand in Turkey will change with 2.5%.

The *egg* market will change also with a high rate in many countries of Asia, Africa, Turkey and Latin America (up to 3% a year), whereas in the industrial countries, which have already a high consumption level and where dietary aspects gain importance, the increase will be very low.

The *milk market* is characterized by different developments at the level of raw and processed products in the individual countries. The highest increase of supply and demand can be expected in Asia and Africa. In industrial countries the increase is lower or sometimes negative. More detailed information is included in Table 4.5.2.5. In Turkey production of raw milk, butter and cheese will grow by 1.3%. In contrast demand will grow by 2.2% (raw milk), 1.3% (butter) and 2.0% (cheese).

To sum up the overall market developments the highest growth rates of supply and demand can be identified in the developing countries of Asia, Africa and Latin America with higher population growth and higher income elasticities than in the developed countries. Although changes of supply and demand in these countries are higher, world trade will be dominated furtheron by the large producers and consumers in the world, which are mainly found among the developed countries. These are producing more efficiently and need only little growth rates of production to suffice the demand of a decreasing, constant or slowly increasing population, combined with low and decreasing income elasticities for many agricultural commodities.

The trend developments of world supply and demand described in this chapter show only the developments without price influence. In the world trade model the market clearing prices will be determined that clear each of the world markets.

Compared with the status quo base scenario different world development scenarios will be described in the following chapters. First, a GATT liberalization scenario on agricultural markets, second only partial liberalization and third radical changes in agricultural sectors of former socialistic countries are assumed.

4.5.3 Scenario WORLD-1: GATT Complete Liberalization

The scenario WORLD-1 is based on the Dunkel-Paper, which was published by the GATT-Administration on December 20, 1991. Arthur Dunkel, the acting secretary-general of GATT, presented this proposal to make a compromise solution between the different positions in the GATT negotations. Related to agriculture up to now the differences between USA and CAIRNS-Group on the one hand and the EC and other countries with highly protected agriculture on the other hand are very large. For the model-run we expect an implemetation of trade liberalization in accordance with this GATT proposal. The liberalization would take place from 1993 to 1999.

Main issues of the proposal are as follows:

- **Market access**
  Ordinary customs duties including those resulting from tariffication, shall be reduced by 36% with a minimum rate of reduction of 15% for each tariff line. The reduction commitment shall be implemented, in case of unbound duties on the level applied as at 1 September 1986, or on the bound duty level. The calculation of tariff equivalents shall be based on the years 1986 to 1988. On markets without significant imports, a minimum access shall be established with 3% of domestic consumption in the first 5 years of the implementation period and 5% at the end of the period. Market access and reductions of duties shall be implemented in equal steps and all duties shall be bound.

- **Domestic support**
  All domestic supports, expressed in AMS (Agricultural Measurement of Support) of the years 1986 to 1988, shall be reduced from 1993 - 1999 by 20% and implemented in constant instalments. Alternatively to AMS sometimes equivalent commitments are possible. Production specific support below 5% of production value and support below 5% of total agricultural production value is not required to be reduced.

  Agricultural measurement of support shall be calculated for each basic product including market price support, non exempt direct payments and other non exempt policies like input subsidies and marketing cost reduction measures. Market price support is the difference between a fixed external reference price (average f.o.b. unit value for exporting countries and average c.i.f. unit value for net importing countries) and the applied administered price.

- **Export competition**
  Export subsidies shall be reduced by 36% for budgetary outlays and 24% for quantities. The base periods are 1986 to 1990. Introduction of new subsidies shall be avoided.

- **Special and differential treatment**
  For developing countries separate treatments are proposed in the direction of more flexibility in the implementation and partly by exemption from the reduction commitments. Fullest liberalization are proposed in the trade of tropical agricultural products.

- Other main points of the GATT proposal of Arthur Dunkel are related to the *sanitary and phytosanitary measures* and the *negative effects of the reforme programme on net food importing countries*. In the context of our modelling approach these two points are of minor importance and will not be discussed furtheron.

Implementation of the GATT proposal in the WTM model:

Agricultural policies and their implications on world trade markets are implemented in the WTM model. For some countries, especially the major exporters and world trade dominating countries, more differentiated statistical informations are available as in the case of other countries. Consequently the implementation of the GATT-proposal of Arthur Dunkel can be adopted in two different ways.

So far as differentiated information about the components of PSE/CSE calculation in the countries are available, it will be used for the implementation of the Dunkel proposal.
The PSE/CSEs (Producer/Consumer Subsidy Equivalents) in the WTM model are very similar to the AMS (Agricultural measurement of support) in the GATT proposal of Arthur Dunkel. Both cover the main factors of agricultural support like market price support, direct payments and input subsidies and, therefore, it seems possible to use the PSE/CSE concept of the model in equivalence to the AMS of the GATT proposal.

Since the Dunkel proposal suggests an overall decrease of support to producers/consumers by 20%, the PSE/CSE after a change in support is equivalent to:

$$PSE^1 = PSE^0 - 0.2 * PSE^0$$

PSE^1 : Total PSE after support reduction

PSE^0 : Total PSE in the base period

$$CSE^1 = CSE^0 - 0.2 * CSE^0$$

CSE^1 : Total CSE after support reduction

CSE^0 : Total CSE in the base period

Since the approach for a change in PSE and CSE is basically the same, the description will be limited to PSEs furtheron.

As described above there are three major areas of reduction foreseen in the Dunkel proposal:

- Border Measures
- Export Subsidies

These two areas correspond to the market price support component of the PSE (PSE_M), the difference between the trade price and the domestic market price.

- Internal Support

This area corresponds to the non-market price support component of the PSE (PSE_{NM}).

For the first two areas a reduction of support by 36% is proposed. Furthermore the market price support has to be transferred to a tariff equivalent (Tariffication). Therefore, we take the following steps in our model:

- Tariffication

  $t^0 = PSE^0_M / PT^0$

  t^0 = tariff equivalent in the base period

  PSE^0_M = market-price support in the base period

  PT^0 = trade price in the base period

- Reduction of support

  The tariff equivalent after reduction of support (t^1) is equivalent to:

  $t^1 = t^0 - 0.36 * t^0$

For the change in internal support the residual between the total change, that is brought about by the reduction in market price support, applies. Therefore, the non-market price support after the change in internal support (PSE^1_{NM}) corresponds to:

$$PSE^1_{NM} = PSE^0_{NM} - (0.2 * PSE^0 - 0.36 * PSE^0_M) \text{ if } (0.2 * PSE^0 - 0.36 * PSE^0_M) > 0$$

else

$$PSE^1_{NM} = PSE^0_{NM}$$

Including these two components in a price transmission equation leads to the following formula, which can be easily included in the supply equation of the model:

$$PI^1 / PI^0 = (PT^1 (1+t^1) + PSE^1_{NM}) / (PT^0 (1+t^0) + PSE^0_{NM})$$

with

PT^1	=	$PT^0 * \Delta PW / PW * \tau$ (Trade price after world market price changes)
PT^0	=	Trade price in the base period
PW	=	World market price
PI^0	=	Incentive price in the base period
PI^1	=	Incentive price after world market price changes and changes in producer support
PSE^{NM}	=	Producer subsidy equivalent non-market price support
τ	=	Price transmission elasticity Since tariffication is implemented, world market prices are fully transmitted to domestic prices and then $\tau = 1$

In the Dunkel-Paper nothing is said, how to consider the already reduced supports in the period until 1993. Furthermore information about the support reductions, which are already realized, are missing. Therefore, we proceed from constant instalments in seven years with 2.85% per anno for the total PSE and 5.15% per anno for the tariff equivalent from 1993 to 1999 and will continue this reduction in the same way after 1999.

Period 1:	1987 - 1990	no change
Period 2:	1990 - 1995	2/7 of support change, i.e. 5.7% of reduction in PSE and 10.3% of reduction in tariff equivalent
Period 3:	1995 - 2000	5/7 of support change, i.e. 14.3% of reduction in PSE and 25.7% of reduction in tariff equivalent
Period 4:	2000 - 2005	It is assumed that reduction in support will continue as in Period 3.
Period 5:	2005 - 2010	It is assumed that reduction in support will continue as in Period 3.

In all other countries the following approach is used:
In the WTM model price transmission elasticities are implemented to specify barriers to trade by comparison of domestic and world market prices. If a change in world market prices would not cause any change in domestic prices the price transmission elasticity is "0", and on

the other hand free market policies are characterized by an elasticity of "1". An increase in market access will lead to higher price transmission elasticities for all commodities and countries.

A reduction of duties and tariffs by 36% compared with the base period (in our model 1987) will make it possible to import commodities at a lower price level. The world market influence on domestic prices will be higher and the price transmission elasticities will change.

Since we assume that the national price influence will decrease in the same way as market access will increase, we are able to calculate the new national price influence after GATT realization (Column 3 in Table 4.5.3.1) and derive the new price transmission elasticities in Column 4. According to the GATT proposal these elasticities shall be applied in constant instalments over the period 1993 to 1999.

Calculation of *price transmission elasticities* expressed in mathematical terms:

$$t_{(1999)} = 1 - ((1 - t_{(1987)}) - 0.36(1 - t_{(1987)}))$$

Period 1: $t_y = t_{(1987)}$

$Y = 1987$ to 1992

Period 2: $t_y = t_{(y-1)} + ((t_{(1999)} - t_{(1987)} : 7)$

$Y = 1993$ to 1999

Period 3: $t_y = t_{(y-1)} + ((t_{(1999)} - t_{(1987)} : 7)$

$Y = 2000$ to 2010

Table 4.5.3.1: Calculation of New Price Transmission Elasticities

Price transmission elasticities 1987	National price influence 1987	National price influence 1999 (-36%)	Price transmission elasticities 1999
0,0	1,0	0,64	0,36
0,1	0,9	0,58	0,42
0,2	0,8	0,51	0,49
0,3	0,7	0,45	0,55
0,4	0,6	0,38	0,62
0,5	0,5	0,32	0,68
0,6	0,4	0,26	0,74
0,7	0,3	0,19	0,81
0,8	0,2	0,13	0,87
0,9	0,1	0,06	0,94
1,0	0,0	0,00	1,00

Source: Own calculation

The fact of *minimum access* of 3 or 5% (share of imports on total domestic consumption) can not explicitly be considered in the model. However, it can be expected, that this condition is fulfilled after decreasing the national price influence and increasing importance of world markets.

The fourth point in the GATT proposal are the *special and differential treatments* for developing countries. Although developing countries are able to implement the measures over a longer period or be exempted from the reduction measures at all, these points are negligible in the context of importance for world trade. Many high protected agricultural products are not or even on a low level produced in these countries. On the other hand the fullest liberalization of world trade with tropical products are not important for the modelling of the GAP region.

4.5.4 Scenario WORLD-2: GATT Partly Liberalization

The second world scenario is derived from the WORLD-1 GATT complete liberalization scenario. In the first scenario we assume, that the Dunkel proposal will be accepted by all countries and country groups in the GATT negotations of 1992. Now, in the senario WORLD-2 we make the assumption, that the Dunkel proposal will only be partly realized.

The countries or country groups with a highly protected agriculture will not accept the paper. They will try to get a compromise at a lower level of support reduction. This lower level will be expected to be about 2/3 of the envisaged level, that is to say a reduction on 24% in price transmission elasticities and a reduction o 13.33% in national support expressed in PSEs up to 1999. From the year 2000 to 2010 the liberalization will continue with the same rates.

The mathematical expressions in the period 2 and period 3 will be as follows:

Price transmission elasticities:

$$t_y = t_{(Y-1)} + ((t_{(1999)} - t_{(1987)}):7)$$

$$t_{(1999)} = 1 - ((1 - t_{(1987)}) - 0.24(1 - t_{(1987)}))$$

Y = 1993, 1994, ..., 2010

PSE/CSE: $PSE_y = PSE_{y-1} - ((PSE_{1987} \cdot 0{,}1333) : 7)$

All other model assumptions of trend developments, supply and demand elasticities will be constant at the level of the base scenario.

4.5.5 Scenario WORLD-3: Radical Changes in the Agricultural Sector of Former Socialistic Countries

The base scenario in Chapter 4.5.2 and the GATT scenarios in Chapters 4.5.3 and 4.5.4 follow the assumption of unchanged developments in the former socialistic countries. Production and demand trend as well as model parameters like elasticities are expected to be the same as in the past.

From the economic point of view we can assume different steps of development in the former socialistic countries. On the agricultural production side the starting point is characterized by a very unelastic supply function (see Figure 4.5.5.1), because price incentives to develop agriculture were very poor in the past. The quantity of production was regulated by government plans in these countries.

In the transition period, which is defined in the model by the period 1990 to 1995, no changes in production in these countries are expected. Production is constant at the base level and the price elasticity of supply is zero. The supply function belonging to this situation is presented in Figure 4.5.5.1 as S2. The main reasons for this assumption are the large problems that arise, when the political system is changed. Although agricultural prices may be higher than in the base period no changes in production will occur because of bottlenecks in the organizational structure of the production units, the procurement of inputs, the selling of the agricultural products and the marketing and processing industry structure.

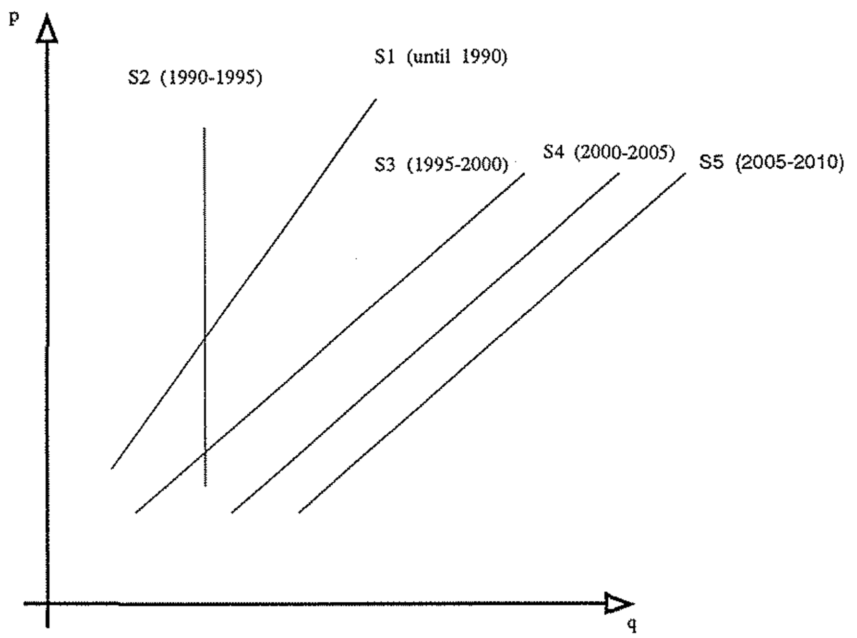
In the subsequent period 1995 to 2000 we assume that technical progress will be implemented in these countries and lead to a shift of the supply function to the right. In other words, although prices may be not changing compared to the past, production will be higher. At the same time the price elasticity of supply will increase, because production will be more and more the result of a competitive system due to the new market conditions.

In the projection period from 2000 to 2005 the elasticity of supply will not change, but due to shift factors the agricultural supply function will move furtheron to the right.

On the demand side changes of the demand function are expected to follow the path shown in Figure 4.5.5.2. The base situation in the period 1987 to 1990 is characterized by a relatively inelastic price demand function. According to the problems in supply of food in the centrally planned economies human consumption was influenced mainly by other factors than prices like for example shortages of some commodities.

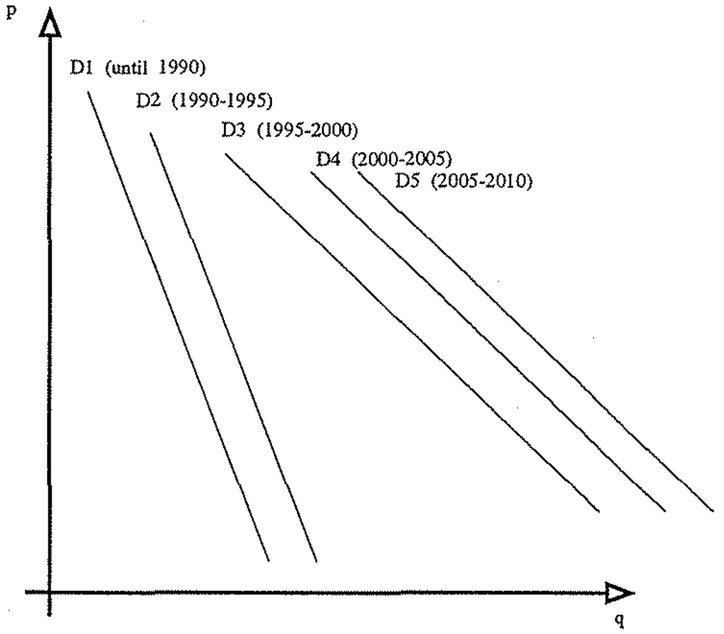
In the transition period to a market economy from 1990 to 1995 we assume that the price elasticity of demand will not change, whereas the price demand function will move to the right due to changes in population and income.

Figure 4.5.5.1: World-3 Scenario: Supply Development in EE and USSR



In the following two periods the function will change in two directions based on the influence of shift factors and changes in price elasticities. An increase in population will lead to an increase in total demand. An increasing income will lead both to higher and lower demand dependening on the nature of the food commodities. Basic foodstuffs like wheat, rice and sugar will become inferior goods characterized by an unchanged demand with regard to income. The demand for other products with a higher attractiveness will increase considerably with higher incomes. The third factor influencing demand is the price elasticity, which will increase after 1995. Alltogether the demand function will move to the right and change its slope (see Figure 4.5.5.2).

Figure 4.5.5.2: World-3 Scenario: Demand Development in EE and USSR



In the original WTM model *price elasticities of supply and demand* of the former socialistic countries are very low, because they are based on the situation when the market system was not yet introduced. In the old system prices were not flexible and in many cases supply and demand changes were not possible, because alternatives were missing.

After changing the political and economic system the framework for price reactions is different. The elasticities will become higher than in the previous years. Therefore, the following assumptions concerning the adjustments in price reactions are made. Starting with 1995 up to 2005 all elasticities will double their size of the base period. The level of elasticities will reach a level similar to other major agricultural producing countries with some differences between the commodities.

Alternatively, it would be possible to replace all elasticities of Eastern Europe and the former USSR by elasticities af another country with similar production and consumption structure but with a market economy. Since it is very difficult to find an appropriate country for this purpose it is preferred to use the approach that is outlined above.

The expected growth rates of supply and demand in the former USSR and Eastern Europe are presented along with the Base Scenario trends for these regions in Table 4.5.5.1 and Table 4.5.5.2.

In the WORLD-3 scenario we suppose, that on the *supply* side at first production will stagnate in the first half of the 1990's, because the change in the economic system will cause many problems. After this period in the second half of the 1990's we can expect an increase in agricultural supply, which is higher as in the basic period. From 2000 to 2005 the production expansion will still be higher as before and will reach a level, which is double the size of the basic period. Afterwards in the 2005 to 2010 period trend developments are estimated to be slowing down again on a lower level. These assumptions are related to most of the agricultural products. In some cases we expect more or less growth rates in dependence of the basic situation in these agricultural sectors (no change of cotton supply, higher increase of beef supply).

Trend developments of *demand* will not be the same as on the production side. According to the population growth at first from 1990 to 1995 the changes in demand will go on like in the 1980's. Then in the second half of the 1990's we can expect a different development on specific commodities. The demand for livestock products and high quality crop products will expand whereas the demand for inferior commodities will decrease. More detailed information is given in Tables 4.5.5.1 and 4.5.5.2.

It is difficult to express these expectations in mathematical growth rates, because the statistical material on the existing food balances are not sufficient. Related to this problem, our assumptions on further trend developments on production and especially on food demand are only preliminary and will outline one possible development, which has to be changed so far as significant political changes occur and new statistical data are available.

Table 4.5.5.1: Expected and Annual Growth Rates of Supply in the former USSR

	Base Scenario	WORLD-3 Scenario				
	1987 - 2005	1987 - 1990	1990 - 1995	1995 - 2000	2000 - 2005	2005 - 2010
WHEAT	1,30	1,30	0,00	1,95	2,60	1,95
BARLEY	1,50	1,50	0,00	2,25	3,00	2,25
MAIZE	1,40	1,40	0,00	2,10	2,80	2,10
OTHER CEREALS	1,50	1,50	0,00	2,25	3,00	2,25
RICE	2,00	2,00	0,00	3,00	4,00	3,00
SUGAR	1,50	1,50	0,00	2,25	3,00	2,25
SOYABEAN	1,50	1,50	0,00	2,25	3,00	2,25
SOYOIL	2,50	2,50	0,00	3,75	5,00	3,75
SOYCAKE	2,50	2,50	0,00	3,75	5,00	3,75
SUNFLOWER	1,50	1,50	0,00	2,25	3,00	2,25
SUNFLOWEROIL	1,50	1,50	0,00	2,25	3,00	2,25
SUNFLOWERCAKE	1,50	1,50	0,00	2,25	3,00	2,25
GROUNDNUT	2,50	2,50	0,00	3,75	5,00	3,75
GROUNDNUTOIL	2,50	2,50	0,00	3,75	5,00	3,75
GROUNDNUTCAKE	2,50	2,50	0,00	3,75	5,00	3,75
OLIVEOIL	0,00	0,00	0,00	1,00	2,00	1,50
LENTILS	1,00	1,00	0,00	1,50	2,00	1,50
CHICKPEAS	0,00	0,00	0,00	1,00	2,00	1,50
DRYBEANS	0,00	0,00	0,00	1,00	2,00	1,50
TOBACCO	1,00	1,00	0,00	1,50	2,00	1,50
COTTON	-0,40	-0,40	0,00	0,00	0,00	0,00
POTATOES	1,50	1,50	0,00	2,25	3,00	2,25
FRESH VEGETABLES*	1,00	1,00	0,00	1,25	1,50	1,25
PROC. VEGETABLES*	1,00	1,00	0,00	1,25	1,50	1,25
FRESH FRUITS*	1,00	1,00	0,00	1,25	1,50	1,25
PROCESSED FRUITS*	1,00	1,00	0,00	1,25	1,50	1,25
BEEF	0,80	0,80	0,00	1,20	1,60	1,20
PIGMEAT	1,00	1,00	0,00	1,50	2,00	1,50
MUTTON	0,60	0,60	0,00	0,90	1,20	0,90
POULTRY	2,00	2,00	0,00	3,00	4,00	3,00
EGGS	1,50	1,50	0,00	2,25	3,00	2,25
MILK	1,30	1,30	0,00	1,95	2,60	1,95
BUTTER	1,30	1,30	0,00	1,95	2,60	1,95
MILKPOWDER	1,30	1,30	0,00	1,95	2,60	1,95
CHEESE	1,30	1,30	0,00	1,95	2,60	1,95

*) annual growth rate of export

Table 4.5.5.1 (cont.): Expected and Annual Growth Rates of Demand in the former USSR

	Base Scenario	WORLD-3 Scenario				
	1987 - 2005	1987 - 1990	1990 - 1995	1995 - 2000	2000 - 2005	2005 - 2010
WHEAT	1,20	1,20	1,20	1,20	1,20	1,20
BARLEY	1,00	1,00	1,00	2,00	2,00	1,50
MAIZE	1,40	1,40	1,40	2,80	2,80	2,10
OTHER CEREALS	1,10	1,10	1,10	1,10	1,10	1,10
RICE	1,50	1,50	1,50	1,50	1,50	1,50
SUGAR	0,80	0,80	0,80	0,80	0,80	0,80
SOYABEAN	2,80	2,80	2,80	5,60	5,60	4,20
SOYOIL	2,20	2,20	2,20	4,40	4,40	3,30
SOYCAKE	3,20	3,20	3,20	6,40	6,40	4,80
SUNFLOWER	2,50	2,50	2,50	5,00	5,00	3,75
SUNFLOWEROIL	2,00	2,00	2,00	4,00	4,00	3,00
SUNFLOWERCAKE	2,00	2,00	2,00	4,00	4,00	3,00
GROUNDNUT	2,50	2,50	2,50	5,00	5,00	3,75
GROUNDNUTOIL	2,50	2,50	2,50	5,00	5,00	3,75
GROUNDNUTCAKE	1,50	1,50	1,50	3,00	3,00	2,25
OLIVEOIL	2,00	2,00	2,00	4,00	4,00	3,00
LENTILS	1,50	1,50	1,50	1,50	1,50	1,50
CHICKPEAS	0,00	0,00	0,00	0,00	0,00	0,00
DRYBEANS	0,00	0,00	0,00	0,00	0,00	0,00
TOBACCO	0,50	0,50	0,50	2,00	2,00	1,50
COTTON	0,20	0,20	0,20	2,00	2,00	1,50
POTATOES	0,60	0,60	0,60	0,60	0,60	0,60
FRESH VEGETABLES**	3,00	3,00	3,00	4,50	4,50	3,75
PROC. VEGETABLES**	3,00	3,00	3,00	4,50	4,50	3,75
FRESH FRUITS**	3,20	3,20	3,20	4,50	4,50	3,75
PROCESSED FRUITS**	3,20	3,20	3,20	4,50	4,50	3,75
BEEF	1,00	1,00	1,00	2,00	2,00	1,50
PIGMEAT	1,00	1,00	1,00	2,00	2,00	1,50
MUTTON	0,50	0,50	0,50	2,00	2,00	1,50
POULTRY	2,00	2,00	2,00	4,00	4,00	3,00
EGGS	1,20	1,20	1,20	1,20	1,20	1,20
MILK	1,20	1,20	1,20	1,20	1,20	1,20
BUTTER	1,20	1,20	1,20	1,20	1,20	1,20
MILKPOWDER	0,80	0,80	0,80	0,80	0,80	0,80
CHEESE	1,20	1,20	1,20	2,40	2,40	1,80

**) annual growth rate of import

Table 4.5.5.2: Expected Annual Growth Rates of Supply in Eastern Europe

	Base Scenario	World-3 Scenario				
	1987 - 2005	1987 - 1990	1990 - 1995	1995 - 2000	2000 - 2005	2005 - 2010
WHEAT	1,26	1,26	0,00	1,89	2,52	1,89
BARLEY	1,23	1,23	0,00	1,85	2,46	1,85
MAIZE	1,75	1,75	0,00	2,63	3,50	2,63
OTHER CEREALS	0,57	0,57	0,00	0,86	1,14	0,86
RICE	1,34	1,34	0,00	2,01	2,68	2,01
SUGAR	0,80	0,80	0,00	1,20	1,60	1,20
SOYABEAN	2,50	2,50	0,00	3,75	5,00	3,75
SOYOIL	2,50	2,50	0,00	3,75	5,00	3,75
SOYCAKE	2,50	2,50	0,00	3,75	5,00	3,75
SUNFLOWER	1,77	1,77	0,00	2,66	3,54	2,66
SUNFLOWEROIL	1,74	1,74	0,00	2,61	3,48	2,61
SUNFLOWERCAKE	1,74	1,74	0,00	2,61	3,48	2,61
GROUNDNUT	1,88	1,88	0,00	2,82	3,76	2,82
GROUNDNUTOIL	1,40	1,40	0,00	2,10	2,80	2,10
GROUNDNUTCAKE	1,40	1,40	0,00	2,10	2,80	2,10
OLIVEOIL	0,95	0,95	0,00	1,43	1,90	1,43
LENTILS	1,52	1,52	0,00	2,28	3,04	2,28
CHICKPEAS	0,00	0,00	0,00	1,00	2,00	1,50
DRYBEANS	0,00	0,00	0,00	1,00	2,00	1,50
TOBACCO	0,20	0,20	0,00	1,00	2,00	1,50
COTTON	-0,31	-0,31	0,00	0,00	0,00	0,00
POTATOES	0,30	0,30	0,00	1,00	2,00	1,50
FRESH VEGETABLES*	1,33	1,33	0,00	1,66	2,00	1,66
PROC. VEGETABLES*	1,17	1,17	0,00	1,46	1,76	1,46
FRESH FRUITS*	1,36	1,36	0,00	1,70	2,04	1,70
PROCESSED FRUITS*	1,38	1,38	0,00	1,73	2,07	1,73
BEEF	0,86	0,86	0,00	1,29	1,72	1,29
PIGMEAT	0,79	0,79	0,00	1,19	1,58	1,19
MUTTON	0,61	0,61	0,00	0,92	1,22	0,92
POULTRY	1,50	1,50	0,00	2,25	3,00	2,25
EGGS	1,09	1,09	0,00	1,64	2,18	1,64
MILK	0,94	0,94	0,00	1,41	1,88	1,41
BUTTER	0,94	0,94	0,00	1,41	1,88	1,41
MILKPOWDER	0,94	0,94	0,00	1,41	1,88	1,41
CHEESE	0,94	0,94	0,00	1,41	1,88	1,41

*) annual growth rate of export

Table 4.5.5.2 (cont.): Expected Annual Growth Rates of Demand in Eastern Europe

	Base Scenario 1987 - 2005	World-3 Scenario 1987 - 1990	1990 - 1995	1995 - 2000	2000 - 2005	2005-2010
WHEAT	1,57	1,57	1,57	1,57	1,57	1,57
BARLEY	1,37	1,37	1,37	2,74	2,74	2,06
MAIZE	1,50	1,50	1,50	3,00	3,00	2,25
OTHER CEREALS	0,86	0,86	0,86	0,86	0,86	0,86
RICE	0,75	0,75	0,75	0,75	0,75	0,75
SUGAR	0,86	0,86	0,86	0,86	0,86	0,86
SOYABEANS	2,60	2,60	2,60	5,20	5,20	3,90
SOYOIL	1,16	1,16	1,16	2,32	2,32	1,74
SOYCAKE	2,36	2,36	2,36	4,72	4,72	3,54
SUNFLOWER	1,57	1,57	1,57	3,14	3,14	2,36
SUNFLOWEROIL	1,60	1,60	1,60	3,20	3,20	2,40
SUNFLOWERCAKE	2,09	2,09	2,09	4,18	4,18	3,14
GROUNDNUT	1,86	1,86	1,86	3,72	3,72	2,79
GROUNDNUTOIL	1,67	1,67	1,67	3,34	3,34	2,51
GROUNDNUTCAKE	1,00	1,00	1,00	2,00	2,00	1,50
OLIVEOIL	1,38	1,38	1,38	2,76	2,76	2,07
LENTILS	0,99	0,99	0,99	0,99	0,99	0,99
CHICKPEAS	0,80	0,80	0,80	0,80	0,80	0,80
DRYBEANS	0,50	0,50	0,50	0,50	0,50	0,50
TOBACCO	0,67	0,67	0,67	1,34	1,34	1,01
COTTON	0,51	0,51	0,51	1,02	1,02	0,77
POTATOES	0,60	0,60	0,60	0,60	0,60	0,60
FRESH VEGETABLES**	3,70	3,70	3,70	5,55	5,55	4,63
PROC. VEGETABLES**	3,70	3,70	3,70	5,55	5,55	4,63
FRESH FRUITS**	3,30	3,30	3,30	4,95	4,95	4,13
PROCESSED FRUITS**	3,30	3,30	3,30	4,95	4,95	4,13
BEEF	0,88	0,88	0,88	1,76	1,76	1,32
PIGMEAT	1,00	1,00	1,00	2,00	2,00	1,50
MUTTON	0,65	0,65	0,65	1,30	1,30	0,98
POULTRY	1,84	1,84	1,84	3,68	3,68	2,76
EGGS	1,07	1,07	1,07	1,07	1,07	1,07
MILK	1,00	1,00	1,00	1,00	1,00	1,00
BUTTER	1,21	1,21	1,21	1,21	1,21	1,21
MILKPOWDER	1,00	1,00	1,00	1,00	1,00	1,00
CHEESE	1,34	1,34	1,34	2,68	2,68	2,01

**) annual growth rate of import

4.6 Results of the World Trade Model

As already explained in Chapter 4.1.2.5 the basic idea of the WTM-model is to clear the world commodity markets via the price mechanism. Clearance of the world market means that net trade (supply - demand - stock changes) adds up to zero over all regions and products.

The model runs are starting from a base year equilibrium in 1987 and are simulating the world market development over various subperiods up to the year 2010. Three main factors should be stressed determining the results of the various model runs:

- The assumed supply and demand trends

  As described in previous chapters supply and demand trends are based on own estimates, taking into account the shift factors behind the supply and demand development. Depending on whether there is an excess supply or excess demand created by trend factors world market prices have to decrease or increase to clear the market.

- The policy framework

  The policies chosen in the individual regions, which are expressed by price transmission elasticities and PSE/CESs in the model, can either stimulate or reduce production or consumption.

- The price elasticities

  Price elasticites determine the flexibility of the supply and demand reaction and take into account the linkages between products.

Of course the final model results will always depend on all factors simultaneously and these complex interrelationships are captured by the model.

In the following chapters the results of the various model runs will be presented. The tables containing the world market price changes are included in the main text, while the detailed model results for the individual products and regions can be found in Appendix C.

4.6.1 Base Scenario

4.6.1.1 World Market Price Developments

In the Tables 4.6.1.1 and 4.6.1.2 changes in the nominal and real world market prices for selected agricultural products from 1987 to 1990 and from 1990 to 2010 are shown. The following description will focus on the second period, since in this period the long-run developments are captured while in the first period specific ex-post conditions influence the price developments.

The highest nominal price increases can be observed for rice among the crop products and for beef, mutton, dry milk and cheese among the animal products. The world market price changes for the other products mostly vary around 15-20%. Only chickpeas, potatoes, processed fruits, eggs and butter show price increases of less than 10%.

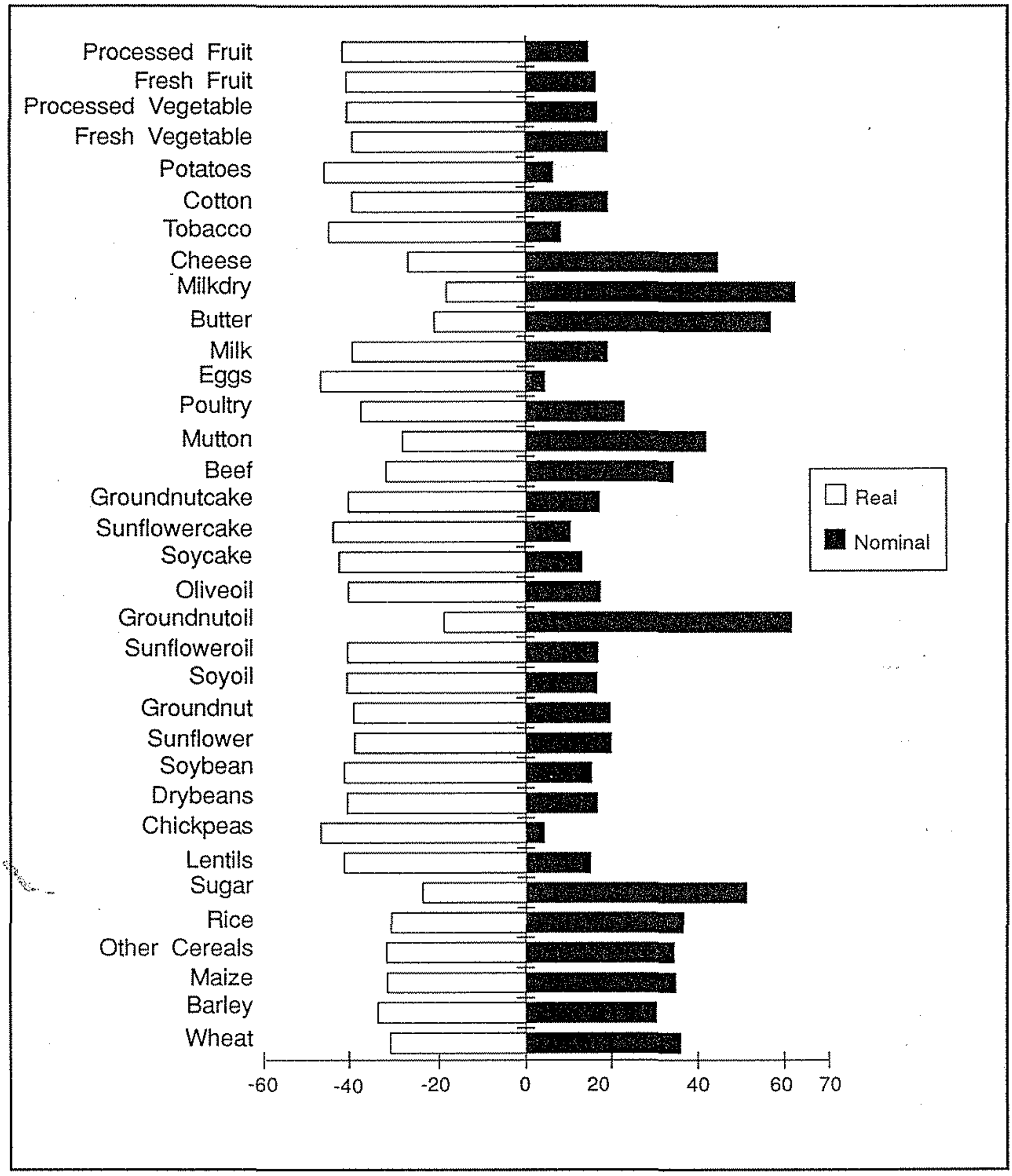
Table 4.6.1.1: Nominal and Real Price Changes 1987-1990

	Nominal Price Changes (%)		Real Price Changes (%)	
	total	annual	total	annual
Wheat	19,19	6,03	4,89	1,60
Barley	20,65	6,46	6,17	2,02
Maize	16,51	5,23	2,53	0,84
Other Cereals	18,74	5,89	4,49	1,48
Rice	21,61	6,74	7,02	2,29
Sugar	28,99	8,86	13,51	4,31
Lentils	0,63	0,21	-11,45	-3,97
Chickpeas	10,07	3,25	-3,14	-1,06
Drybeans	31,16	9,46	15,42	4,90
Soybean	3,56	1,17	-8,87	-3,05
Sunflower	4,90	1,61	-7,69	-2,63
Groundnut	23,35	7,25	8,55	2,77
Soyoil	6,29	2,05	-6,46	-2,20
Sunfloweroil	6,29	2,05	-6,46	-2,20
Groundnutoil	44,10	12,95	26,81	8,24
Oliveoil	16,52	5,23	2,54	0,84
Soycake	9,52	3,08	-3,62	-1,22
Sunflowercake	2,58	0,85	-9,73	-3,35
Groundnutcake	3,38	1,11	-9,03	-3,10
Beef	12,65	4,05	-0,87	-0,29
Mutton	13,74	4,38	0,09	0,03
Poultry	13,69	4,37	0,05	0,02
Eggs	14,75	4,69	0,98	0,33
Milk	31,75	9,63	15,94	5,05
Butter	5,71	1,87	-6,97	-2,38
Milkdry	15,91	5,04	2,00	0,66
Cheese	22,87	7,11	8,13	2,64
Tobacco	3,31	1,09	-9,09	-3,13
Cotton	5,30	1,74	-7,34	-2,51
Potatoes	12,29	3,94	-1,18	-0,40
Vegetable fresh	3,26	0,81	-17,27	-4,63
Vegetable proc.	2,14	0,53	-18,17	-4,89
Fruit fresh	2,81	0,70	-17,63	-4,73
Fruit processed	1,66	0,41	-18,55	-5,00

Table 4.6.1.2: Nominal and Real Price Changes 1990-2010

	Nominal Price Changes (%)		Real Price Changes (%)	
	total	annual	total	annual
Wheat	22,89	1,04	-38,15	-2,37
Barley	14,73	0,69	-42,25	-2,71
Maize	19,34	0,89	-39,93	-2,52
Other Cereals	17,05	0,79	-41,09	-2,61
Rice	41,30	1,74	-28,88	-1,69
Sugar	20,31	0,93	-39,45	-2,48
Lentils	14,92	0,70	-42,16	-2,70
Chickpeas	4,33	0,21	-47,49	-3,17
Drybeans	16,56	0,77	-41,33	-2,63
Soybean	14,83	0,69	-42,20	-2,70
Sunflower	16,64	0,77	-41,29	-2,63
Groundnut	15,90	0,74	-41,66	-2,66
Soyoil	19,81	0,91	-39,70	-2,50
Sunfloweroil	16,14	0,75	-41,54	-2,65
Groundnutoil	19,21	0,88	-40,00	-2,52
Oliveoil	22,55	1,02	-38,32	-2,39
Soycake	22,28	1,01	-38,45	-2,40
Sunflowercake	18,08	0,83	-40,57	-2,57
Groundnutcake	17,97	0,83	-40,62	-2,57
Beef	33,44	1,45	-32,84	-1,97
Mutton	28,78	1,27	-35,18	-2,14
Poultry	16,74	0,78	-41,24	-2,62
Eggs	2,45	0,12	-48,43	-3,26
Milk	10,26	0,49	-44,50	-2,90
Butter	6,81	0,33	-46,24	-3,06
Milkdry	39,90	1,69	-29,59	-1,74
Cheese	36,76	1,58	-31,17	-1,85
Tobacco	10,13	0,48	-44,57	-2,91
Cotton	12,27	0,58	-43,49	-2,81
Potatoes	2,74	0,14	-48,29	-3,24
Vegetable fresh	16,56	0,77	-41,33	-2,63
Vegetable proc.	10,76	0,51	-44,25	-2,88
Fruit fresh	14,67	0,69	-42,28	-2,71
Fruit processed	8,21	0,40	-45,54	-2,99

Figure 4.6.1.1: Nominal and Real Price Changes 1990-2010 in %



As has been mentioned earlier, most of the differences in the levels of price changes can be attributed to the magnitude of the supply and demand disequilibrium based on individual trend developments. This is quite obvious for rice, where a large supply deficit is expected.

Strong cross-price effects are a major reason, why a rather balanced price level exists for cereals and soycake. For livestock and livestock products the cross-price effects are not quite as strong as for feed grains, but are still able to balance the prices in this product group a little.

Another reason for the relatively sharp nominal price increases of some products (e.g. sugar) is related to the degree of isolation of the domestic markets. Much higher price changes are needed to stimulate supply and demand under such conditions.

To give a clearer picture of the world market price developments, nominal price changes have been transfered to real price changes using the MUV Index, an index widely used for the deflation of nominal commodity prices. Nominal and real world market price changes for the simulation period along with the corresponding annual changes are also presented in the Tables 4.6.1.1 and 4.6.1.2. and for the period 1990-2010 in Figure 4.6.1.1.

4.6.1.2 Development of Supply, Demand and Net Trade

The model results of the WTM-model are related to 34 agricultural product groups and 55 country groups of the world. A detailed description of all these results is not possible at this place, but can be seen in computer outputs. In APPENDIX-C aggregated model outputs on the level of 12 countries/country groups are prepared.

In the following chapter the main results of world market developments on agricultural markets are presented, whereas model results for Turkey and the GAP region are described and discussed in Chapter 5. Therefore, the focus of this chapter is on world developments of supply and demand in all other countries and country groups.

The WTM-model results provide part of the basic data set for the crop pattern model runs. In the crop pattern model other factors like e.g. water supply determine the model outcome. Consequently, the calculated production and trade quantities of the two models are not at the same level. They can be interpreted as follows:

The world market situation might allow Turkey to export a certain quantity of product, but in Turkey and/or the GAP-region it is economically not advisable to increase production to export this quantity. Vice versa economic conditions in Turkey and/or the GAP-region for other products could be very advantageous leading to higher production quantities than assumed in the WTM model.

Cereals and Pulses

The cereal market is one of the most important agricultural markets in the world according to the importance of cereals in world nutrition and feeding of livestock. The expected developments are different on the markets of wheat, barley, maize and other cereals.

Supply and demand of world *wheat* will increase from 1987 to 2010 by 65% (Appendix C - Table 4.6.1.2.1). The growth rate in Turkey will be lower than in the rest of the world but Turkish wheat supply is still of importance in relation to other countries or country groups. Turkish production is higher than RWE (Rest of Western Europe), ME (Middle East), NAF (North Africa), RAF (Rest of Africa) and ANZ (Australia, New Zealand), but nevertheless other countries and country groups are much more important like RAS (Rest of Asia), NA (North America), USS (former USSR) and the EC. Up to 2010 the importance of these country groups will grow furtheron (Figure 4.6.1.2). The biggest consumers of wheat in 2010 will be the countries of the Far East and Central Asia, followed by the USSR, the Middle East and North Africa.

The world *barley* market is characterized by a lower increase than the wheat market until the year 2010 (Appendix C - Table 4.6.1.2.2). Nevertheless *barley* is the second most important product in the cereal market of Turkey. In 1987, about 7 Mio tons were produced and about 6.5 Mio tons consumed. The world market share of Turkish barley production was 3.8%. Up to 2010 Turkey's barley supply will increase and also the share in world supply to about 5%. The main producers and consumers in the world are the former USSR and the EC, followed by North America (Figure 4.6.1.3). Barley is exported mainly from the EC and North America. The biggest importer is the Middle East, whose imports will nearly double up to 2010.

Following North America, Australia/New Zealand (ANZ) and the EC, Turkey will stay the fourth largest exporter of barley in 2010. Main deficit regions will be the Middle East, other countries of Asia (RAS), North Africa, the USSR and Eastern Europe. Thus all the main deficit regions for barley in the world will be situated around Turkey and the barley export position of Turkey looks favourable.

On the world markets for *maize and other cereals* Turkey is of minor importance with a world market share of only 0.5% in the base period. The main developments on these markets are illustrated in the Tables 4.6.1.2.3 and 4.6.1.2.4 of Appendix C.

The maize market is dominated by North America, the region with the highest production and consumption in the world. North America is the only region in the world with significant maize exports (Figure 4.6.1.4). All other countries are either self sufficient in maize (like Turkey) or have to import, mainly from the U.S. market. The biggest importers are the region RAS (Rest of Asia) and the USSR. Changes on the Turkish maize market according to the expected increase will, therefore, have only little influence on the world trading structure.

In the group other cereals the crops oats, rye, sorghum, millet and some other cereals are subsummed. Supply and demand for these crops are highest in the USSR and primarily related to oats and rye. Oats are produced in the USSR, Eastern Europe, the EC-12 and North America. The major markets for rye are the USSR and Europe. Turkey is also producing and consuming oats and rye at a self sufficiency level. Future prospects for rye and oats markets in the world are not so advantageous, because the demand for these products is either going down in some countries or increasing only marginally in other countries compared with developments in other cereal markets.

Figure 4.6.1.2: Supply and Demand of Wheat 2010

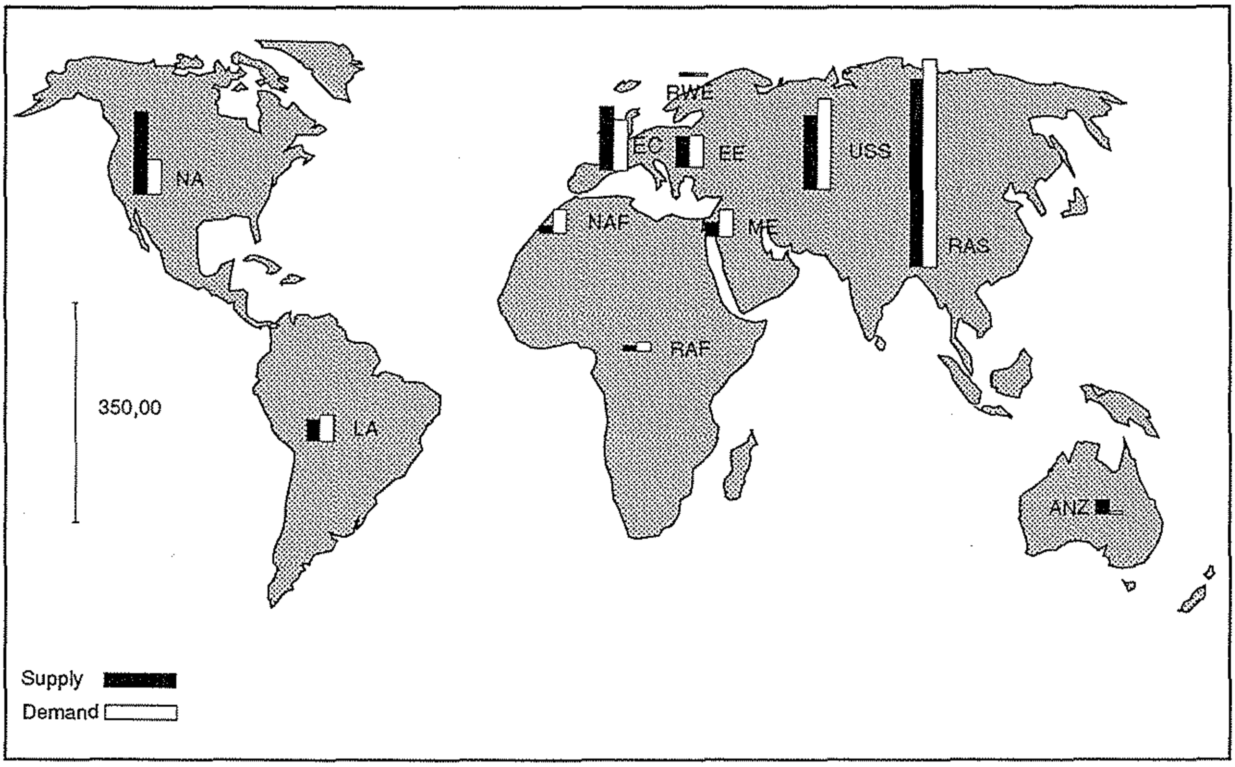


Figure 4.6.1.3: Supply and Demand of Barley 2010

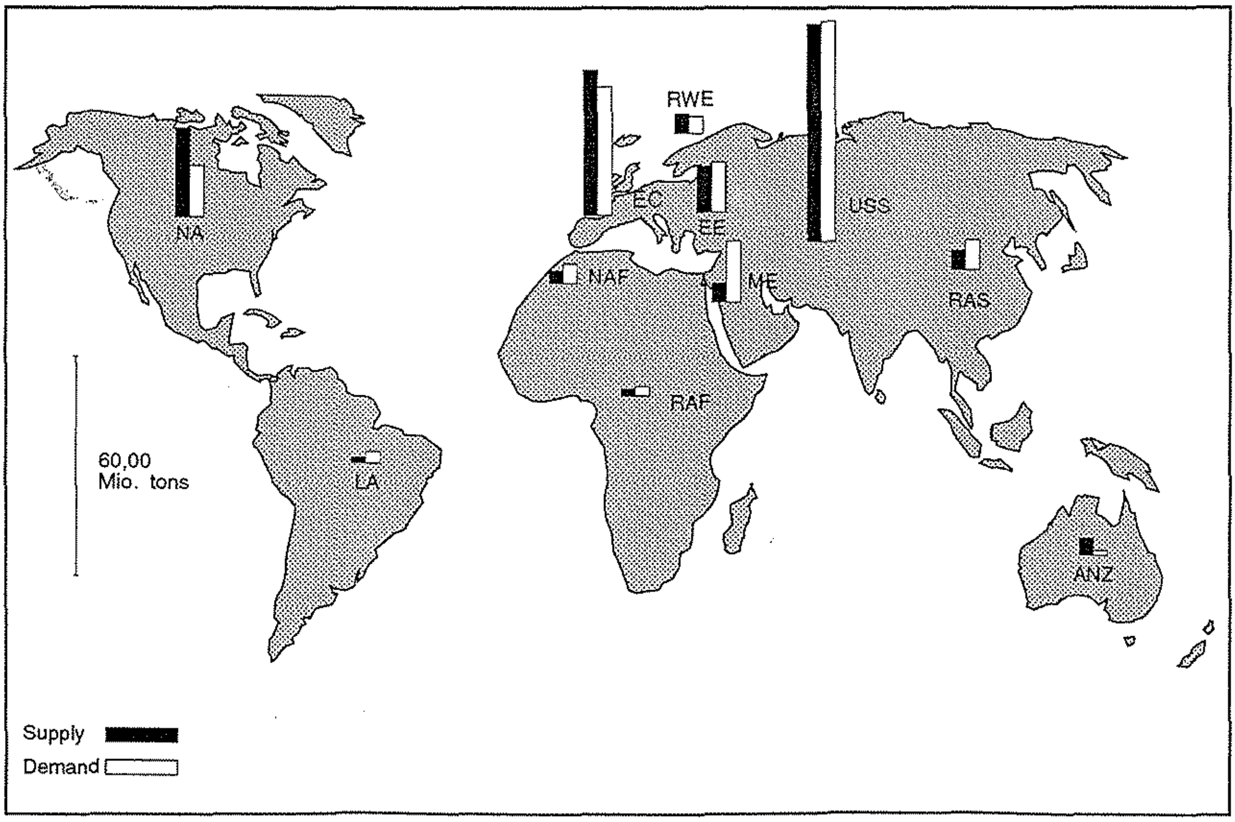
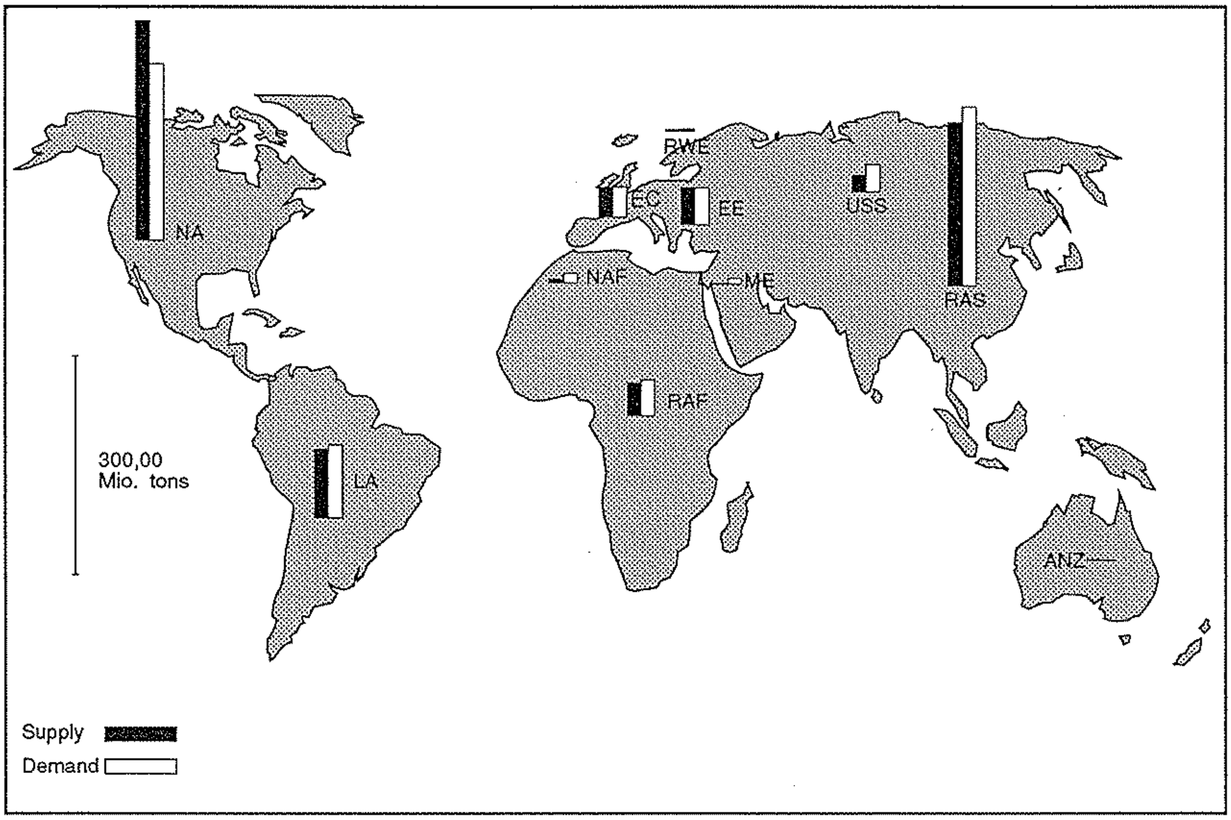


Figure 4.6.1.4: Supply and Demand of Maize 2010



In the other countries of Africa, Asia and Latin America sorghum is the most important cereal within the other cereal group. All these countries have a deficit in production and have to import sorghum.

The biggest exporter in the whole group of other cereals is North America with an increasing tendency. The second most important exporter is the region ANZ (Australia, New Zealand).

The world *rice* market (Appendix C - Table 4.6.1.2.5) is dominated by the countries of Asia, which are traditionally the major producers and consumers. These countries are able to balance differences between supply and demand by stock changes.

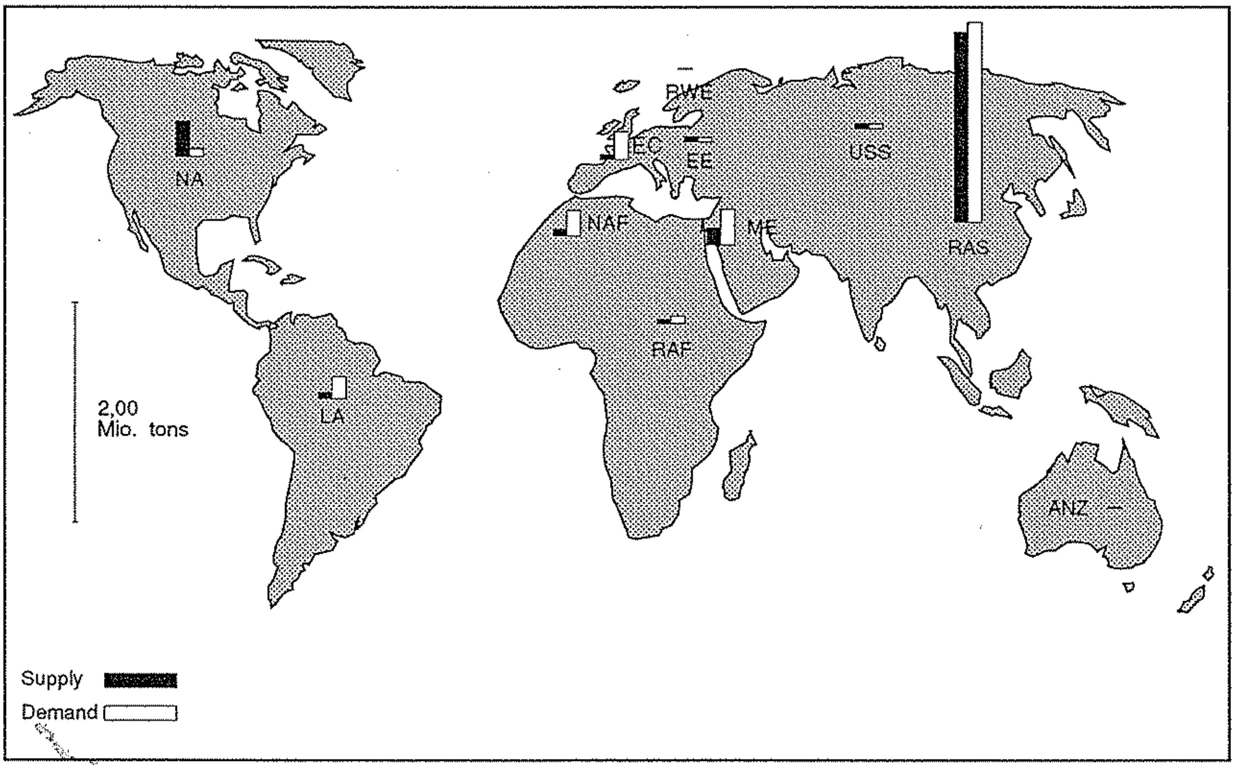
In the world market Turkish supply and demand for rice are rather unimportant (just about 0.1% of world supply and demand). But with the growing population in Turkey, human consumption of rice will increase and the supply deficit may rise up to 2010.

Next to Rest of Asia (RAS), Turkey is the second biggest producer of *lentils* and by far the biggest exporter (about one third of the world trade volume in lentils comes from Turkey). The highest import needs have to be satisfied in the EC, in North Africa and in the Middle East (Appendix C - Table 4.6.1.2.6). Existing and future markets for lentils are shown in Figure 4.6.1.5. The need of imports is going up in the EC, Middle East, Africa, Rest of Asia and Latin America.

The next species of pulses with a considerable Turkish market share are *chickpeas* (Appendix C - Table 4.6.1.2.7) with a world production share of 10% in 1987. The main producing region is Rest of Asia (80%). About half of the 0.73 Mio. tons of Turkish production is exported. So Turkey is the world biggest exporter of chickpeas. The main importers are the EC, the Middle East and North Africa.

According to the simulation results, some considerable changes in world chickpeas supply, demand and net-trade will occur in the future, because Asia will turn from a net exporter in 1987 to a big importer in 2010 and the import needs of the Middle East and of North Africa will more than triple during that period.

Figure 4.6.1.5: Supply and Demand of Lentils 2010



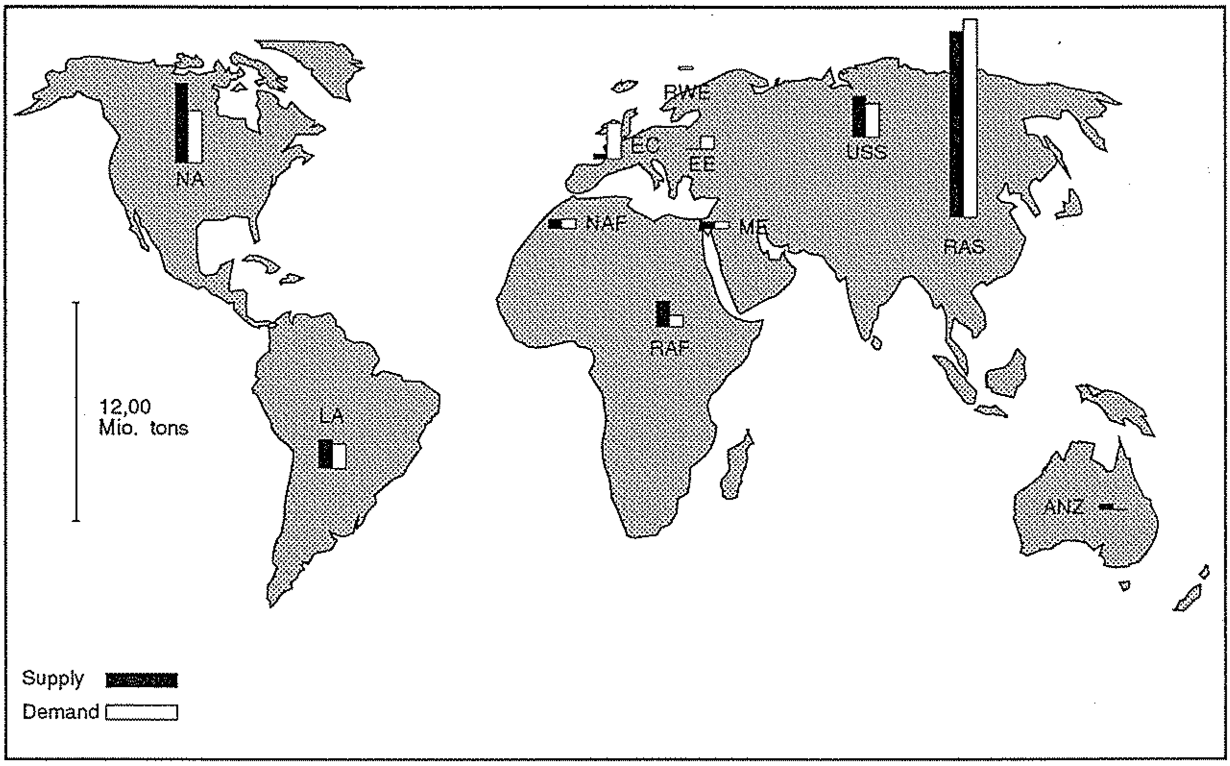
The main producers of *drybeans* are Asia, the EC and the two African regions (Appendix C - Table 4.6.1.2.8). The Turkish production totaled less than 2% of world production, but because of the low domestic demand, Turkey is the third biggest net-exporter of drybeans. The dominant importer is the EC with about 0.27 Mio tons in 1987.

Up to 2010, the import needs of the EC will more than double and the import needs of North Africa will also increase considerably to 0.15 Mio tons.

Cotton

On the world cotton market, which is analyzed in this chapter for raw cotton and not for processed cotton, Turkey has a strong position (Appendix C - Table 4.6.1.2.9). More than 3% of world production is harvested in Turkey. The main producing regions for raw cotton are Central Asia and the Far East, followed by North America and the USSR. Up to the year 2010 the cotton producers in Africa will expand their production and exports and on the other side, the production and exports of the former USSR will go down (Figure 4.6.1.6).

Figure 4.6.1.6: Supply and Demand of Cotton 2010



Due to a further expansion of the textile industry we also expect a growing cotton demand in Turkey. Cotton production in the GAP region can, therefore, contribute to satisfy this domestic demand.

Oilseeds and Oilseed Products

World *soybean* production and demand is dominated primarily by the U.S. market. North America is the biggest producer, consumer and exporter of soybean, soyoil and soycake in the world, followed by Latin America.

In the Tables 4.6.1.2.10, 4.6.1.2.13, 4.6.1.2.17 of Appendix C developments in the soybean and soybean product markets are presented. The share of Turkey in world soybean production and consumption is quite low. Turkey has no import demand for soybean, but a huge deficit in soybean products. Turkey imports about 80% of its soyoil and about 30% of its soycake demand. With the expansion of livestock production and intensification of production techniques in Turkey the demand for protein feed will increase even further.

The main producers and consumers of *sunflowers* and sunflower products are the former USSR, the EC, Eastern Europe, Latin America and Asia (Appendix C - Tables 4.6.1.2.12, 4.6.1.2.14, 4.6.1.2.18) Latin America with its big oilprocessing industry is the biggest importer of sunflowers, but at the same time the biggest exporter of sunflower oil and sunflower cake in the world. Turkey produced 1.1 Mio tons of sunflowers in 1987, which was sufficient to satisfy the domestic demand.

Up to 2010 the growth of the Turkish sunflower production will exceed the world average, increasing its market share significantly up to 2010. But because consumption is growing at nearly the same rate world trade is not affected by the supply increase.

About 60% of total *groundnut* production and over 70% of total groundnutoil and groundnutcake production belong to Asia (Appendix C - Tables 4.6.1.2.13, 4.6.1.2.15, 4.6.1.2.19). Other producers with considerable market shares are Africa (RAF), North America and Latin America. These big producers are also the main exporters, while the EC is the dominant importer. In 1987, Turkey was able to satisfy its domestic groundnut supply out of its own production.

According to the model results, there will be some considerable changes in the groundnut market structure up to 2010. For example, Asia will switch from the biggest exporter of groundnuts in 1987 to the biggest importer in 2010, but will stay the main exporter of groundnutcake over the time. Turkey will increase its production and consumption.

The dominating producer, consumer and exporter of *oliveoil* in the world is the EC with more than 85% of world supply and over 70% of world demand in 1987 (Appendix C - Table 4.6.1.2.16). After North Africa, Turkey is the third biggest producer in the world (2.74% of world total production in 1987).

Vegetables and Fruits

World leading producers of *potatoes* in 1987 were the former USSR, the EC, Rest of Asia and Eastern Europe (Appendix C - Table 4.6.1.2.20). The surplus of the main exporters, the EC and Eastern Europe, were absorbed first of all by the Rest of Western Europe (RWE), by Rest of Asia and by Latin America. Turkey produced about 4.3 Mio tons and had a little surplus for exports.

Up to 2010 some considerable production and trade changes will occur. Some regions will need far bigger imports (Asia, Latin America), some will switch from big exporters to big importers (Eastern Europe), some will turn the other way around to become net exporters (North America, USSR, Middle East, North Africa) and finally some will expand their exports considerably. The biggest export regions in 2010 will be North America, the former USSR and the EC.

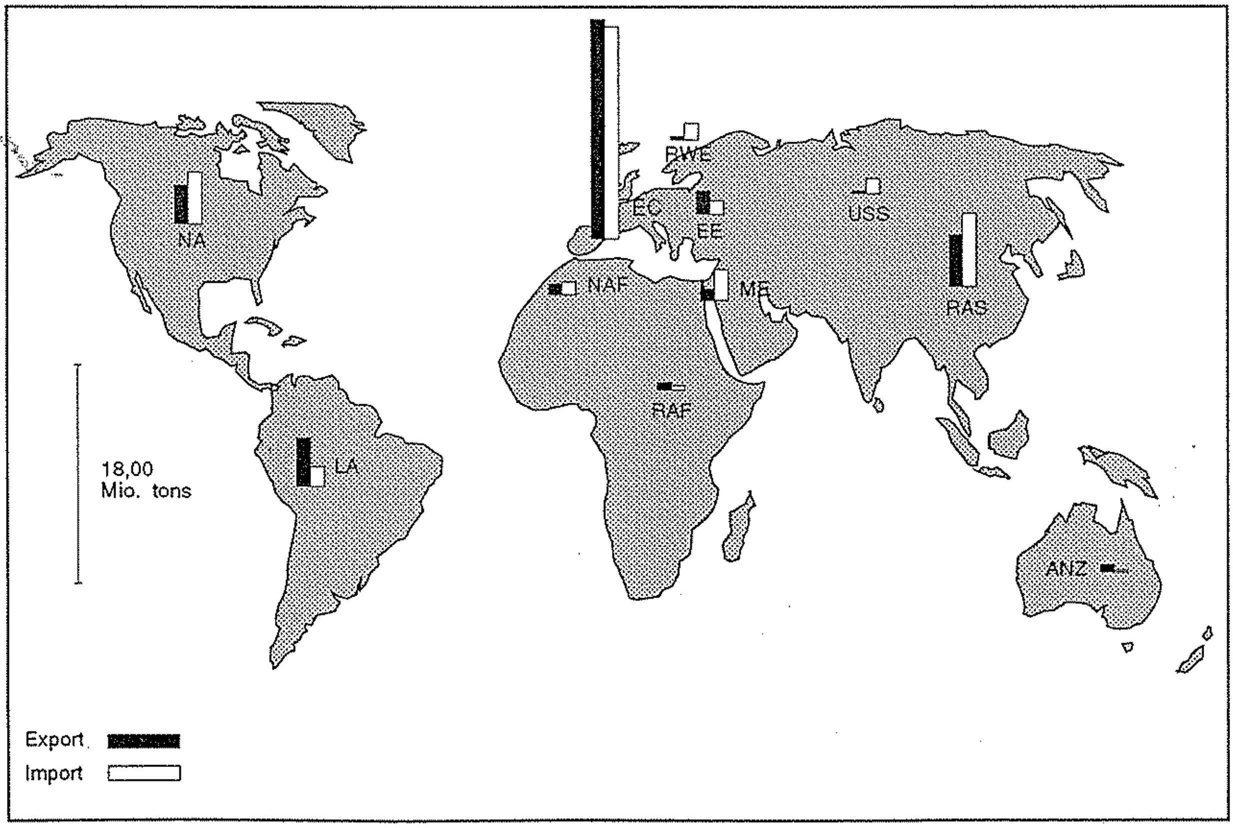
The model runs on world market development of other vegetables and fruits are related to exports and imports. Production and demand data are not available for all countries of the world to generate sufficient world market balances. Although export and import data are used to get an idea of possible changes on the world markets for fruits and vegetables up to 2010, the quality of these data is very low, consistencies are not guaranteed in all points and some values are missing too. A break down of export and import data on product level seems impossible according to these data problems.

The world markets for *vegetables* are characterized by huge local disparities between supply and demand, so that international trade is very important. In 1987 more than 50% of all fresh vegetables in the world were exported and imported by the EC (Appendix C - Table 4.6.1.2.21). The high import quantities of vegetables in the EC are related about 50% to trade between EC countries, and to 50% to trade from third countries. In 1987 the share of vegetable exports in other EC-countries was 88% and in third countries 12%. The EC was also by far the biggest net-exporter for prepared vegetables. Significant net-importers were North America, the former USSR, the Middle East, the Rest of Western Europe and Rest of Asia (the latter only for fresh vegetables). Turkey has only a low import demand for vegetables but exports rather high quantities.

Future development up to 2010 will not change the direction of net trade flows, but it can generally been said, that net-exporters will export even more and net-importers will import even more. World trade in vegetables will increase about 80% from 1987 to 2010.

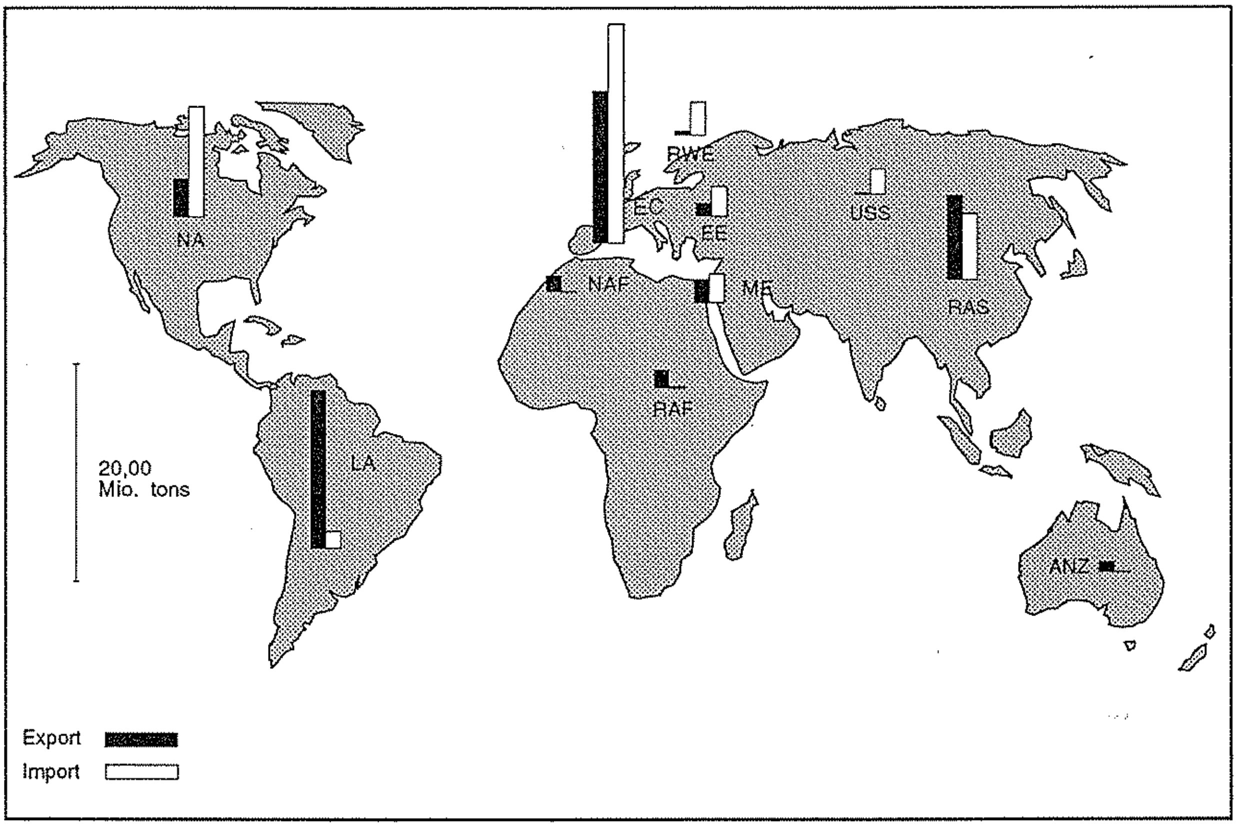
The characteristics of the world market for *fruits* are quite similar to the vegetable markets. Only the main actors change considerably. The biggest net-exporter is by far Latin America, while the EC, North America and the Rest of Western Europe face huge trade deficits (Appendix C - Table 4.6.1.2.23 and 4.6.1.2.24). According to the trade between EC countries the EC as a whole is a big exporter and importer of fruits. The deficit in net-trade is primarily the result of subtropical and tropical product imports. The other main importer of these products is North America. Turkey's net-exports amounted to nearly 600 Mio tons in 1987.

Figure 4.6.1.7: Export and Import of Fresh Vegetables 2010



Up to 2010 net-exporters will increase their surpluses even more, while the net-importers face bigger deficits.

Figure 4.6.1.8: Export and Import of Fresh Fruits 2010



Dairy Products

The biggest *milk* producers and exporters in the world are the EC, the former USSR and North America (Appendix C - Table 4.6.1.2.25). Exports are going mainly to the Rest of Africa (RAF), Latin America and the Middle East. The Turkish raw milk production was sufficient to satisfy the domestic demand.

The further developments will show increasing exports from the EC, North America, the Rest of Western Europe (RWE) and from Australia/New Zealand (ANZ). These will be absorbed mainly from Eastern Europe, Latin America, Rest of Asia and the Rest of Africa (RAF).

The world production structure for *butter* in 1987 was quite similar to that of milk (Appendix C - Table 4.6.1.2.26). The EC and the former USSR were the main producers, large exports come from the EC and from Australia/New Zealand and are mainly going to the USSR, the Middle East and North Africa. Turkey held a world market share of about 1.3% and had balanced trade flows for butter in 1987.

Milkpowder production in the world (Appendix C - Table 4.6.1.2.27) was dominated by the EC in 1987 (market share of about 42.5%). The USSR and North America were also big producers. Main exporting regions were the EC, Australia/New Zealand and North America.

The biggest import regions are Latin America, the Middle East, North Africa and the Rest of Africa (RAF). This structure will prevail up to 2010. Milkpowder production and consumption plays only a marginal role in Turkey.

In 1987, *cheese* (Appendix C - Table 4.6.1.2.28) was mainly produced in the EC (world market share of about 35%), in North America (world market share of about 25%) and in the former USSR (world market share of about 15%). The biggest exporters were the EC, Australia/New Zealand and the Rest of Western Europe (RWE). Importing regions were first of all the Middle East, Central/East Asia (RAS) and North America. With a production output of about 0.1 Mio tons of cheese, Turkey held a share of less than 1% of world production, but was able to satisfy domestic demand.

In 2010, the EC will be surpassed by both Australia/New Zealand and the former USSR as the leading exporter of cheese, while the Middle East and North Africa develop additional needs for imports. Turkey's production and consumption will increase by about 40 and 50% respectively, making some imports necessary.

Other Livestock Products

There are four main regions for *beef* production in the world: North America, the former USSR, the EC and Latin America (Appendix C - Table 4.6.1.2.29). The biggest exporters are Australia/New Zealand, Latin America and the EC. Up to 2010 the region Rest of Asia will also expand their beef production rapidly, but will not be able to match the even faster growth of their domestic demand.

Turkey held only about 0.5% of total world beef production in 1987 and had to import about 10% of its domestic demand. Up to 2010 the country will be able to decrease the production gap, but still will not play a significant role on world markets.

In the FAO data base for the WTM model only *mutton* meat supply, demand and net-trade are included. Exports and imports of live animals, which are very important for the sheep market, are not considered at all. Consequently, the exports of live animals, which are slaughtered later on in the importing countries, contribute to meat supply in these countries. This should be kept in mind when looking at the meat supply of surrounding countries of Turkey.

Australia and New Zealand (ANZ) were the biggest mutton producers in the world in 1987, closely followed by the EC, the former USSR and Central/East Asia (RAS) (Figure 4.6.1.2.8). Turkey hold a share of nearly 5% of world production in 1987 (Appendix C - Table 4.6.1.2.30).

In 2010, RAS the region with the highest population in the world will surpass ANZ as the main producer of mutton, but ANZ will further strenghten its dominant export position. Turkey will also expand its domestic production, but will loose market shares, because its production growth will be below world average.

Five Regions hold a considerable market share in world *poultry and eggs* production (Appendix C - Tables 4.6.1.2.31 and 4.6.1.2.32): Central/East Asia, the EC, North America, the former USSR and Latin America. Main exporter in 1987 were the EC, North America and

Eastern Europe. Importing countries are mainly the Middle East, Central/East Asia and the former USSR. Turkey contributed less than 1% to world production. Up to 2010, the EC, North America and Latin America will strenghen their export positions, while Central/East Asia will need additional imports of poultry and eggs.

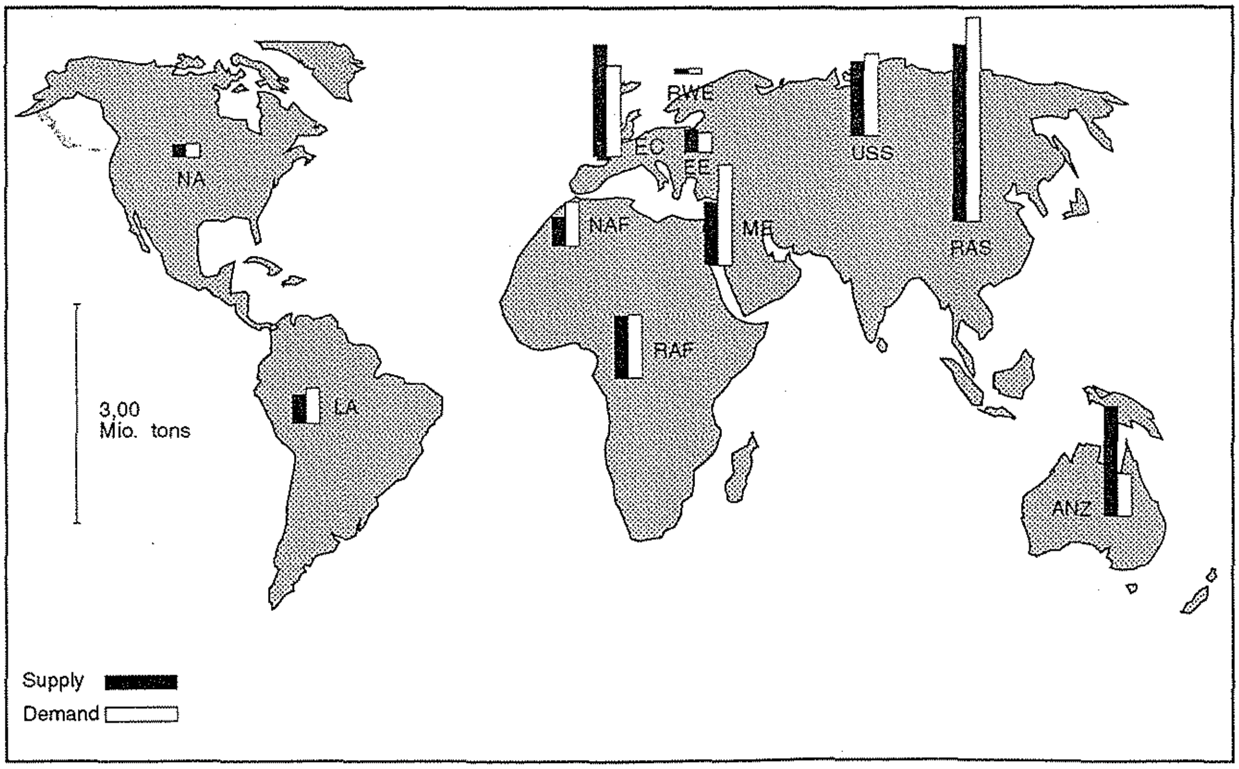
Other Agricultural Products

On the *sugar* market Latin America and Asia are the biggest producers in the world, producing cane-sugar, followed by the EC, the biggest sugarbeet producer in the world (Appendix C - Table 4.6.1.2.33). The share of Turkey in world production is about 1.8% in 1987. Domestic production of sugar is roughly sufficient to cover demand in Turkey. In relation to the big exporters of sugar in the world (Latin America, EC-12 and Australia), Turkey is only of minor importance. On the other hand, Turkey is located close to main deficit regions for sugar, like the Middle East, the former USSR and North Africa.

The Central and East Asian Countries (RAS) are dominating the world production of *tobacco* with a market share of more than 50% (Appendix C - Table 4.6.1.2.34). But the biggest exporters are Latin America, Rest of Africa (RAF) and Turkey. The latter exported more than 50% of its domestic production of about 0.19 Mio tons. The main importer is the EC.

Up to 2010, growing import needs especially from the former USSR and North Africa will have to be served. Latin America will benefit most of this development through an expansion of its exports from 0.25 Mio tons in 1987 to about 0.4 Mio tons in 2010.

Figure 4.6.1.9: Supply and Demand of Mutton 2010



4.6.2 Scenario World-1: GATT Complete Liberalization

As described in Chapter 4.5 the GATT Full Liberalization Scenario is based on the "Dunkel-Proposal" of December, 1991. According to the proposal the reduction of overall assistance to agriculture, and border barriers in particular, will take place over the period 1993 to 1999. Furthermore it is assumed that after this initial period, the reduction of assistance will continue at the same path up to the year 2010. The decrease in support over the whole simulation period will thus reach a level of around 50% for overall assistance and almost 90% for border barriers. In the following chapters the impact of this drastic decrease in agricultural protection on world market prices, supply, demand and net-trade will be described. The results will be discussed with reference to the Base Scenario to highlight the influence of the policy change.

4.6.2.1 World Market Price Developments

Since the assumed policy changes start after 1990, the price changes for the first simulation period (1987-1990) do not differ from the Base Scenario. Therefore, only the price changes for the period 1990-2010 are presented in Table 4.6.2.1 and Figure 4.6.2.2. There are two main factors that influence the extent and direction of price changes in comparison to the Base Scenario:

- The removal of protection of agriculture decreases producer prices and consumer prices. The lower producer prices will diminish production whereas lower consumer prices will stimulate demand and thus tend to create a strong excess demand. This situation causes world market prices to increase at a higher level as compared to the Base Scenario. The higher the assistance to an individual product the higher the world market price increase that can be expected.

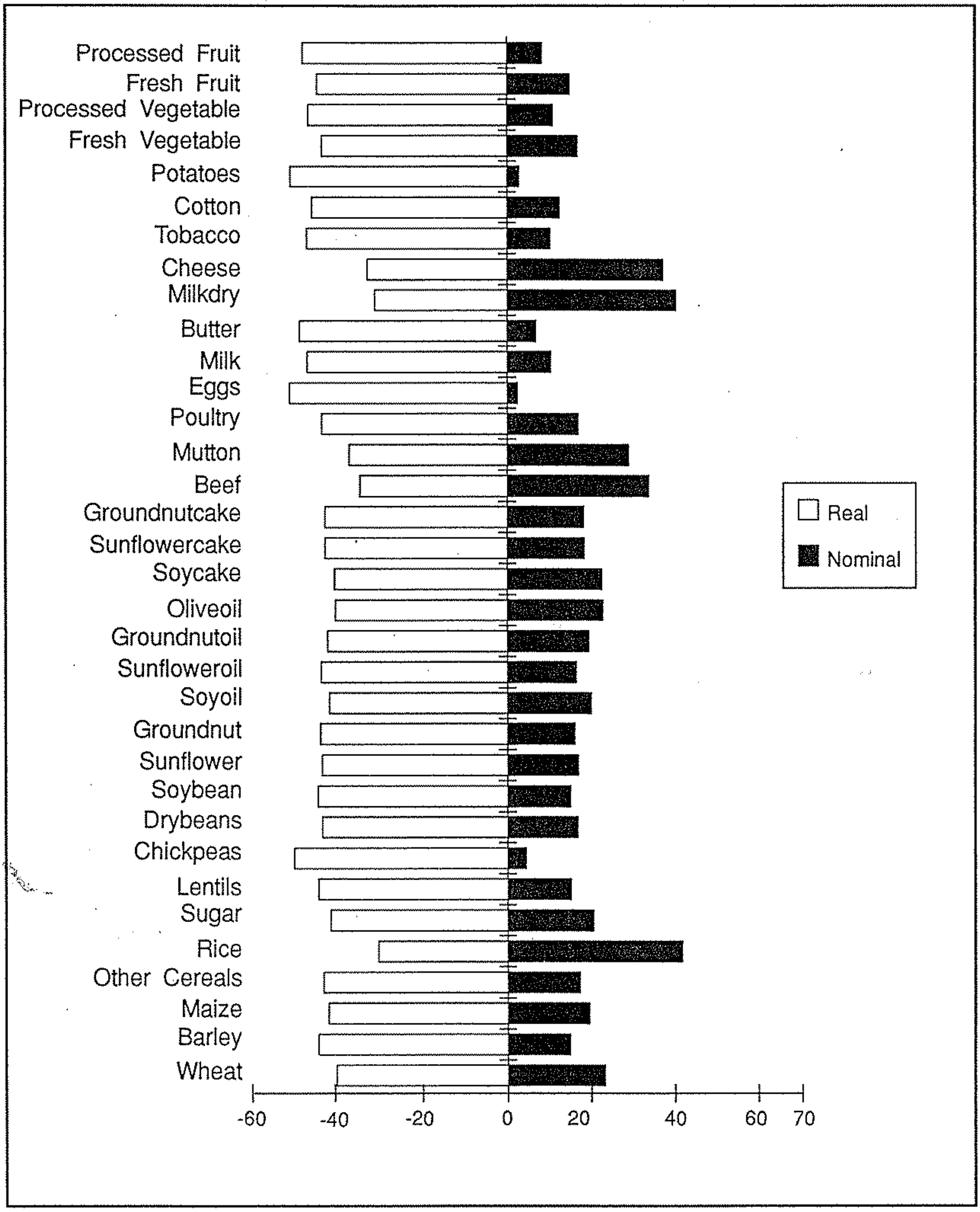
- The reduction of trade barriers ties domestic markets closer to world market developments, which is expressed by price transmission elasticities that approach the value of one. With larger price transmission elasticities there is a stronger supply and demand response to world market price changes. This stronger response causes world market price variability to be lower as under conditions when price changes are only partly transmitted.

It is obvious that these two factors have an opposite effect on the change of the world market prices. Since most of the products have a very high level of assistance in the major producing countries, the first factor dominates the second factor and, therefore, the price increases under full liberalization are higher than in the Base Scenario. As can be seen in Table 4.6.2.1 and 4.6.1.1 this applies in particular for cereals with the exception of rice, for sugar, groundnut oil, mutton and dairy products. Sugar, groundnut oil, mutton and the dairy products will have the highest overall price increase, all of them above 40%, while in the Base Scenario rice, dry

Table 4.6.2.1: Nominal and Real Price Changes 1990-2010

	Nominal Price Changes (%)		Real Price Changes (%)	
	total	annual	total	annual
Wheat	35,97	1,55	-31,56	-1,88
Barley	30,45	1,34	-34,34	-2,08
Maize	34,96	1,51	-32,07	-1,92
Other Cereals	34,57	1,50	-32,27	-1,93
Rice	36,59	1,57	-31,25	-1,86
Sugar	51,10	2,09	-23,95	-1,36
Lentils	15,00	0,70	-42,12	-2,70
Chickpeas	4,34	0,21	-47,48	-3,17
Drybeans	16,56	0,77	-41,33	-2,63
Soybean	15,24	0,71	-42,00	-2,69
Sunflower	19,97	0,91	-39,62	-2,49
Groundnut	19,67	0,90	-39,77	-2,50
Soyoil	16,62	0,77	-41,30	-2,63
Sunfloweroil	16,86	0,78	-41,18	-2,62
Groundnutoil	61,64	2,43	-18,64	-1,03
Oliveoil	17,44	0,81	-40,89	-2,59
Soycake	13,17	0,62	-43,04	-2,77
Sunflowercake	10,47	0,50	-44,40	-2,89
Groundnutcake	17,07	0,79	-41,08	-2,61
Beef	34,37	1,49	-32,37	-1,94
Mutton	41,92	1,77	-28,57	-1,67
Poultry	23,01	1,04	-38,09	-2,37
Eggs	4,54	0,22	-47,38	-3,16
Milk	19,08	0,88	-40,06	-2,53
Butter	56,92	2,28	-21,02	-1,17
Milkdry	62,57	2,46	-18,17	-1,00
Cheese	44,72	1,87	-27,16	-1,57
Tobacco	8,33	0,40	-45,48	-2,99
Cotton	19,13	0,88	-40,04	-2,52
Potatoes	6,46	0,31	-46,42	-3,07
Vegetable fresh	19,18	0,88	-40,01	-2,52
Vegetable proc.	16,57	0,77	-41,33	-2,63
Fruit fresh	16,18	0,75	-41,52	-2,65
Fruit processed	14,50	0,68	-42,37	-2,72

Figure 4.6.2.1: Nominal and Real Price Changes 1990-2010 in %



milk and cheese showed the highest upward trend. In the case of fruits and vegetables it is interesting to observe that the price increases for the processed products are considerably higher, which of course is related to the higher protection for processed products. For some products like rice, soyoil and soycake, olive oil, sunflowercake, groundnut cake and tobacco the price increase is lower than in the Base Scenario. All these products have a relatively low level of support and thus the second factor is more relevant for the price development. Furthermore their production will expand due to the fact that they become more competitive after removing assistance to other crops.

As for the Base Scenario Table 4.6.2.1 and Figure 4.6.2.1 contain annual and real price changes. Though the nominal price increase for most of the products is higher than in the Base Sceanrio the corresponding real price changes are still all negative.

4.6.2.2 Developments of Supply, Demand and Net-Trade

The development of supply, demand and net-trade in the individual regions depends both on the changes in their protection level and the change of the world market prices following the reduction of assistance. If the removal of support is more extensive than the world price changes production tends to decrease, demand to increase and vice versa.

Cereals and Pulses

While the situation on the various cereal markets changes considerably, supply, demand and net-trade on the markets of pulses almost stay constant as compared to the Base Scenario. The reason for the latter development is the fact, that while for cereals the protection level is among the highest between all product groups, the level of protection for pulses is only marginal in major producing and consuming countries. Therefore, the following paragraphs will focus on the developments on the cereal markets.

Table 4.6.2.2.1 of Appendix C shows the situation on the *wheat market*. Total production and consumption in the world will reach a slighlty lower level as in the Base Scenario. The decrease on the production side is mainly caused by the EC and North America. Both regions subsidize wheat production heavily and the reduction of assistance dominates the increase in world market prices leading to a much lower wheat production compared to the Base Scenario. Besides these two regions production slightly goes down in Rest of Western Europe and Latin America. In all other regions production increases relative to the Base Scenario due to higher world market prices. Especially Rest of Asia strengthens its dominating role on the wheat market reaching a share of wheat production of more than 37% by 2010. Contrary the share of the EC and North America in production will shrink more drastically than in the Base Scenario and will reach a level of just slightly above 10% for the EC and less than 15% for North America.

On the demand side the regions with a high protection, especially the EC and North America, have an increase compared to the Base Scenario due to relatively lower consumer prices after removing the support to agriculture. In the other regions demand will be lower than in the Base Scenario due to higher world market prices. This is most obvious for the region Rest of Asia.

As a result of the developments of supply and demand, there are very drastic changes in net-trade of some of the regions. The highly protective regions EC and North America will export much lower quantities in 2010 as compared to the Base Scenario. In the EC exports go down by about 18 Mio tons and in North America by 10 Mio tons. The EC will even export much lower quantities than in 1987. The former USSR and the region Rest of Asia will be able to lower their imports. In 2010 Rest of Asia will only have to import half the quantity of 1987.

As can be seen from Table 4.6.2.2.2 of Appendix C on the *barley market* the changes in supply, demand and net-trade compared to the Base Scenario are only marginal compared to the wheat market both at the world level and the level of individual regions. The overall tendency is, however, very similar to wheat: regions like the EC and North America with high subsidies reduce production and increase demand, whereas most of the other regions show the opposite development. With regard to net-trade exports of the EC and North America will go down by 2 Mio tons relative to the Base Scenario, with the EC loosing its second position as an exporter to Australia and New Zealand.

The developments on the *maize market* are presented in Table 4.6.2.2.3 of Appendix C. Like on the wheat market the changes after trade liberalization are rather strong compared to the Base Scenario. North America the main producing region, which has extensive subsidies for maize, has a 10 Mio tons lower production in 2010 as in the Base Sceanrio. A relative decrease also applies to the EC, whereas Rest of Asia, the second most important producer will supply 15 Mio tons more of maize than in the Base Scenario. On the demand side the major difference to the Base Scenario can be found for the EC and Rest of Asia. The EC is the only region with a considerable increase of demand among all countries, whereas in the region Rest of Asia demand goes down by 7 Mio tons. The most drastic changes can be observed for net-trade. After liberalization the EC will take the place of Rest of Asia as the most important importer by the year 2010 with 15 Mio tons of imports. Rest of Asia will only rank third behind the former USSR by that time. North America, the only important exporter in the world will have much lower exports as in the Base Scenario.

The changes on the markets of *other cereals* compared to the Base Scenario are limited. Considerable differences can be observed for Africa, where production increases and demand declines and for North and Latin America, where the opposite development takes place. For the net-trade position there are several switches from exporters to importers, most noteworthy for the EC and Latin America. The major exporter North America will export only 6 Mio tons as compared to 9 Mio tons in the Base Scenario. Turkey will stay around the self-sufficiency level in the liberalization scenario.

On the *rice market* the removal of subsidies will also have only minor impacts on the market developments. In particular there are no switches from importers to exporters or vice versa. Rest of Asia, which is dominating the rice market and where most of the exporting countries give only little support to the rice sector, will however be able to export 3 Mio tons more of rice in 2010 as compared to the Base Scenario. Turkey will keep its position as a small importer of rice.

Cotton

The cotton market is a market where the assistance to agriculture is very low. Furthermore there is no major discrimination of consumers. So it is not surprising, that trade liberalization has only a small effect on this market, which can be seen from Table 4.6.2.2.4 of Appendix C. Among the major producers Rest of Asia increases its production slightly compared to the Base Scenario and North America has a relative decrease. Demand is not showing any considerable differences to the Base Scenario. North America, the most important exporter of cotton and one of the few countries with considerable subsidies to cotton producers, will only export 1 Mio tons in 2010 as compared to 1,5 Mio tons in the Base Scenario. Turkey will continue to import raw cotton like in the Base Scenario, however in slightly smaller quantities.

Oilseeds and Oilseed Products

Since there are only minor deviations from the Base Scenario and since Turkey is not playing an important role as an exporter or importer for oilseeds and oilseed products, a detailed discussion is omitted at this place. The minor differences to the Base Scenario stem from the fact that protection in this sector is very low and mainly exists for the raw products. One observation should be stressed, however: since the raw products serve as input to the derived products a reduction of subsidies to the raw product will stimulate the production of the derived products. This is very obvious in the case of soyoil and soycake supply for the EC. For Turkey production, demand and net-trade quantities after liberalization are almost identical to the Base Scenario.

Vegetables and Fruits

As mentioned in Chapter 4.3. the information on protection of fruits and vegetables is rather scarce and only refers to tariffs and the main industrialized countries/regions (EC, Rest of Western Europe, Japan, North America, Australia and New Zealand). Still some effect of liberalization can be observed in particular for processed fruits and vegetables.

Table 4.6.2.2.5 of Appendix C shows the situation on the market for *potatoes*. In the the EC and North America, production declines heavily compared to the Base Scenario. Coupled with an increase of demand both regions turn to net importers by the year 2010. For all other regions production increases slightly while demand goes down somewhat relative to the Base Scenario. While in the Base Scenario Eastern Europe became a net-importer of potatoes it will be able to expand its exports in the full liberalization scenario.

For fresh and processed *vegetables* the development of exports, imports and net-trade under liberalization are shown in Tables 4.6.2.2.6 and 4.6.2.2.7 of Appendix C. As for potatoes, the major changes occur in the regions EC and North America. Exports decrease while imports increase by the year 2010 relative to the Base Scenario. This will even bring the EC to a net importing position for fresh vegetables in 2010. Turkey, who is an important net exporter of fresh and processed vegetables will strengthen this position in the liberalization scenario.

Tables 4.6.2.2.8 and 4.6.2.2.9 of Appendix C contain the trade situation for fresh and processed *fruits*. The only region with lower exports than in the Base Scenario is the EC with a high protection level for these products. On the import side all regions beside the EC, Rest of Western Europe and Rest of Asia (containing Japan with a rather protective policy) lower their imports compared to the Base Scenario. There are no changes from net exporters to net importers for fresh fruits. For processed fruits exports decrease not only in the EC but also in North America relative to the Base Scenario. Since at the same time imports reach a higher level in 2010 as compared to the Base Scenario both regions have a very strong net-import demand by the year 2010.

Dairy Products

For many of the major producing and consuming regions the protection level is rather high for dairy products though at a somewhat lower level as for cereals. As for oilseeds input-output relationships play a decisive role in the price building. Furthermore it has to be stressed that in regions where assistance to feedstuffs is reduced, supply can be stimulated although subsidies to milk producers are reduced. This might be the reason why for example milk supply in the EC stays at the same level as in the Base Scenario and the EC can thus strenghten its position in the dairy product market.

As mentioned in the previous chapter trade of milk and milk products is only of minor importance for Turkey. Like in the Base Scenario Turkey stays at the self-sufficiency level with small export quantities of milk and butter and small import quantities of milkpowder and cheese.

Other Livestock Products

As for the Base Scenario the focus will be on the developments on the mutton market and only a short overview will be given on the beef, poultry and eggs market. The overall protection level for these products is rather low compared to product groups like cereals or even dairy products. Therefore, the changes after trade liberalization are rather small compared to the Base Scenario. As for dairy products the price developments of feed further influence the development of supply of livestock products.

The smallest changes compared to the Base Scenario occur for *eggs*. For Turkey supply, demand and net-trade even stay at the same level as in the Base Scenario. In the EC production of *beef* and *poultry* reaches a considerably lower level as in the Base Scenario. For beef the EC even becomes an importer by the year 2010. Again Turkey almost remains at the same net-trade level as in the Base Scenario.

The situation on the *mutton* market is shown in Table 4.6.1.2.10 of Appendix C. As for the other liverstock products the major change in the mutton market can be observed for the EC, that is heavily subsidizing mutton production. The level of production in the EC, that is reached in the year 2010, will be much lower than in the Base Scenario. As demand increases to a much higher extent as in the Base Scenario the EC will switch from an exporter to an importer. Australia and New Zealand another major producing region will be able to increase production and net-trade as compared to the Base Scenario. With the EC becoming a net importer, Turkey will be the second most important exporter of mutton by the year 2010.

Other Agricultural Products

The situation on the *sugar market* is presented in Table 4.6.2.2.11 of Appendix C. The total production and consumption stays almost at the same level as in the Base Scenario. For some of the major producers supply differs, however considerably in both runs. The EC and in particular North America, both strongly subsidizing this sector, have a lower production in the liberalization run. Contrary Latin America, where most of the countries do not give much of assistance to sugar producers, gains from the high price increase and expands its production relative to the Base Scenario. On the demand side, where there are much smaller policy influences in most of the regions, no major changes appear compared to the Base Scenario. Due to the strong increase in production Latin America will expand its dominating role as sugar exporter and will reach 19 Mio tons of exports in 2010. The EC will have lower exports than in the Base Scenario while North America will become the third most important importer.

The *tobacco* market is again a market with no major changes relative to the Base Scenario. Turkey will keep the same export level like in the Base Scenario.

Summarized, a liberalization according to the Dunkel proposal will increase the price level for most of the products compared to the Base Scenario. Considerable changes with regard to supply, demand and net-trade are, however, only expected in a few markets, in particular cereals, fruits and vegetables, dairy products and sugar. A more specific analysis of effects on Turkey will be performed in the crop pattern modelling section.

4.6.3 Scenario World-2: GATT Partial Liberalization

The GATT partial liberalization scenario assumes that the basic idea of the Dunkel proposal is retained while lower rates of reduction in protecion are chosen. The overall decrease of assistance will have a level of slightly more than 30% and border barriers are removed by around 50%. Since the tendency of changes caused by a partial liberalization is very similar to the full liberalization scenario, which was described above, the following discussion will only highlight some of the major differences between these two scenarios and will mainly concentrate on the net-trade developments. Futhermore, only those products will be included in the discussion, for which the full liberalization run showed considerable changes compared to the Base Scenario.

4.6.3.1 World Market Price Developments

Table 4.6.3.1 next page shows the price changes after partial liberalization. Again only the price changes for the period 1990 to 2010 are presented since the price changes of the first period stay unchanged. For almost all the products the price changes under partial liberalization lie between the price changes of the Base Scenario and the full liberalization scenario. This applies to the case, when prices in the full liberalization scenario are higher than in the Base Scenario as well as when they are lower than in the Base Scenario. The exceptions are rice, dry beans, sunflower, sunflower oil, groundnut cake and beef. For these products strong cross-price effects as well as specific constellations with regard to the two price determining factors, that were explained in Chapter 4.6.1.1 seem to be relevant.

4.6.3.2 Developments of Supply, Demand and Net-Trade

Cereals and Pulses

Among these product groups the major differences to the full liberalization scenario can be found for the products wheat, barley and maize with regard to the development in the EC (see Tables 4.6.3.2.1 and 4.6.3.2.2 of Appendix C).

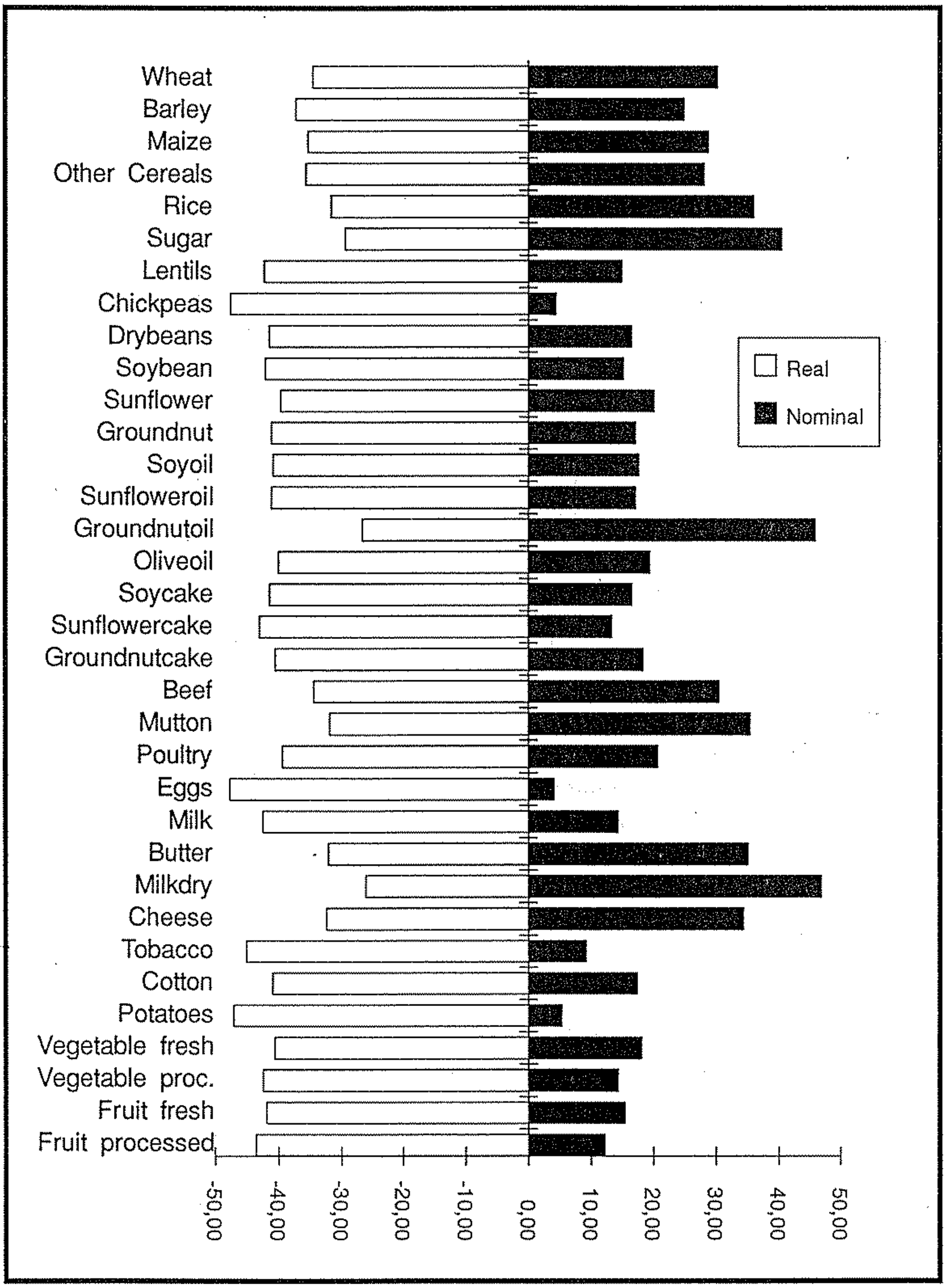
In the full liberalization scenario the EC exports of *wheat* go down to a level of 3 Mio tons in 2010 as compared to 14 Mio tons in 1987. This strong decrease does not take place under a partial liberalization framework. Though exports in 2010 are still lower than in the Base Scenario, the level reaches still about 13 Mio tons, which is thus only slightly lower than in 1987. Developments in the region Rest of Asia, the major producing and consuming region of wheat, also differ considerably from the full liberalization scenario. Compared to the Base Scenario, wheat imports can still be decreased in 2010, but with 22 Mio tons the level is much higher than under full liberalization (15 Mio tons).

The reduction of EC *barley* exports in the partial liberalization scenario is considerably lower than in the full liberalization scenario. With almost 5 Mio tons the EC stays the second most important exporter. While the former USSR becomes an exporter under a full liberalization scenario in 2010, it will continue to be an importer with partial liberalization.

Table 4.6.3.1: Nominal and Real Price Changes 1990-2010

	Nominal Price Changes (%)		Real Price Changes (%)	
	total	annual	total	annual
Wheat	30,33	1,33	-34,40	-2,09
Barley	24,93	1,12	-37,12	-2,29
Maize	28,83	1,27	-35,16	-2,14
Other Cereals	28,11	1,25	-35,52	-2,17
Rice	36,05	1,55	-31,52	-1,88
Sugar	40,45	1,71	-29,31	-1,72
Lentils	14,98	0,70	-42,13	-2,70
Chickpeas	4,34	0,21	-47,48	-3,17
Drybeans	16,58	0,77	-41,32	-2,63
Soybean	15,23	0,71	-42,00	-2,69
Sunflower	20,10	0,92	-39,55	-2,49
Groundnut	17,14	0,79	-41,04	-2,61
Soyoil	17,71	0,82	-40,75	-2,58
Sunfloweroil	17,19	0,80	-41,02	-2,60
Groundnutoil	45,84	1,90	-26,60	-1,53
Oliveoil	19,42	0,89	-39,89	-2,51
Soycake	16,56	0,77	-41,33	-2,63
Sunflowercake	13,37	0,63	-42,94	-2,77
Groundnutcake	18,40	0,85	-40,41	-2,55
Beef	30,49	1,34	-34,32	-2,08
Mutton	35,43	1,53	-31,84	-1,90
Poultry	20,64	0,94	-39,28	-2,46
Eggs	4,03	0,20	-47,64	-3,18
Milk	14,36	0,67	-42,44	-2,72
Butter	35,07	1,51	-32,02	-1,91
Milkdry	46,88	1,94	-26,07	-1,50
Cheese	34,41	1,49	-32,35	-1,94
Tobacco	9,17	0,44	-45,05	-2,95
Cotton	17,43	0,81	-40,89	-2,60
Potatoes	5,21	0,25	-47,05	-3,13
Vegetable fresh	18,09	0,83	-40,56	-2,57
Vegetable proc.	14,41	0,68	-42,41	-2,72
Fruit fresh	15,46	0,72	-41,89	-2,68
Fruit processed	12,19	0,58	-43,53	-2,82

Figure 4.6.3.1: Nominal and Real Price Changes 1990-2010 in %



Like in the full liberalization scenario the drastic increase of *maize* imports of the EC is the most striking observation when trade is only partly liberalized. By 2010 the EC will import 9 Mio tons of maize, which is, however, lower than the 15 Mio tons with full liberalization. Like in the full liberalization scenario the region Rest of Asia looses its position as main exporter, but instead of the EC, the former USSR will become the most important importer in the partial liberalization scenario.

Vegetables and Fruits

As in the full liberalization scenario both the EC and North America become importers of *potatoes*, though at a much lower level. Eastern Europe is also able to keep its position as a net-exporter. For Turkey the partial liberalization scenario does not make any significant change to the full liberalization scenario with regard to exports.

Tables 4.6.3.2.4 to 4.6.3.2.7 of Appendix C show the situation on the other vegetable and fruit markets.

For fresh and processed *vegetables* and fresh and processed *fruits* the overall tendency, that was presented in the full liberalization scenario, will prevail and Turkey's export position would be very close to those under full liberalization. The main difference to the full liberalization scenario exists for the EC. Instead of switching to a net-importer for fresh vegetables, the EC remains a net-exporter though at a lower level than in the Base Scenario.

Other Livestock Products

For eggs the developments with partial liberalization are almost identical to the situation with full liberalization For *beef* and *poultry* there only exists a difference with regard to the EC. For beef the EC will not become an importing region and in the case of poultry the EC will continue to export rather large quantities, keeping its place as the third most important exporter. Turkey will remain at the self-sufficiency level for all these products.

Developments on the *mutton* market are shown in Table 4.6.3.2.8 Appendix C. Like for beef, the EC will not become an importer like in the full liberalization scenario. However, since the export quantities will be much smaller than in the Base Scenario, Turkey will still be able to take the second position as exporter in the world.

Altogether like for the full liberalization scenario prices for most of the products will increase in the partial iberalization run, though at a lower level. Major deviations from the full liberalization scenario can mainly be observed for wheat, barley, fruit and vegetables. The overall tendency of export prospects for Turkey remains, however, the same as in the full liberalization scenario.

4.6.4 Scenario World-3: Radical Changes in the Agricultural Sector of former Socialisitc Countries

In Chapter 4.3 the various periods of adjustment in the former socialistic countries are described. Following a period of constant supply and rather unflexible demand up to the year 1995, both supply and demand will increase considerable and show much higher flexibility to prices. The results of this scenario will be presented in the next chapters. Again reference will be made to the Base scenario to emphasize the changes in the World Scenario 3. Since the time path of adjustment is of particular importance in this scenario some attention will be given to developments in the various subperiods.

4.6.4.1 World Market Price Developments

Like for the other world scenarios price changes for the period 1987 to 1990 are omitted since they are identical to the Base Scenario.

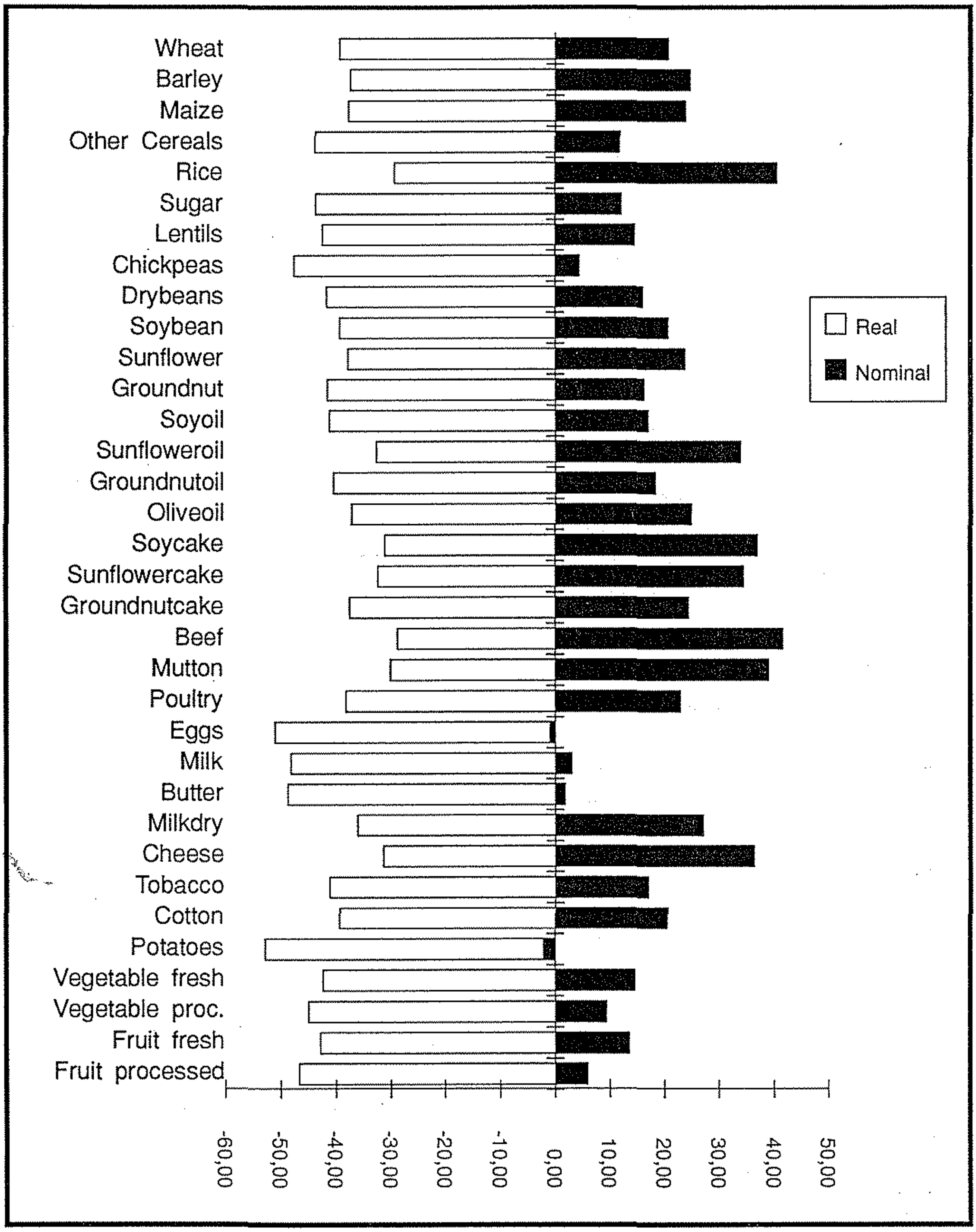
Table 4.6.4.1 presents the overall nominal price changes for the period 1990 to 2010. As for the other scenarios Table 4.6.4.1 also contains the annual and real price changes. The prices differ very markedly from the Base Scenario, depending of course on the importance of the former USSR and Eastern Europe for the individual markets. Furthermore, the direction of price changes compared to the Base Scenario varies considerably among the various product groups.

For wheat, other cereals, rice, pulses, sugar, soyoil, groundnut oil, eggs, dairy products, potatoes, vegetables and fruits the price increases are lower than in the Base Scenario. Besides the vegetable oils these are all products for which it is assumed that the demand trend will not change compared to the Base Scenario, as they are becoming inferior goods. Since, however, supply for these products is supposed to increase considerably in the former socialistic countries an excess supply is created, that causes world market prices to fall relative to the Base Scenario. This relative price decrease is most pronounced for barley, sugar and dairy products, for which the former USSR and Eastern Europe have a very high share in production and consumption. For other products like pulses, where the former USSR and Eastern Europe produce and consume only minor quantities, the relative price decrease is almost insignificant. The relative price decrease of soyoil and groundnut oil stems from the fact that the supply trend assumed for these products in the Base Scenario is already higher than the demand trend. If now, as assummed in the World-3 Scenario, supply and demand trends double in the long run this stronger supply growth is further increased, thus leading to lower growth rates for world market prices.

Table 4.6.4.1: Nominal and Real Price Changes 1990-2010

	Nominal Price Changes (%)		Real Price Changes (%)	
	Nominal	annual	Real	annual
Wheat	20,69	0,94	-39,25	-2,46
Barley	24,61	1,11	-37,28	-2,31
Maize	23,76	1,07	-37,71	-2,34
Other Cereals	11,83	0,56	-43,71	-2,83
Rice	40,53	1,72	-29,27	-1,72
Sugar	12,12	0,57	-43,57	-2,82
Lentils	14,56	0,68	-42,34	-2,72
Chickpeas	4,31	0,21	-47,50	-3,17
Drybeans	16,01	0,75	-41,61	-2,65
Soybean	20,59	0,94	-39,30	-2,47
Sunflower	23,67	1,07	-37,75	-2,34
Groundnut	16,16	0,75	-41,53	-2,65
Soyoil	16,98	0,79	-41,12	-2,61
Sunfloweroil	33,86	1,47	-32,63	-1,96
Groundnutoil	18,28	0,84	-40,47	-2,56
Oliveoil	24,81	1,11	-37,18	-2,30
Soycake	36,96	1,59	-31,07	-1,84
Sunflowercake	34,46	1,49	-32,32	-1,93
Groundnutcake	24,33	1,09	-37,42	-2,32
Beef	41,58	1,75	-28,74	-1,68
Mutton	38,93	1,66	-30,07	-1,77
Poultry	22,85	1,03	-38,17	-2,37
Eggs	-0,91	-0,05	-50,13	-3,42
Milk	2,96	0,15	-48,18	-3,23
Butter	1,81	0,09	-48,76	-3,29
Milkdry	27,07	1,21	-36,04	-2,21
Cheese	36,36	1,56	-31,37	-1,86
Tobacco	16,99	0,79	-41,12	-2,61
Cotton	20,52	0,94	-39,34	-2,47
Potatoes	-2,09	-0,11	-50,72	-3,48
Vegetable fresh	14,61	0,68	-42,31	-2,71
Vegetable proc.	9,37	0,45	-44,95	-2,94
Fruit fresh	13,58	0,64	-42,83	-2,76
Fruit processed	5,92	0,29	-46,69	-3,10

Figure 4.6.4.1: Nominal and Real Price Changes 1990-2010 in %



For all the other products, in particular for feedstuffs (barley, oilcakes), ruminant meat (beef, mutton), sunflower and sunflower-oil as well as cotton, prices increase considerably as compared to the Base Scenario. For these products the long-run demand growth in the former socialistic countries will exceed the supply growth, thus leading to relatively higher world market prices. Besides the assumed supply and demand growth rates, the higher flexibility of supply and demand expressed in increased price elasticities have an influence on the final price level.

After presenting the overall prices developments due to the radical changes in the former socialistic countries, some comments should be given to time path of adjustment. In the period 1990 to 1995 prices increase for all but one product. As was explained in Chapter 4.5.4 this period is characterized by a fixed supply but a demand that is assumed to grow like in the Base Scenario. This creates a situation of relative shortage driving up the world market prices. In the following period (1995-2000), after adjustment of the economic system, production and demand grow at a level that is higher than in the Base Scenario, with demand growth exceeding supply growth for most of the products. Thus the overall tendency of higher world market price changes as compared to the Base Scenario prevails. As mentioned above some of the products will become inferior goods, however. For these products the demand growth rate will not increase and prices will fall relative to the Base Scenario. In the next period (2000-2005) supply growth further increases and changes the overall tendency of world market prices. Now most of the price changes are lower than in the Base Scenario. In the final period (2005-2010) the growth rates of supply and demand decrease slightly but still stay at a higher level than in the Base Scenario. Since supply growth in this period exceeds demand growth for most of the products the lower price changes of the preceeding period continue.

4.6.4.2 Development of Supply, Demand and Net-Trade

The discussion on the developments of supply, demand and net-trade in the various product groups will of course focus on the changes in the former socialistic countries. Due to the impact on world market prices there are, however, also considerable changes in other regions including Turkey, which will also be discussed in the following paragraphs. Like for the GATT full liberalization scenario the Base Scenario is taken as the benchmark.

Cereals and Pulses

The major changes in these product groups take place for wheat, barley, maize and other cereals. For rice and pulses the former USSR and Eastern Europe are not important producers and consumers and, therefore, the changes in these markets do not affect the world market considerably, which already becomes obvious when looking at the very minor price changes relative to the Base Scenario.

The developments for *wheat* are shown in Table 4.6.4.2.1 of Appendix C. Both, the former USSR and Eastern Europe increase their production levels considerably compared to the Base Scenario. Since on the other hand the demand growth for wheat as a basic foodstuff is almost identical to the Base Scenario, Eastern Europe would become an exporter by the year 2010 and the former USSR would decrease their imports by more than 4 Mio tons as compared to the Base Scenario. Due to the relatively lower world market prices the impact on the other regions is also rather pronounced. Most of the exporters show smaller export quantities in 2010 compared to the Base Scenario because of the lower world market prices. Importers will have to import slightly higher quantities as compared to the Base Scenario.

Table 4.6.4.2.2 of Appendix C contains the situation on the *barley* market. Due to increased livestock production feed demand in general and demand for barley in particular will go up very heavily in the former socialistic countries relative to the Base Scenario. Since the production increase will not be able to keep path with this development the import demand in these countries will reach a much higher level than in the Base Scenario. Contrary to wheat increased world market prices will stimulate exports in other regions or diminish imports compared to the Base Scenario.

For *maize*, another important feedstuff in the former USSR and Eastern Europe, the developments are very similar to barley (Table 4.6.4.2.3 of Appendix C). The import demand in both regions will increase considerably compared to the Base Scenario with Eastern Europe even switching from an export to an import position. For the other regions increased world market prices relative to the Base Scenario lead to the corresponding developments as for barley. The EC even becomes an exporter by 2010. For Turkey the gains in exports are, however, only of minor signifiance.

Other cereals, which are treated as inferior goods in the long-run, thus show similar supply, demand and net-trade reactions like wheat. The situation is presented in Table 4.6.4.2.4 of Appendix C. Like for wheat Eastern Europe becomes an exporting region by the year 2010.

Cotton

Table 4.6.4.2.5 of Appendix C shows the developments for raw cotton. In the World-3 Scenario it is assumed that the negative production trend for cotton will not continue in the former socialistic countries. Therefore, there is no decline in production like in the Base Scenario. But as demand in the former USSR and Eastern Europe increases much stronger than in the Base Scenario, exports of the USSR will go down relative to the Base Scenario and imports in Eastern Europe will increase. Furthermore, it can be seen from Table 4.6.4.2.5 of Appendix C that the changes in the other regions and Turkey, in particular, are not very pronounced.

Oilseeds and Oilseed Products

The overall tendency for the developments in this products group is very uniform. Either import demand of the former socialistic countries increases relative to the Base Scenario or exports are reduced. The changes are most pronounced for oilcakes, since feed demand increases heavily as already mentioned above. Since the impact of these developments for the other regions are not very strong no detailed results are presented for this product group. Turkey's position will not change compared with the other model runs.

Fruits and Vegetables

When looking at the results for fruits and vegetables it should be kept in mind that the data base for the former USSR and Eastern Europe is very weak. Therefore, the results should be interpreted with caution.

Potatoes are treated as an inferior good in the WORLD-3 scenario. Therefoe the reactions on the demand side are rather small for the former USSR and Eastern Europe as shown in Table 4.6.4.2.6 of Appendix C. Since production increases in Eastern Europe by more than 8 Mio tons and in the former USSR by almost 4 Mio tons compared to the Base Scenario both regions will become the major exporters in the world by the year 2010. Contrary former exporters like the EC, Rest of Africa or North Amercia but also Turkey become importers.

The situation for fresh and processed *vegetables* is shown in the Tables 4.6.4.2.7 and 4.6.4.2.8 of Appendix C. While Eastern Europe increases its exports considerably compared to the Base Scenario the former USSR will import larger quantities. These reactions are strongly influenced by the higher export supply and import demand flexibility assumed in the World-3 scenario for the former socialistic countries. For vegetables, but also for fruits, this increased flexibility plays an even more important role than for other product groups, because in these groups elasticites are relatively higher. The relatively lower price level for fresh and processed vegetables causes other exporters to decrease exports compared to the Base scenario and importers to increase imports.

Developments for fresh and processed fruits are presented in Tables 4.6.4.2.9 and 4.6.4.2.10 of Appendix C. For fresh fruits both the former USSR and Eastern Europe are net-importers. Both will have lower imports in 2010 as compared to the Base Scenario, which is, however more pronounced for Eastern Europe. For processed fruits Eastern Europe will increase its net-exports compared to the Base Scenario, while the former USSR, a net-importer, will increase its net-imports. Like for vegetables a relatively lower price level than in the Base Scenario causes lower exports and higher imports relative to the Base Scenario.

Dairy Products

Since the changes in the former socialistic countries do affect Turkey in this product group only to a very small extent and since trade of these products only plays a minor role for Turkey a detailed discussion and presentation of results is omitted at this place. The former USSR and Eastern Europe will have either higher exports or lower imports of milk, butter and milkpowder as compared to the Base Scenario. These products are treated as basic foodstuffs with lower growth rates for demand than supply. For cheese this is different and, therefore, exports decrease for the former USSR and imports increase for Eastern Europe relative to the Base Scenario. Turkey will remain at the self-sufficiency level for all these products.

Other Livestock Products

Like for the other scenarios the focus in this category will be on the *mutton* market. For all meat products there is however a similar development for the former socialistic countries. Since demand has a much higher growth rate than supply as compared to the Base Scenario import demand increases or export supply goes down. In the case of poultry Eastern Europe even switches from an exporting to an importing country. Higher world market prices than in the Base Scenario lead to higher exports or lower imports of the other regions. Contrary eggs are treated as a basic feedstuff in the World-3 scenario. Therefore, exports of Eastern Europe are able to increase relative to the Base Scenario and the former USSR even switches from a net-importing position to a net-exporter.

Table 4.6.4.2.11 of Appendix C shows the developments on the mutton market. Eastern Europe will have slightly lower exports by the year 2010 than in the Base Scenario while the former USSR will increase its imports considerably. The EC will become an exporter like in the Base Scenario and will even reach a much higher export level. Like the main exporting region Australia and New Zealand, Turkey will also be able to increase exports slightly as compared to the Base scenario.

Other Agricultural Products

Since the changes in the former socialistic countries with respect to sugar and tobacco do not affect Turkey considerably, only a short discussion will follow for these two products. For sugar, that is treated as an inferior good imports of the former USSR and Eastern Europe will go down rather strong as compared to the Base Scenario. For tobacco the deviations from the Base Scenario are very insignificant.

Summarized, in the World-3 Scenario the price developments depend very much on the assumptions on the demand side. In the case of inferior goods, when demand has a much lower growth rate than supply, the arising excess supply tends to decrease the world market prices relative to the Base Scenario. For most of the other products higher price changes than in the Base Scenario can be observed.

The most drastic developments take place for cereals, that also affect Turkey considerably. With regard to wheat changes in the former socialistic countries would diminish the export opportunities of Turkey slightly in the longer term, while for barley and maize Turkey could export larger quantities. For all the other products Turkey is only affected slightly. In the case of fruits and exports the poorer export prospects for Turkey should be taken with caution because of the statistical problems with data from Eastern Europe and the USSR mentioned above.

4.6.5 Conclusion

The results of the World Trade Model, that are summarized in Table 4.6.5.1 show that the price prospects for Turkish agriculture and the GAP-region are considerably influenced by international agricultural policies, especially the outcome of the GATT negotiations, and general political and economic developments in other regions of the world, of special concern being the transition process of the former socialistic countries.

Under the assumptions of the Base Scenario, the present trends of world market price developments will continue. This means smaller or stronger nominal price increases for the different agricultural commodities, but more or less real price decreases for all commodities.

A successful conclusion of the GATT negotiations would lead to an increase of world market prices for most agricultural commodities, especially for the cereals and milk sector. The impact on crop pattern in the GAP region will be studied furtheron in Chapter 5.

The developments in the transition process of the former socialistic countries will tighten the situation on the world markets for agricultural commodities and tend to increase world market prices during the next years, effects which will be more or less offset, or even overtaken, in the later phase of the transition process. The crop pattern implications for the GAP region will be analysed also in Chapter 5.

Table 4.6.5.1: Nominal Price Changes 1990-2010

	BASE SCENARIO	WORLD-1	WORLD-2	WORLD-3
Wheat	22,89	35,97	30,33	20,69
Barley	14,73	30,45	24,93	24,61
Maize	19,34	34,96	28,83	23,76
Other Cereals	17,05	34,57	28,11	11,83
Rice	41,30	36,59	36,05	40,53
Sugar	20,31	51,10	40,45	12,12
Lentils	14,92	15,00	14,98	14,56
Chickpeas	4,33	4,34	4,34	4,31
Drybeans	16,56	16,56	16,58	16,01
Soybean	14,83	15,24	15,23	20,59
Sunflower	16,64	19,97	20,10	23,67
Groundnut	15,90	19,67	17,14	16,16
Soyoil	19,81	16,62	17,71	16,98
Sunfloweroil	16,14	16,86	17,19	33,86
Groundnutoil	19,21	61,64	45,84	18,28
Oliceoil	22,55	17,44	19,42	24,81
Sycake	22,28	13,17	16,56	36,96
Sunflowercake	18,08	10,47	13,37	34,46
Groundnutcake	17,97	17,07	18,40	24,33
Beef	33,44	34,37	30,49	41,58
Mutton	28,78	41,92	35,43	38,93
Poultry	16,74	23,01	20,64	22,85
Eggs	2,45	4,54	4,03	-0,91
Milk	10,26	19,08	14,36	2,96
Butter	6,81	56,92	35,07	1,81
Milkdry	39,90	62,57	46,88	27,07
Cheese	36,76	44,72	34,41	36,36
Tobacco	10,13	8,33	9,17	16,99
Cotton	12,27	19,13	17,43	20,52
Potatoes	2,74	6,46	5,21	-2,09
Vegetable fresh	16,56	18,09	19,81	14,61
Vegetable proc.	10,76	14,41	16,57	9,37
Fruit fresh	14,67	15,46	16,18	13,58
Fruit processed	8,21	12,19	14,50	5,92

WORLD1 GATT: FULL LIBERALIZATION
WORLD2 GATT: PARTLY LIBERALIZATION
WORLD3 RADICAL CHANGES IN THE AGRICULTURAL SECTOR OF FORMER SOCIALISTIC COUNTRIES

5. CROP PATTERN PLANNING STUDY

5.1 The Structure and Methodology of the Regional Agricultural Sector Model of Turkey and GAP (TURGAP)

5.1.1 Introduction

A regional agricultural sector model is constructed to analyze the developments in the crop pattern of the GAP Region over the next two decades. The model will be referred to as the TURGAP Model. The model is a partial equilibrium regional agricultural sector model. The main features of the model can be summarized as follows:

i. TURGAP is a non-linear programming model with a quadratic objective function which maximizes the sum of consumer and producer welfare.

ii. TURGAP treats GAP Region within the agricultural sector of Turkey. GAP Region is nested in Turkey, and the individual projects and rainfall zones are further nested in GAP.

iii. The model solves the crop patterns in the project areas, GAP Region and Turkey simultaneously.

iv. The farmgate prices are determined endogenously, through the price responsive demand functions.

v. The model includes the field crops, perennial crops and livestock sector and incorporates the interactions between them to derive the crop pattern.

vi. The supply functions are endogenously determined, based on the non-linear cost structures of individual crops.

vii. The labor, tractor, land costs are endogenously determined by the model. Fertilizer and water prices are given exogenously to the model.

viii. The model statistics are given in Table 5.1.1. TURGAP contains approximately 4500 variables, 4325 of which are linear and 175 nonlinear. There are over 1200 equations which are solved simultaneously. 83 products are explicitly incorporated in TURGAP. 37 of the products are field crops for human consumption , 6 for feed. There are 20 perennial and 20 livestock products. On the input side, 882 different inputs are specified. 750 of these are land inputs, 12 labor, 12 machinery; 18 water, 2 fertilizer inputs. The remaining are feed, seeds and investment costs for perennials.

Table 5.1.1: TURGAP Model Statistics

Number of Variables(Activities)			4500
Linear		4325	
Non-Linear		175	
Number of Constraints			1240
Number of Products			83
Crop		37	
Perennial		20	
Feed		6	
Livestock		20	
Number of Inputs			882
Land		750	
TURKEY	8		
GAP	732		
Labor		12	
TURKEY	4		
GAP	12		
Tractor		12	
TURKEY	4		
GAP	12		
Seed/Seedling		40	
Investment Cost		20	
Feed		28	
Straw and Hay	7		
Concentrates	5		
Grains	5		
Oilcake	5		
Fodder	6		
Water		18	
Fertilizer		2	
Non Zero Elements			125,000

ix. TURGAP can be solved by an IBM compatible PC with a minimum of 12 Mbytes of RAM and 80 Mbytes hard disc. It employes the GAMS-MINOS software to generate and to solve the model.

x. TURGAP to our knowledge is the largest agricultural sector model in the world that can be solved on a personal computer, and one of the largest regional sector models that exist on main frame computers.

xi. The model is structured in a way such that it can easily be solved and updated under changing conditions and policy environments.

5.1.2 Overview of the Crop Pattern Models for Turkey

The importance of the modelling approach arises from the need for multi-purpose planning and policy tool for the Turkish agriculture.

Turkish Agricultural Sector Model (TASM) was the pioneer attempt in this vein, and it was developed by the World Bank[1] to assess: the comparative advantage of Turkish agriculture, to identify changes in crop and livestock production patterns under alternative trade policies, and to project the pattern of agricultural production to 1990. In TASM, the soil and agro-climatic differences are approximated by crop rotations commonly practiced in the country. TASM maximizes consumers' and producers' surplus and incorporates MOTAD type of risk aversion in the objective function[2]. Although the model is comprehensive in terms of crop coverage, it fails to explore significant regional differences in production. Aggregation errors are likely to be significant given the differences in production possibilities among regions.

TASM was later converted to single crop activity model by Kasnakoglu and Howitt[3] for the calibration and validation tests of the PQP analysis.

An extended and updated version of TASM (TEAM = Turkish European Agricultural Model) was later used to study the possible effects of EC integration on Turkish agriculture[4].

Norton and Gencaga developed a programming model with 5 regions[5]. The documentation of the model is poor. The model was used for the evaluation of the performance of the agricultural sector.

Çakmak[6] extended the basic structure of TASM with PQP approach and constructed a model with 7 regions to assess the impact of various government policies and to determine the medium term growth prospects of Turkish agriculture.

The importance of the programming models arises from their ability to enforce consistency. The components of many agricultural strategy papers and national plans can turn out to be highly unrealistic when placed in a formal structure such as an agricultural sector model.

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1 Le-Si, V., Scandizzo P.L., Kasnakoglu, H., "Turkey: Agricultural Sector Model", The World Bank, 1983.

2 Hazel, P.B.R and Scandizzo,P.L., 1974 "Competitive Demand Structure under Risk in Agricultural Programming Models", American Journal of Economics, Vol.56, pp.235-244.

3 Kasnakoglu, H. and Howitt, R.E., 1985 "The Turkish Agricultural Sector Model" A PQP Approach to Calibration and Validation", Working Paper No.85-9, University of California, Davis.

4 SPO, 1990 "Turkish Agriculture and European Community Policies, Issues, Strategies and Institutional Adaptation", SPO Pub No: 2241

5 Norton, R.D., Gencaga, H., 1985 "Turkey: Agricultural Sector Performance Possibilities", Working Papers 71-7c, EMENA Projects Office, The World Bank, Washington, D.C

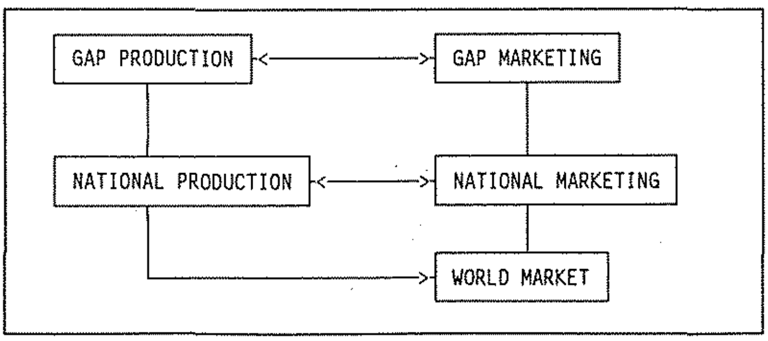
6 Çakmak, E, 1987 "A Regional Sector Model for Turkish Agriculture: Structure, Calibration and Validation" Ph.D Thesis, Stanford University California.

5.1.3 Basic Structure of the TURGAP

Agricultural crop pattern study in Turkey or in a specific region of the country is a complex task. Agricultural production is highly diversified due to variety of soils and agro-climatic conditions. The country can produce Continental products (wheat, barley, corn, cotton) and Mediterranean products (vegetables, fruits and nuts). The structure of production presents a challenging diversity; the regions having both common and region specific crops. Cash crops and export crops are mainly grown in the coastal areas, whereas cereals and extensive livestock production are traditionally the major commodities of the relatively less developed inland regions. The techniques of production for the common crops are quite different among the regions because of the differences in climate and resource endowments. The diversity in production combined with the competition of different agricultural commodities in the use of resources like water, land, labor, machinery, indicates an unusually interdependent production structure on the supply side. Moreover, on the demand side, the regions -including GAP Region of the future- compete with each other for access to the same national and international markets.

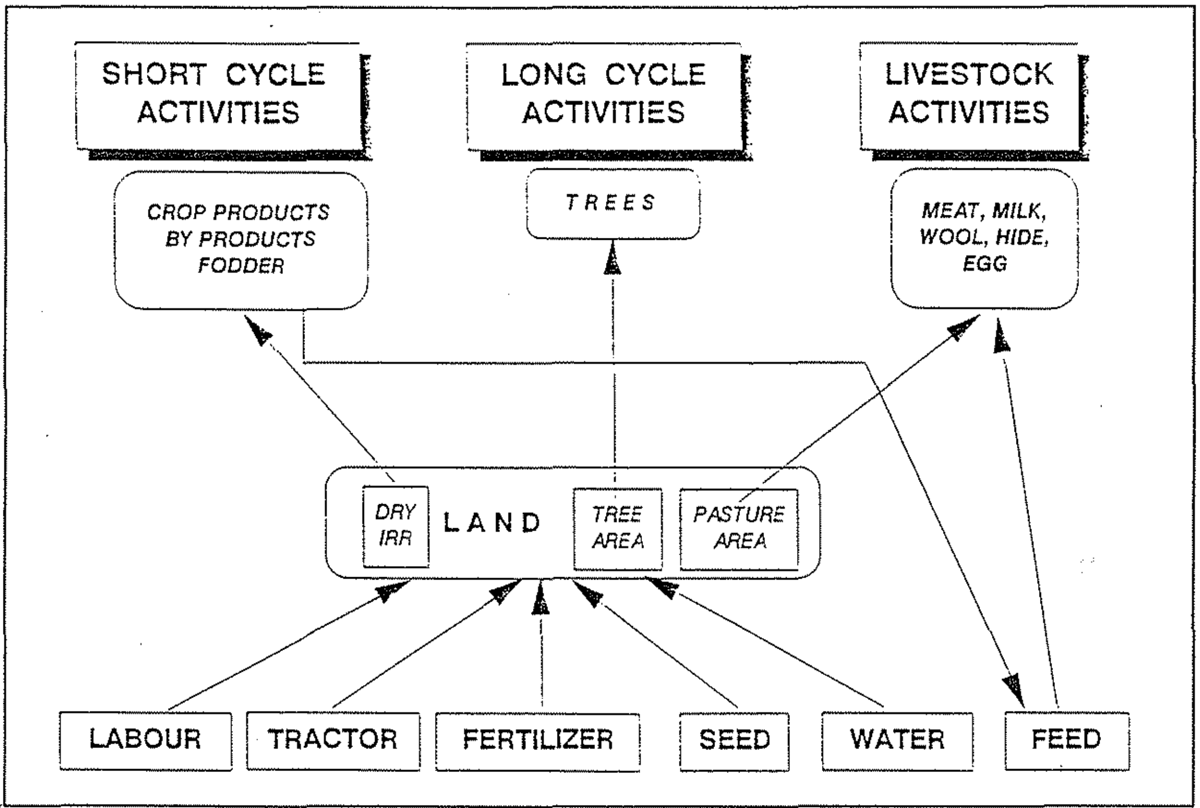
Given the magnitude of the GAP, the interdependencies in supply and demand show that the effects of the project will certainly be driven by the interactions among crops, regions, and by the changes in the structure of the world market. The evaluation of the impact of GAP and growth possibilities in a partial context rather than tracing its effects through the sector, can give misleading results. The direct effect of the Project may be desirable but they may be lessened or nullified by its indirect effects, which are more difficult to quantify and predict. In addition, in the dynamic context, the changes on the crop pattern of Turkey caused by the GAP Project will be distributed over the future. The expansion of the irrigation systems might be simultaneously accompanied by the changes in the domestic and world market structures. To take into account the interactions involved within the sector and among markets, it is necessary to have an integrated simultaneous modelling approach. A simple schematic presentation of the interactions involved in the overall system for a generic commodity is given in Figure 5.1.1.

Figure 5.1.1: GAP-Turkey-World Interactions



The flow of inputs and outputs at the sub-regional and regional levels is presented in Figure 5.1.2. Figure 5.1.3 shows the interrelations among the exogenous and endogenous variables of the national model which would be the basic interacting unit with the World Trade Model. The most important points about the interactions can be summarized as follows:

Figure 5.1.2: TURGAP Input-Output Structure



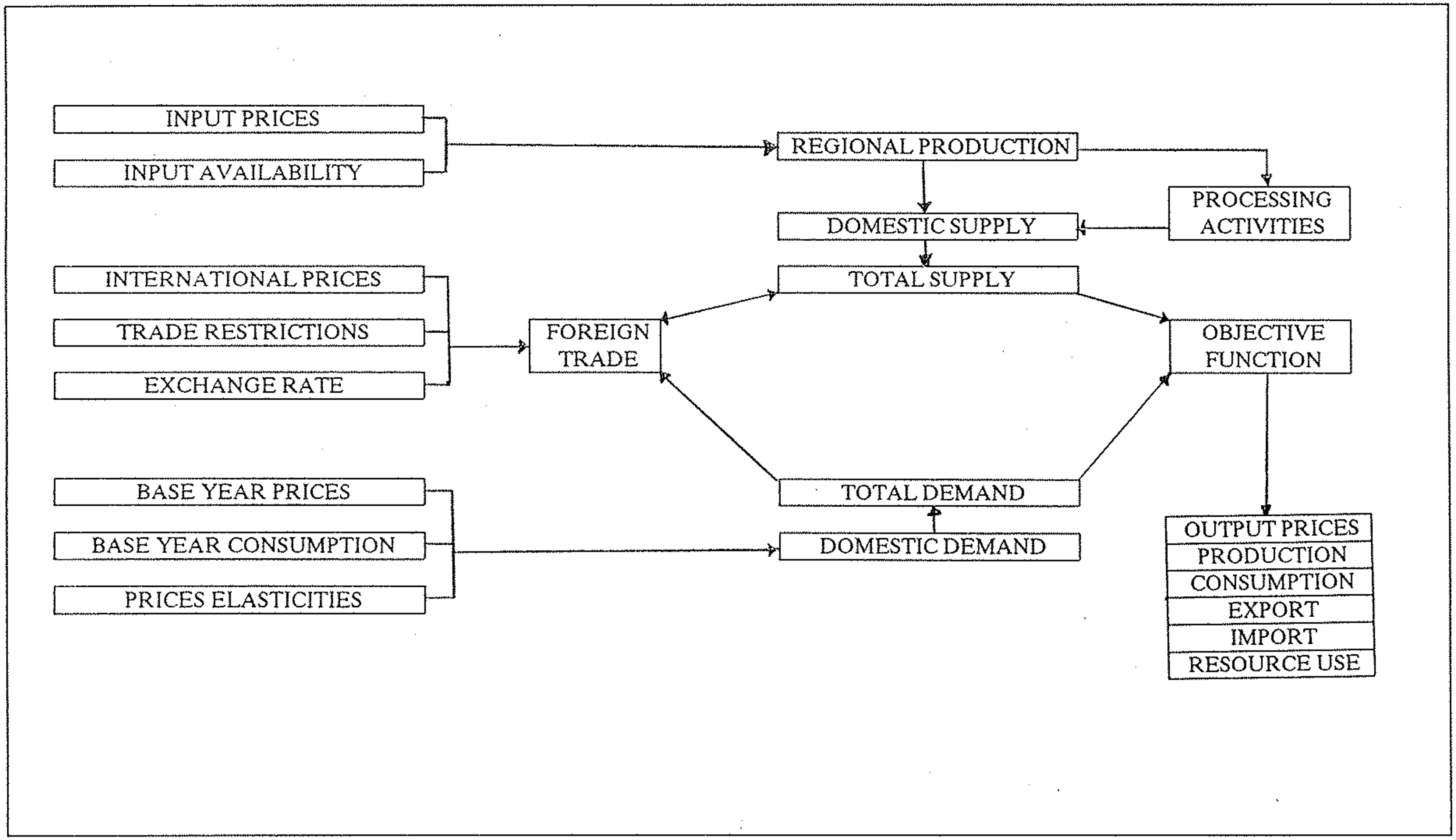
i) The production side of the model is disaggregated into regions for the exploration of interregional comparative advantage which would be one of the major factors to determine the impact of GAP.

ii) The crop and livestock sub-sectors are integrated endogenously. The livestock sub-sector gets inputs from crop production.

iii) Foreign Trade is allowed. Export and import quantities are constrained according to the results obtained from the World Trade Model.

iv) The sub-regions in TURGAP are identified according to the agro-climatic characteristics, land class, and irrigation projects to minimize possible aggregation errors. In total, the model is based on 43 single annual crops, 20 perennial crops, and 20 animal products.

Figure 5.1.3: Supply and Demand Interactions of TURGAP



v) Turkey is divided into two regions, namely GAP and Rest of Turkey (ROT). Interregional transportation is possible given the cost of transportation from one region to the other.

The model is solved using the recent version of the linear and non-linear programming software GAMS/MINOS[7].

5.1.4 Basic Assumptions of the Models

The assumptions under which the model is constructed are given below:

i. The agricultural sector of the GAP and ROT, as the producing units can be partitioned into discrete and divisible regions.

ii. Within each region, production is possible using different cultivation techniques.

iii. Inputs and outputs of every production activity are in constant proportion for all levels at which the activity is operated.

iv. Commodities are divided as follows:

   a. Resources used in production.

   b. Endogenous intermediate inputs emerging from a farm level production process as an output and entering some other process as an input.

   c. Final commodities which are produced commodities desirable in their current state. The commodities which `are desired after processing are included in raw equivalent form.

v. In general, consumption occurs at the national level. Region specific local consumption is allowed without transportation cost.

vi. The availability of resources in each region is known and fixed, except for fertilizers which has infinitely elastic supply curves.

vii. The level of income in the other sectors of the economy for any time is given.

viii. At the national level the demand for final commodities are presented by known linear price dependent functions.

ix. Competitive behavior is assumed for all participants in the system and all commodities are traded in competitive markets.

Schematically the basic structure of the models can be partitioned into 5 submatrix blocks (Figure 5.1.4). Block 1 is the product use which consists of regional demand and trade both in raw and processed products. The implicit cost function estimated by the

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7 Brook, A., Kendrick D., Meeraus, A., 1988 GAMS: A User's Guide, The Scientific Press, California.

Figure 5.1.4: Schematic Presentation of TURGAP

	CROP PRODUCTION	LIVESTOCK PRODUCTION	FERTILIZER USE	SEED USE	PRODUCTION COSTS	REGIONAL PRODUCTION	PQP TERMS	TOTAL FERTILIZER USE	TOTAL SEED USE	TOTAL PRODUCTION USE	TOTAL CONSUMPTION	EXPORTS	IMPORTS	SUB-REGION RHS
OBJECTIVE FUNCTION					-1 . . . -1		BLOCK-2	BLOCK-1			?, δ	+ . . . +	- . . . -	FREE
COMMODITY BALANCES					-1 . . . -1		BLOCK-3	BLOCK-3		-1 . . . -1	-1 . . . -1	-1 . . . -1	-1 . . . -1	= 0
PRODUCTION BALANCES						+1 . . . +1				-1 . . . -1				= 0
FERTILIZER ACCOUNT			+1 . . . +1					-1 . . . -1						= 0
SEED ACCOUNT				+1 . . . +1					-1 . . . -1					= 0
TRADE LIMITS												+1 . . . +1	+1 . . . +1	≤ BASE YEAR QUANTITY
LAND	+1 . . . +1						BLOCK-4							≤ LAND
MAN-POWER	+ . . . + + . . . +	+ . . . + + . . . +												≤ LABOUR
TRACTOR-POWER	+ . . . + + . . . +													≤ TRACTOR
LIVESTOCK-INVENTORY		-1 . . . -1												≤ BASE YEAR INVENTORY
FERTILIZERS	+ . . . + + . . . +		- . . . - - . . . -								TURGAP			= 0
SEEDS	+ . . . + + . . . +			- . . . - - . . . -										= 0
WATER	+ . . . + + . . . +													= WATER
FEED BALANCES	- . . . - - . . . -	+ . . . + + . . . +												≤ 0
REGIONAL PRODUCTION	+ . . . + + . . . +					- . . . - - . . . -								= 0
PRODUCTION COSTS	+ . . . + + . . . +	+ . . . + + . . . +			- . . . - - . . . -									= 0
PRODUCTION LIMITS	+1 . . . +1						BLOCK-5							≤ BASE YEAR PRODUCTION

PQP method is represented in the second block. Commodity and consumption balances are shown in block 3. Block 4 forms the core of the model and consists of regional production activities and resource constraints. Finally Block 5 consists of crop production limits incorporated for the first stage run of the model. They are used in the estimation of the cost terms not accounted for in the constraint block. As it has been mentioned earlier but the national model will incorporate downward sloping demand functions for all crops. Hence it is useful to discuss the structure of the objective function in its general form.

5.1.4.1 The Objective Function

The objective function is quadratic in revenue and cost because it maximizes the area between linear demand and supply curves. The maximal consists of the sum of consumers' and producers' surplus plus net export revenue. The optimal solution entails equating supply to domestic plus foreign demand and prices to marginal costs for all commodities. By incorporating linear demand curves, it is possible to solve the model for prices and quantities endogenously and simultaneously. The model considers the sector as the price maker, but implicitly assumes that producers and consumers are price takers, and hence they operate in perfectly competitive markets both in output and factor markets.

The incorporation of demand curves in the model means that the programming solution will correspond to market equilibria. The sector wide effects of various policies and exogenous changes, e.g. subsidizing or taxing inputs or output prices, or varying the exchange rate, can be investigated. Furthermore, the inclusion of demand curves makes it possible to identify the distribution of benefits from changes in agricultural output. For example, if the domestic demand is price inelastic, then the economic return to producers from an increase in output is negative whereas the effect on consumers' welfare is positive.

For this type of regional models, it is possible to incorporate regional demand if at the regional level the estimation of regional demand function of commodities is feasible. This approach requires extensive consumer expenditure data which are not readily available for most of the less-developed countries, including Turkey. An alternative is to assume that the demand system in a region is proportional to the national demand matrix. This approach adds little to the formulation of the model because it ignores the regional differences in consumer preferences. In the models, except for a few feed crops, the commodities can be moved between regions without any costs and consumption occurs at the national level. Since the primary purpose of the model, at this stage of development, is to evaluate the response of farmers to new technologies and crops, to greater resource endowments, and to changes in relative prices, it seems reasonable to leave the consumption activities at the national level. The supply side of the models incorporate the PQP methodology. The underlying assumption of the methodology is that, farmers operate in competitive markets and maximize profits. An important implication of this assumption is that regional cropping pattern in the base year represents a global optimum of the maximization problem. It is consistent with the main goal of the sector models: to simulate the response of the producers to changes in market environments, resource endowments, and production techniques. Therefore, although the models are optimization models, mathematically they become simulation models by incorporating the behavior of the agents (maximization of economic surpluses) into the models' structure. The acceptability of the models in the literature depends whether or not they can approximate the observed values in the base year. At the sector level, normative statements are difficult to support and provide little help for policy analysis in decentralized economies, yet the identification of interdependencies and causal relations can help to answer production related policy questions. Approximation actual cropping pattern in regional models is difficult to achieve with an unconstrained model, because it is not possible to estimate all costs and benefits of growing a specific crop. In addition, given the quantifiable resource constraints, the production function used in linear programming implies constant returns to scale. But, agricultural production, by its nature, exhibits diminishing returns to scale, mainly due to risk and land quality. The increase in the production of a specific crop may be realized by expanding its production to less suitable soil and thus the benefits of diversification would be diminished. The revenue is linear in output, and hence the concavity of the profit function is contained in the cost function. The unknown Hessian of the cost function is estimated by using the dual values of the constraints on the crop production activities (Block 5, Figure 5.1.4).

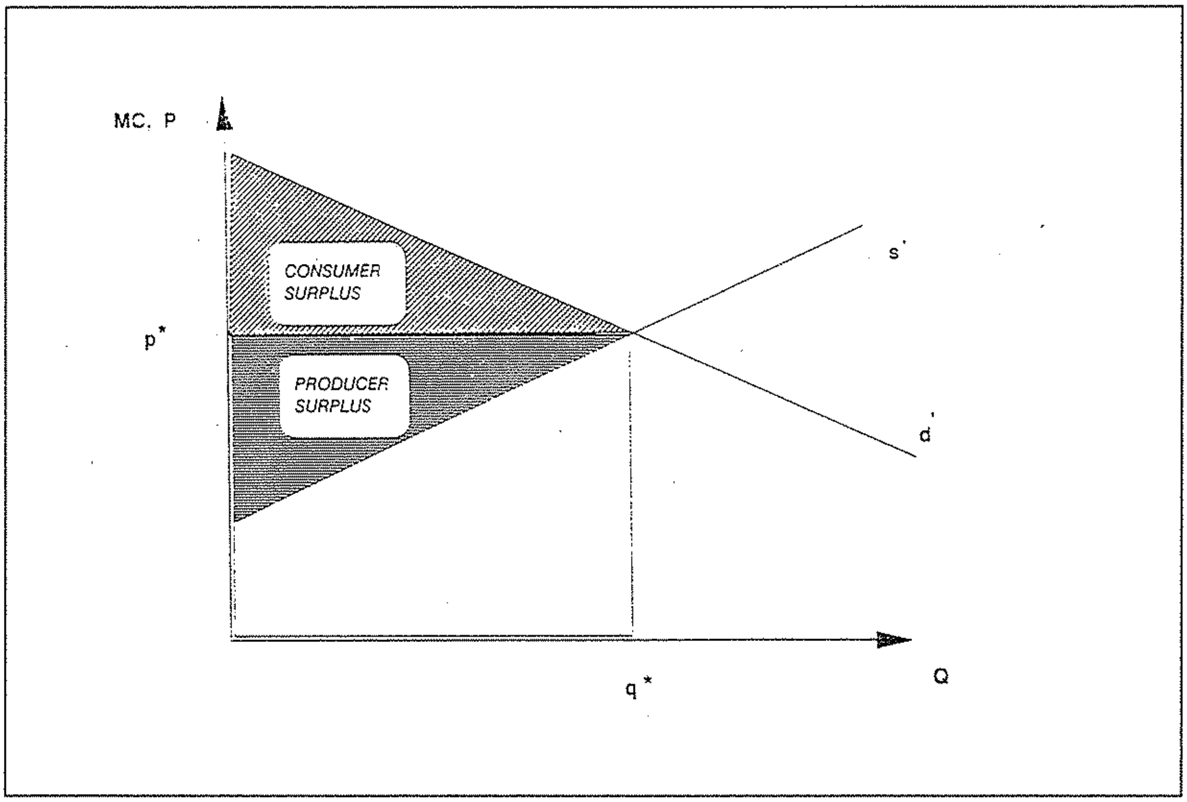
The implementation of the methodology for the sector model can be described in two stages: The first stage is similar to the validation step of the programming models. The model is calibrated and reproduces exactly the observed output levels of the base year by running the model with Block 5 in Figure 5.1.4. In the second stage, the dual values obtained from the crop production constraints are incorporated as quadratic terms in the cropwise objective function of the problem in Stage 2 (PQP terms in block 2), and the upper bound constraints on the production levels are removed. Without any upper and lower bounds and rotational activities, the model's reaction to policy changes is a smooth trade-off based on the changes in comparative advantage. It can be shown that the quadratic non-linearity in the objective function results from a quadratic production function and/or mean-variance risk specification. The quadratic term can be called as the implicit cost since it is implied -in a positive sense- by the farmers' crop allocations. The main elements of the objective function for a single crop, at the regional level are illustrated in Figure 5.1.5.

The producers face a linear demand function dd of the following form:

$$P = a + bQ$$

where a is the intercept term and b is the slope coefficient.

Figure 5.1.5: Supply and Demand for a Single Crop



The supply function ss exposes increasing costs with rising production of the crop activity, due to declining yields as production expands to less suitable lands and/or to the increasing risk and uncertainty due to specialization. The marginal cost function has the following form:

$$MC = c + kQ$$

where c and k are weighted averages of regional intercept and slope terms

respectively. The generic objective function, without any foreign trade activities can be written as:

$$\text{MAX } W = \text{Consumer Surplus} + \text{Producer Surplus}$$

$$= \int_0^{Q^*} (a + bQ)\, dQ \; - \; \int_0^{Q^*} (c + kQ)\, dQ$$

$$= (aQ^* \quad + \; \tfrac{1}{2}\, bQ^{*2}) - (cQ \; + \; \tfrac{1}{2}\, kQ^{*2})$$

5.1.4.2 Product Use

The products are distributed among different production selling and transportation activities at the regional and national level. First, there are national demand activities which are generated by linear demand curves. National demand includes the regional and national consumption of processed commodities in raw equivalent form. Second, there is a demand for cereals used for feeding in the livestock sector. Third, the model allows both selling the commodities to the national level and export of commodities at exogenous prices. It is possible to augment the supply of commodities through import activities at exogenously determined world prices. In terms of regional product use the model allows the transportation of commodities from one region to the other at a predetermined transportation costs given the proportion of the regional demand to the national demand.

5.1.5 Production and Factor Supply Activities

5.1.5.1 Production Technology Matrix

TURGAP contains approximately more than 4000 activities to describe the production of 83 commodities. Each production activity defines a yield per hectare for crop production and yield per head for livestock production. The activities use fixed proportion of labor, tractor power, fertilizers, water, seeds and seedlings. The ratio of each input and output varies over regions for each crop.

Land, labor, and tractor power constraints are specified monthly for the GAP Region. Monthly land coefficients are used to allow for double cropping. Water input coefficients are specific to the GAP Region. Water constraints are also on a monthly basis except for the plausible peak-demand periods (June, July, August) for which the water input coefficients are expressed in ten-day periods of a month.) For the rest of Turkey (ROT) region labor and tractor power coefficients are disaggregated into quarters of a year. The disaggregation of these input coefficients allows more accurate identification of seasonality in the demand for factors of production. The core of the models consists of the production activities and resource constraints shown in Block 4, Figure 5.1.4. The input and output coefficients for crop production are specified for each unit of land.

All of the products incorporated in the TURGAP are listed in Table 5.1.2. Output from crop production activities is divided into three categories: crop production for human and livestock consumption, crop by-products (forage and straw) for feed.

5.1.5.2 Factor Supply Activities

The production activities in the model also constitute factor demand activities. Some factor supply functions are perfectly elastic (such as fertilizers), some are perfectly inelastic i.e. categories of land. In the former category, factor prices are exogenous, whereas in the later they are endogenous to the model. Zone identification of the regions are similar. In rainfed condition, rainfall is considered to be the crucial factor whereas in irrigated farming temperature is important. In ROT, rainfed land is classified into dry land with high rainfall, dry land with medium rainfall, dry land with low rainfall. Same classification is applied to GAP. The irrigated land is categorized according to the temperature: irrigated land with high temperature, irrigated land with low temperature. In the GAP Region North GAP is the low temperature and South GAP is the high temperature zone. Land constraints are further disaggregated according to the land classes (four land classes for rainfed and three land classes for irrigated farming) for the GAP Region. Land, labor, tractor power and water are directly constrained by the relevant period's availability. The labor input is measured in man-hour equivalents and shows actual time required on the field. The tractor hours correspond to the usage of tractors in actual production and transportation related activities. Water input is measured in cubic meters per hectare. The two kinds of fertilizer, namely nitrogen and phosphate are measured in terms of nutrient contents. They are considered to be traded goods and are not restricted by any physical limits. In addition to the costs of labor, tractor and fertilizer, seed and seedlings (for vegetables and tobacco) are included as production costs for annual crops. Fixed investment costs are assigned for perennial crops.

5.1.5.3 Livestock Production

It is difficult to incorporate livestock production in a static sector model because of its dynamic character. Static models, however, can throw light on number of interesting questions related to the links with the production of feed crops and to alternative equilibrium states of the livestock sub-sector due to policy changes and income growth. Due to the limitation of data available on livestock production in Turkey, a short-run approach is taken in the model. Historical upper bounds for the herd sizes are incorporated in the model rather than a long-run approach which will determine the optimal size of the herd for projection purposes. Livestock production activities are treated at the national level. The activities acquire labor form the crop production of both macro regions. The livestock sector is an integrated part of the model. The main activities for the livestock sub-sector are: Cattle, buffalo, goat, angora, sheep, and, poultry. The feed supply is disaggregated into different categories. The input requirement of the livestock production are expressed in terms of total digestible energy equivalent of the products or by-products that can be used as feed. The structure of the input coefficients is flexible. In other words, the rations of the livestock activities are not fixed. The rations might change depending on the prices of the crops used as feed given the absolute and variable (depending on the yield) energy requirement of the livestock.

Table 5.1.2: TURGAP Product List

CODE(a)	CROP	OUTPUT	SEED(b)	BY-PRODUCT(c)	NOTES(d)
CEREALS					
BR1I	BARLEY	BARLEY	S-BARLEY	F-BARLEY	
BR2I	BARLEY	BARLEY	S-BARLEY	F-BARLEY	
BRLD	BARLEY	BARLEY	S-BARLEY	F-BARLEY	
CG1I	CORN-GRAIN	CORN	S-CORN	F-CORN	
CG2I	CORN-GRAIN	CORN	S-CORN	F-CORN	
CG3I	CORN-GRAIN	CORN	S-CORN	F-CORN	
CW1I	COMMON-WHEAT	COMWHEAT	S-COMWHEAT	F-COMWHEAT	
CW2I	COMMON-WHEAT	COMWHEAT	S-COMWHEAT	F-COMWHEAT	ONLY NG
CW3I	COMMON-WHEAT	COMWHEAT	S-COMWHEAT	F-COMWHEAT	ONLY SG
CWHD	COMMON-WHEAT	COMWHEAT	S-COMWHEAT	F-COMWHEAT	
DW1I	DURUM-WHEAT	DURWHEAT	S-DURWHEAT	F-DURWHEAT	
DW2I	DURUM-WHEAT	DURWHEAT	S-DURWHEAT	F-DURWHEAT	ONLY NG
DW3I	DURUM-WHEAT	DURWHEAT	S-DURWHEAT	F-DURWHEAT	ONLY SG
DWHD	DURUM-WHEAT	DURWHEAT	S-DURWHEAT	F-DURWHEAT	
RICI	RICE	RICE	S-RICE		ONLY LC1
RYED	RYE	RYE	S-RYE	F-RYE	
PULSES					
CH1I	CHICKPEA	CHICK-PEA	S-CHICKPEA	F-PULSES	
CH2I	CHICKPEA	CHICK-PEA	S-CHICKPEA	F-PULSES	
CH3I	CHICKPEA	CHICK-PEA	S-CHICKPEA	F-PULSES	
CHCD	CHICKPEA	CHICK-PEA	S-CHICKPEA	F-PULSES	
DBNI	DRYBEAN	DRY-BEAN	S-DRYBEAN	F-PULSES	ONLY NG
LNTD	LENTIL	LENTIL	S-LENTIL	F-PULSES	
LNTI	LENTIL	LENTIL	S-LENTIL	F-PULSES	
OILSEEDS					
GN1I	GROUNDNUT	GROUNDNUT	S-GRUNDNUT		
GN2I	GROUNDNUT	GROUNDNUT	S-GRUNDNUT		
SB1I	SOYABEAN	SOYABEAN	S-SOYABEAN		
SB2I	SOYABEAN	SOYABEAN	S-SOYABEAN		
SB3I	SOYABEAN	SOYABEAN	S-SOYABEAN		
SESD	SESAME	SESAME	S-SESAME		
SN1I	SUNFLOWER	SUNFLOWER	S-SUNFLWER		
SN2I	SUNFLOWER	SUNFLOWER	S-SUNFLWER		
SN3I	SUNFLOWER	SUNFLOWER	S-SUNFLWER		ONLY SG
SNFD	SUNFLOWER	SUNFLOWER	S-SUNFLWER		
INDUSTRIAL CROPS					
CT1I	COTTON	COTTON	S-COTTON		ONLY LC1 & LC2
CT2I	COTTON	COTTON	S-COTTON		ONLY SG; LC1 & LC2
CT3I	COTTON	COTTON	S-COTTON		ONLY SG; LC1 & LC2
SBTI	SUGARBEET	SUGARBEET	S-SUGRBEET		
TOBD	TOBACCO	TOBACCO	S-TOBACCO		

Table 5.1.2: TURGAP Product List (continued)

CODE(a)	CROP	OUTPUT	SEED(b)	BY-PRODUCT(c)	NOTES(d)
TUBER CROPS					
PTEI	EARLY-POTATO	EARLY-POT	S-POTATO		
PTLI	LATE-POTATO	POTATO	S-POTATO		
ON1I	ONION-WINTER	ONION	S-ONION		
ON2I	ONION-WINTER	ONION	S-ONION		
ON3I	ONION-WINTER	ONION	S-ONION		
ONSI	ONION-SPRING	ONION	S-ONION		
VEGETABLES					
CASI	CARROT-SPRING	CARROT	S-CARROT		
CAWI	CARROT-WINTER	CARROT	S-CARROT		
CB1I	CABBAGE	CABBAGE	S-CABBAGE		
CB2I	CABBAGE	CABBAGE	S-CABBAGE		
CB3I	CABBAGE	CABBAGE	S-CABBAGE		
CC1I	CUCUMBER	CUCUMBER	S-CUCUMBER		
CC2I	CUCUMBER	CUCUMBER	S-CUCUMBER		
CLFI	CAULIFLOWER	CAULIFLOWR	S-CAULIFLW		
CTOI	CON-TOMATO	CON-TOMATO	S-CONTOMAT		
FTOI	FRESH-TOMATO	FRE-TOMATO	S-FRETOMAT		
EG1I	EGGPLANT	AUBERGINE	S-AUBERGIN		
EG2I	EGGPLANT	AUBERGINE	S-AUBERGIN		
LEKI	LEEK	LEEK	S-LEEK		
LT1I	LETTUCE	LETTUCE	S-LETTUCE		
LT2I	LETTUCE	LETTUCE	S-LETTUCE		
LT3I	LETTUCE	LETTUCE	S-LETTUCE		
MELD	MELON	MELON	S-MELON		
MELI	MELON	MELON	S-MELON		
OKRI	OKRA	OKRA	S-OKRA		
PP1I	PEPPER	PEPPER	S-PEPPER		
PP2I	PEPPER	PEPPER	S-PEPPER		
SP1I	SPINACH-WINTER	SPINACH	S-SPINACH		
SP2I	SPINACH-WINTER	SPINACH	S-SPINACH		
SP3I	SPINACH-WINTER	SPINACH	S-SPINACH		
SPSI	SPINACH-SPRING	SPINACH	S-SPINACH		
SQAI	SQUASH	SQUASH	S-SQUASH		
WMLD	WATER-MELON	WAT-MELON	S-WATMELON		
WMLI	WATER-MELON	WAT-MELON	S-WATMELON		
FEED CROPS					
ALFI	ALFALFA	ALFALFA	S-ALFALFA		
CS1I	CORN-SILAGE	CORN-SIL	S-CORN		
CS2I	CORN-SILAGE	CORN-SIL	S-CORN		
CS3I	CORN-SILAGE	CORN-SIL	S-CORN		
SG1I	SORGHUM-GRAIN	SORGHUM	S-SORGHUM		
SG2I	SORGHUM-GRAIN	SORGHUM	S-SORGHUM		
SG3I	SORGHUM-GRAIN	SORGHUM	S-SORGHUM		
SS1I	SORGHUM-SILAGE	SORGHUM-SIL	S-SORGHUM		
SS2I	SORGHUM-SILAGE	SORGHUM-SIL	S-SORGHUM		
SS3I	SORGHUM-SILAGE	SORGHUM-SIL	S-SORGHUM		
VCFD	VETCH-FODDER	VETCH-FOD	S-VETCH		
VCGD	VETCH-GRAIN	VETCH-FOD	S-VETCH	F-VETCHG	

Table 5.1.2: TURGAP Product List (continued)

CODE(a)	CROP	OUTPUT	SEED(b)	BY-PRODUCT(c)	NOTES(d)
PERENNIALS					
APPI	APPLE	APPLE			ONLY NG
APRI	APRICOT	APRICOT			
CRRI	CHERRY	CHERRY			
FGDI	DRY-FIG	DRY-FIGS			
FGFI	FRESH-FIG	FRE-FIGS			
GRSI	RAISIN	SULTANA			
GRTD	TABLE-GRAPE	TAB-GRAPE			ONLY NG & HR
GRTI	TABLE-GRAPE	TAB-GRAPE			
GRWD	WINE-GRAPE	WINE-GRAPE			ONLY HR & MR
OLOD	OIL-OLIVE	OIL-OLIVE			ONLY NG & HR
OLTD	TABLE-OLIVE	TAB-OLIVE			ONLY NG & HR
PARI	PEAR	PEARS			ONLY NG
PCFI	FRESH-PEACH	FRE-PEACH			ONLY SG
PCPI	PROCESSED-PEACH	PRO-PEACH			ONLY SG
PISD	PISTACHIO	PISTACHIO			
POMI	POMEGRANATE	POMEGRAN			
WCRI	WILDCHERRY				
ADDITIONAL CROPS FOR THE REST OF TURKEY					
	COLZA	COLZA	S-COLZA		ROT
	HAZELNUT				ROT
	LEMON				ROT
	LINSEED	LINSEED	S-LINSEED		ROT
	ORANGE				ROT
	TEA				ROT
LIVESTOCK					
		SHEEP-MEAT			
		SHEEP-MILK			
		SHEEP-WOOL			
		SHEEP-HIDE			
		GOAT-MEET			
		GOAT-MILK			
		GOAT-WOOL			
		GOAT-HIDE			
		ANGOR-MEET			
		ANGOR-MILK			
		ANGOR-WOOL			
		ANGOR-HIDE			
		COW-MEET			
		COW-MILK			
		COW-HIDE			
		BUFAL-MEAT			
		BUFAL-MILK			
		BUFAL-HIDE			
		POLTR-MEAT			
		EGGS			

(a) 'I' at the end of crop codes stands for 'irrigated', 'D' for 'dry'.
The numbers in the crop codes (1, 2 and 3) stand for alternative seeding and harvesting dates.
(b) 'S' stands for seed.
(c) 'F' stands for 'fodder'.

(d) NG: North GAP
SG: South GAP
HR: High Rainfall
MR: Medium Rainfall
LCi: i'th Land Class
ROT: Rest of Turkey

In addition, the model makes sure that the minimum feed composition requirements are fulfilled by specifying minimum shares of single cereal types in relation to total grain used as feed. The explicit production cost for animal husbandry is labor. Other inputs required are cereals, concentrates, straws, and forage which are by-products of the crop production. Pasture land is also required for grazing except for poultry. The inputs are all given in fixed proportions. In the GAP Region, beside the above mentioned livestock activities additional types of animal production activities like apiculture (bees producing honey, wax, gelee royal, fruit tree pollination services), sericulture (silk worms producing silk-cocoons), aquaculture (various types of outputs from aquatic life forms, besides the mainly produced cold-freshwater fish in the dam sees) are possible. Since these activities are not directly competing with other livestock and crop production activities in the use of resources, they shall not be considered explicitly in the IO-matrix of the models; these 'relatively independent' activities, their biological-technical characteristics, the existing production levels, development chances and limitations is investigated Volume II / Chapter 2.

5.1.6 Spatial Disaggregation

The development of a suitable regional disaggregation for regional supply and production analysis introduces the modeler to a three way trade-off among the aggregation level, data availability and computational feasibility. The more disaggregated the regional aggregation, the more difficult it is to find data, and the more costly it becomes to solve the model on the computer. On the other hand, the greater the number of regions, the greater the ability to capture local differences in climate, resource availabilities, prices and markets. To minimize the aggregation error, the agricultural regions need to posses an adequate level of homogeneity with respect to soil and climatic conditions. The sub-regional structure of TURGAP is an attempt to capture the homogeneity in the crucial factors which affects the agricultural production. The GAP Region is divided into five agro-climatic zones: High and low temperature for the irrigated farming and high, medium, and low rainfall zones for dry farming. The activities are further specified separately for the each irrigation project to be able to analyze the crop patterns in the irrigation project areas. Three land class groups for irrigated and four for dry land according to the TOPRAKSU classification will be treated separately. There are 17 irrigation projects in the region, which will be aggregated into 14 sub-regions in the study. In addition potential irrigated area in the Gaziantep province which is to be irrigated from outside the GAP Region, is considered as the 15th region. The spatial disaggregation of TURGAP is presented in Table 5.1.3. A more aggregated approach is taken for the other region of Turkey. Agro-climatic zones form the spatial disaggregation in the rest of Turkey (ROT).

Figure 5.1.3: Regions of TURGAP

PROJECT REGIONS (a)

N01	:	Siverek-Hilvan
N2A	:	Adiyaman-Kahta
N2B	:	Adiyaman-Göksu-Araban
N03	:	Dicle
N4A	:	Garzan
N4B	:	Batman
N4C	:	Batman-Silvan
NOP	:	Non-Project Region
S05	:	Urfa-Harran
S06	:	Mardin-Ceylanpinar
S07	:	Bozova
S08	:	Suruç-Baziki
S09	:	Gaziantep
S10	:	Nusaybin-Cizre-Idil
S11	:	Silopi
N00	:	All project regions in North GAP
S00	:	All project regions in South GAP
000	:	All project regions (North & South GAP)

(a) applies to irrigated crops

RAINFALL REGIONS (b)

NHR	:	North GAP High Rainfall
NMR	:	North GAP Middle Rainfall
SMR	:	South GAP Middle Rainfall
SLR	:	South GAP Low Rainfall
000	:	All rainfall regions in both North and South GAP

(b) applies to dry crops

LAND CLASSES

LC1	:	Land Class 1
LC2	:	Land Class 2
LC3	:	Land Class 3
LC4	:	Land Class 4 (for only reainfed agriculture)
LC0	:	All land classes

5.2 Algebraic Statement of TURGAP

5.2.1 Set of Indices

```
O1(OCR)  OUTPUT  CROPS
       { COMWHEAT,  DURWHEAT,  CORN,       RYE,        BARLEY,    RICE,
         CHICK-PEA, DRY-BEAN,  LENTIL,     DRY-PEA,
         POTATO,    EARLY-POT, ONION,
         FRE-TOMATO,CON-TOMATO,AUBERGINE,  MELON,      CAULIFLOWR,
         WAT-MELON, CARROT,    CABBAGE,    CUCUMBER,   OKRA,      PEPPER,
         LETTUCE,   SPINACH,   SQUASH,     LEEK,
         GROUNDNUT, SESAME,    SUNFLOWER,  SOYABEAN,
         LINSEED,   COLZA,     COTTON,     TOBACCO,    SUGARBEET,
         PISTACHIO, HAZELNUT,  TAB-OLIVE,  OIL-OLIVE,  TEA,
         TAB-GRAPE, WINE-GRAPE,SULTANA,    FRE-FIGS,   DRY-FIGS,
         ORANGE,    LEMON,
         APPLE,     PEARS,     FRE-PEACH,  PRO-PEACH,  APRICOT,   CHERRY,
         WILDCHERRY,POMEGRAN }

O2       OUTPUT  ANIMALS
       { SHEEP-MEAT,SHEEP-MILK,SHEEP-WOOL,SHEEP-HIDE,
         GOAT-MEAT, GOAT-MILK, GOAT-WOOL, GOAT-HIDE,
         ANGOR-MEAT,ANGOR-MILK,ANGOR-WOOL,ANGOR-HIDE,
         COW-MEAT,  COW-MILK,  COW-HIDE,
         BUFAL-MEAT,BUFAL-MILK,BUFAL-HIDE,
         POLTR-MEAT,EGGS }

J        LIVESTOCK PRODUCTION ACTIVITIES
       { SHEEP,     GOAT,      ANGORA,     CATTLE,     BUFFALO,   POULTRY }

E        PRODUCTION COST STRUCTURE
      {  SEED,        FERTILIZER,CAPITAL,
         CWCCERX,     CWCRIC,    CWCPUL,     CWCTUB,     CWCVEGX,   CWCMEL,    CWCOIL,
         CWCIND,      CWCFED,    CWCFRNX,    CWCFIG,     CWCCIT,    CWCGRA,    CWCOLI }

L        LABOR DIVIDED INTO 4 QUARTERS PER YEAR
       { LABOR-1Q,    LABOR-2Q, LABOR-3Q, LABOR-4Q }

M        TRACTOR POWER DIVIDED INTO 4 QUARTERS PER YEAR
       { TRACTOR-1Q, TRACTOR-2Q, TRACTOR-3Q, TRACTOR-4Q }

       { LG01,    LG02,    LG03,    LG04,    LG05,    LG06,
         LG07,    LG08,    LG09,    LG10,    LG11,    LG12 }

MG       MACHINE DIVIDED INTO MONTHS
       { MG01,    MG02,    MG03,    MG04,    MG05,    MG06,
         MG07,    MG08,    MG09,    MG10,    MG11,    MG12 }

T        LMG LABOR AND TRACTOR;
         LMG(LG)=YES;
         LMG(MG)=YES;

OCR      OUTPUT  ALL CROPS
       { COMWHEAT,  DURWHEAT,  CORN,       RYE,        BARLEY,    RICE,
         CHICK-PEA, DRY-BEAN,  LENTIL,     DRY-PEA,
         POTATO,    EARLY-POT, ONION,
         FRE-TOMATO,CON-TOMATO,AUBERGINE,  MELON,      CAULIFLOWR,
         WAT-MELON, CARROT,    CABBAGE,    CUCUMBER,   OKRA,      PEPPER,
         LETTUCE,   SPINACH,   SQUASH,     LEEK,
         GROUNDNUT, SESAME,    SUNFLOWER,  SOYABEAN,
         LINSEED,   COLZA,     COTTON,     TOBACCO,    SUGARBEET,
         PISTACHIO, HAZELNUT,  TAB-OLIVE,  OIL-OLIVE,  TEA,
         TAB-GRAPE, WINE-GRAPE,SULTANA,    FRE-FIGS,   DRY-FIGS,
         ORANGE,    LEMON,
         APPLE,     PEARS,     FRE-PEACH,  PRO-PEACH,  APRICOT, CHERRY,
         WILDCHERRY,POMEGRAN,
         ALFALFA,   VETCH-FOD,VETCH-GRA,   CORN-SIL,   SORGHUM, SORGH-SIL }

S   AGREGATED LAND TYPES
       { DRY-EITH,  DRY-GOOD,  DRY-VGOOD,
         IRR-EITH,  IRR-GOOD,  IRR-POOR,   TREE,       PASTURE }
```

```
I  SINGLE CROP ACTIVITIES
       { SCOMWHDG, FCOMWHDP, SCOMWHDV, SCOMWHIL, SDURWHDG, FDURWHDP,
         SDURWHIL, SDURWHDV, SCORN-DV, FCORN-DG, SCORN-IL, SRYE--DG,
         FRYE--D,  SRICE-IL, SRICE-IH, SBARLYDG, FBARLYDP,
         SCKPEADP, SCKPEAIL, SDBEANIL, SLENTLDP, SLENTLDG, SDPEASDP,
         SDPEASIL, SLINSEDG, SEPOTAIL, SEPOTAIH,
                   SPOTATIL, SPOTATIH, SONIONDV, SONIONIL, SMELONIH,
         STOMATIL, STOMATIH, SAUBERIH, SMELONDP, SMELONIL, SMELONDV,
         SWMELOIL, SWMELOIH, SWMELODV, SWMELODP,
         SCARROIL, SCABBAIL, SLEEKIL,  SOKRAIL,  SSQUASIL,
         SLETTUIL, SSPINAIL, SCUCUMIL, SPEPPEIL, SCAUFLIP,
         SSUNFLDP, SSUNFLIL, SSUNFLDG, SSUNFLDV, SSBEANI,
         SGRUDNIH, SSESAMDG, SCOLZAIP,
         SCOTTNIH, STOBACDG, STOBACDV,SSBEETIL,
         SALFALI,  SVETFODP, SVETGRDP, PASTUSE,  SCRSILI,  SSORGHI,  SSOSILI,
         PISTA-D,  HAZEL-D,  TOLIV-D, OOLIV-D, TEA---D,
         TGRAPDV,  TGRAPIH,  TGRAPIL, WGRAPDG, SULTA-I,
         FFIGS-I,  DFIGS-I,  ORANG-I, LEMON-I,
         SAPPLEIL, PEARS-I,  FPEAC-I, PPEAC-I, SAPRICIL, SAPRICIH,
         SCHERRIL, SWCHERIL, SCHERRIH, POMEGR-I }

IR   SINGLE AND ROTATION CROPS;
          IR(I) = YES;

TG(YTG)  LAND DIVIDED INTO MONTHS
       { TG01*TG12 }

TECHNOLOGIES
       { C11 }




IG  CROP ACTIVITIES FOR THE GAP REGION
       { CW1I, CW2I, CW3I, CWHD, DW1I, DW2I, DW3I, DWHD,
         BR1I, BR2I, BRLD, CG1I, CG2I, CG3I, RYED, RICI,
         CH1I, CH2I, CH3I, CHCD, LNTI, LNTD, DBNI,
         SN1I, SN2I, SN3I, SNFD, SB1I, SB2I, SB3I
         GN1I, GN2I, SESD,
         CT1I, CT2I, CT3I, SBTI, TOBD,
         PTEI, PTLI, ON1I, ON2I, ON3I, ONSI,
         CTOI, FTOI, MELI, MELD, WMLI, WMLD, CASI, CAWI,
         CB1I, CB2I, CB3I, EG1I, EG2I, CLFI, CC1I, CC2I,
         OKRI, PP1I, PP2I, LT1I, LT2I, LT3I, SPSI, SP1I,
         SP2I, SP3I, SQAI, LEKI,
         ALFI, VCGD, VCFD, CS1I, CS2I, CS3I, SG1I, SG2I,
         SG3I, SS1I, SS2I, SS3I,
         APPI, APRI, CRRI, FGDI, FGFI, GRSI, GRTD, GRTI,
         GRWD, OLOD, OLTD, PARI, PCFI, PCPI, PISD,
         POMI, WCRI }

** LAND CLASSES: 3 FOR IRRIGATED, 4 FOR DRY CULTIVATION
       { LC1 * LC4 }

LCI(LC)     { LC1, LC2, LC3 }

RF(ALR)   RAINFALL REGIONS
          { NHR, NMR, SMR, SLR }

PJ(ALR)   IRRIGATION PROJECT REGIONS
       { N01, N2A, N2B, N03, N4A, N4B, N4C,
         S05, S06, S07, S08, S09, S10, S11, NOP }

W        WATER DIVIDED INTO MONTHS FOR JUNE JULY AUGUST 10 DAY PR
       { WG02, WG03, WG04, WG05,
         WG6A, WG6B, WG6C, WG7A, WG7B, WG7C, WG8A, WG8B, WG8C,
         WG09, WG10, WG11 }

WPK(W)   WATER PEAK MONTHS
       { WG6A, WG6B, WG6C, WG7A, WG7B, WG7C, WG8A, WG8B, WG8C }

WNPK(W) WATER NON PEAK MONTHS
       { WG02, WG03, WG04, WG05, WG09, WG10, WG11 }

IIGFRN(IG) IRRIGATED FRUITS ALL
     { APPI, APRI, CRRI, PARI, PCFI, PCPI, POMI, WCRI
       FGDI, FGFI, GRSI, GRTI }

DGCER(IG) DRY CEREALS
       { CWHD,   DWHD,   BRLD,   RYED }

DGPUL(IG) DRY PULSES
      { CHCD,   LNTD }
```

```
OFRX(OCR) ALL FRUIT OUTS
       { HAZELNUT, TAB-OLIVE,  OIL-OLIVE, TEA,       TAB-GRAPE, WINE-GRAPE,
         SULTANA,  FRE-FIGS,   DRY-FIGS,  ORANGE,    LEMON,     APPLE,
         PEARS,    FRE-PEACH,  PRO-PEACH, APRICOT,
         CHERRY,   WILDCHERRY}

IGVEGX(IG) IRRIG VEGS EXCEPT MELONS GAP
      { CTOI, FTOI, CASI, CAWI, CB1I, CB2I, CB3I, EG1I, EG2I,
        CLFI, CC1I, CC2I, OKRI, PP1I, PP2I, LT1I, LT2I,
        LT3I, SPSI, SP1I, SP2I, SP3I, SQAI, LEKI }

** THE FOLLOWING SET DEFINITIONS (FROM G1 TO TE) ARE ALL FOR THE
** LIVESTOCK PRODUCTION. G'S DENOTE THE INPUTS IN RAW FORM.
** T'S DENOTE THE INPUTS IN DIGESTABLE ENERGY.

G1   FEED -- STRAW AND HAY
        { F-COMWHEAT,F-DURWHEAT,F-CORN,     F-RYE,    F-BARLEY,  F-PULSES, F-VETCHG }

G2(OCR) FEED -- CONCENTRATES
        { COMWHEAT,  DURWHEAT,  RYE,        BARLEY,    SUGARBEET}

G3(OCR) FEED -- GRAINS
        { COMWHEAT,  DURWHEAT,  CORN,       RYE,       BARLEY,
          VETCH-GRA, SORGHUM }

G4(OCR)  FEED  OILCAKE
        { SUNFLOWER, COTTON,    SOYABEAN,  LINSEED,   COLZA}

G5(OCR)  FEED --  HIGH QUALITY HAY AND SILAGE
        { VETCH-FOD, ALFALFA,   CORN-SIL,  SORGH-SIL}

TF       TOTAL FEED SUPPLY IN ENERGY VALUES
        { TSTRAW,    TCONCEN,   TGRAIN,    TFODD,     TOIL,      TPAST}

TS       SUBGROUPS OF ENERGY REQUIREMENTS FROM LIVESTOCK SECTOR
        { TGRCONOIL, TGROIL,     PASTFEED }

TE       TOTAL ENERGY
        { TENE}

ALR      ALL RAIN AND PROJ REGS GAP
        { NHR, NMR, SMR, SLR, N01, N2A, N2B, N03, N4A, N4B, N4C,
          S05, S06, S07, S08, S09, S10, S11, NOP }


F        FERTILIZER
        { NITROGEN, PHOSPHATE }

OAL      ALL OUTPUTS (MARKET AND INTERNAL PRODUCTION);
          OAL(OCR) = YES;  OAL(O2) = YES;

BC      CEREAL AREA

       { A-COMWHE, A-DURWHE, A-CORN--, A-RYE---, A-RICE--}


LG       LABOR DIVIDED INTO MONTHS
```

5.2.2 List of Variables

```
PROFIT          OBJECTIVE FUNCTION
CROPS           PRODUCTION OF CROP ROT
CROPSG          PRODUCTION OF CROP GAP
PRODUCT         PRODUCTION OF LIVESTOCK
PFERT           PURCHASE OF FERTILIZER
PRCOST          PRODUCTION COSTS
LATRUSE         LABOR AND TRACTOR USE
FEED            FEED USE IN ANIMAL PRODUCTION IN ENERGY UNITS
FGRAIN          COMPOSITION OF FEEDGRAIN IN PRODUCT WEIGHT
TOTALPROD       TOTAL PRODUCTION IN RAW FORM
TOTALCONS       TOTAL CONSUMPTION IN PROCESSED FORM
IMPORT          IMPORT OF LIVESTOCK AND CROPS
EXPORT          EXPORT OF LIVESTOCK AND CROPS
CERAREA         CEREAL AREA
FALAREA         FALLOW AREA
LATRUSEG        LABOR AND TRACTOR USE IN GAP
```

5.2.3 List of Parameters

PQPLT	QUADRATIC LABOUR AND TRACTOR COSTS FOR ROT
RUNEMP	RELATIVE EMPLOYMENT OF LABOUR AND TRACTORS
PQPLG	QUADRATIC LABOUR COSTS FOR GAP
PQPTG	QUADRATIC MACHINE COSTS FOR GAP
RUNEMPG	RELATIVE EMPLOYMENT OF LABOUR AND TRACTORS
P	CROP PRODUCTION COEFFICIENTS
PG	CROP PRODUCTION COEFS FOR GAP
Q	LIVESTOCK PRODUCTION COEFFICIENTS
QQ	INDEX OF LIVESTOCK GRAIN CONSUMPTION
PCOST	CROP PRODUCTION COSTS
PCOST	CROP PRODUCTION COSTS FOR ROT
PGCOST	CROP PRODUCTION COSTS FOR GAP
IMPRICE	IMPORT PRICE
EXPRICE	EXPORT PRICE
TCON	CONSUMPTION OF RAW PRODUCTS
ALPHA10	PROJECTED DEMAND CURVE INTERCEPT 2010
BETA10	PROJECTED DEMAND CURVE SLOPE 2010
EXPINDEX	EXPORT INDEX
IMPINDEX	IMPORT INDEX

5.2.4 List of Equations

SURPLUS	OBJECTIVE FUNCTION
LAND	BASIC LAND CONSTRAINTS
LABTRAC	LABOR AND TRACTOR CONSTRAINTS
LANDDG	DRY LAND CONSTRAINTS FOR GAP
LANDIG	IRRI LAND CONSTRAINTS FOR GAP
LABTRACG	LABOR AND TRACTOR CONSTRAINTS FOR GAP
WATERPK	PEAK PERIODS WATER CONSTRAINTS
WATERNPK	WATER NON PEAK PERIODS CONSTRAINTS
WATERTOT	WATER YEARLY CONSTRAINTS
FRUULI	FRUITS AND NUTS AREA UPPER LIMIT LC1I
CEVAROT	CEREALS VARIOUS ROTATION
RFRLOL	ROT FRUIT LOWER LIMIT
GVEGLI	GAP VEGS LIMIT
ANIMALINV	ANIMAL INVENTORY
FEEDPAST	FEED SUPPLY FROM PASTURE
FEEDSTRAW	FEED SUPPLY STRAW
FEEDCON	FEED SUPPLY CONCENTRATES
FEEDCERI	GRAIN USED FOR ANIMAL FEEDING
FEEDOIL	FEED SUPPLY OIL CAKE
FEEDFODD	FEED SUPPLY ALFALFA AND FODDER
TOTALFEED	TOTAL FEED BALANCE
MINFEED	MINIMUM FEED REQUIREMENTS BY COMPONENTS
MINGRCOIL	MINIMUM GRAIN CONCENTRATES AND OILCAKE
MINGROIL	MINIMUM GRAIN AND OILCAKE
MINGRAIN	MINIMUM SHARE OF INDIVIDUAL GRAINS
PURCFERT	PURCHASE FERTILIZER
PRODCOST	PRODUCTION COSTS
PRODUCTION	PRODUCTION BALANCES
COMBAL	COMMODITIES BALANCES
CERBAL	CEREAL BALANCE
FALBAL	FALLOW BALANCE

5.2.5 Equations

SURPLUS..

$$\sum_{O} (ALPHA10_{O} * TOTALCONS_{O} \; + \; 0.5 * BETA10_{O} * TOTALCONS_{O}^{2})$$

$$+ \sum_{O} (EXPORT_{O} * TRADE_{O,exp\text{-}p} * TRADE_{O,pfact10})$$

$$- \sum_{O} (IMPORT_{O} * TRADE_{O,imp\text{-}p} * TRADE_{O,pfact10})$$

$$- \sum_{E} PRCOST_{E} + 0.37 \quad * (\sum_{J} Q_{animal,J} * PRODUCT_{J})$$

$$- \; 0.5 * \sum_{LM} (PQPLT_{LM} \quad * LATRUSE_{LM}^{2})$$

$$- \; 0.5 * \sum_{LG} (PQPLT_{LG} \quad * LATRUSE_{LG}^{2})$$

$$- \; 0.5 * \sum_{MG} (PQPTG \quad * LATRUSEG_{MG}^{2})$$

$$- \; 0.5 * \sum_{OCR} (PAR_{OCR,pqp1} \quad * TOTALPROD_{OCR}^{2})$$

$$- \; 0.5 * \sum_{J} (RES_{J,pqp3} \quad * PRODUCT_{J}^{2})$$

$$= PROFIT$$

LAND(S)..

$$\sum_{IR} (P_{S,IR} * CROPS_{IR}) \leq RES_{S,quant} * RES_{S,qindex2010}$$

LABTRAC(LM)..

$$\sum_{IR} (P_{LM,IR} * CROPS_{IR}) + \sum_{J} (Q_{LM,J} * PRODUCT_{J}) + \quad LABFED_{LM} * FEED_{tstraw} = LATRUSE_{LM}$$

LANDDG(RF,LC,TG)..

$$\sum_{IG,T} (PG_{TG,IG,T,LC,RF} * CROPSG_{IG,T,LC,RF}) \leq DLNGAP_{RF,LC} / 1000$$

LANDIG(PJ,LC,TG)..

$$\sum_{IG,T} (PG_{TG,IG,T,LC,PJ} * CROPSG_{IG,T,LC,PJ}) \leq ILNGAP_{PJ,LC} / 1000$$

LABTRACG(LMG)..

$$\sum_{IG,T,LC,ALR} (PG_{LMG,IG,T,LC,ALR} * CROPSG_{IG,T,LC,ALR}) = LATRUSEG_{LMG}$$

WATERPK(PJ,WPK)..

$$\sum_{IG,T,LC} (PG_{WPK,IG,T,LC,PJ} * CROPSG_{IG,T,LC,PJ}) \leq WGAP_{PJ,wap} * MACRO_{mmha} * WGAP_{PJ,ep}$$

WATERNPK(PJ,WNPK)..

$$\sum_{IG,T,LC} (PG_{WNPK,IG,T,LC,PJ} * CROPSG_{IG,T,LC,PJ}) \leq WGAP_{PJ,wanp} * MACRO_{mmha} * WGAP_{PJ,ep}$$

WATERTOT(PJ)..

$$\sum_{W,IG,T,LC} (PG_{W,IG,T,LC,PJ} * CROPSG_{IG,T,LC,PJ}) \leq WGAP_{PJ,wat} * MACRO_{mmha} * WGAP_{PJ,ep}$$

FRUULI(PJ)..

$$\sum_{IGFRN,T,LC} (PG_{tyr,IGFRN,T,LC,PJ} * CROPSG_{IGFRN,T,LC,PJ}) \leq ((ILNGAP_{PJ,lc2} + ILNGAP_{PJ,lc3}) / 1000) * 0.20$$

CEVAROT(RF)..

$$\sum_{DGCER,T,LC} (PG_{tyr,DGCER,T,LC,RF} * CROPSG_{DGCER,T,LC,RF}) \geq \sum_{DGPUL,T,LC} (PG_{tyr,DGPUL,T,LC,RF} * CROPSG_{DGPUL,T,LC,RF})$$

RFRLOL(OFRX)..

$$\sum_{ALFRN} (P_{OFRX,ALFRN} * CROPS_{ALFRN}) \geq DOM_{OFRX,dprod}$$

GVEGLI(PJ,IGVEGX)..

$$\sum_{T,LC} (PG_{tyr,IGVEGX,T,LC,PJ} * CROPSG_{IGVEGX,T,LC,PJ}) \leq (\sum_{LC} (ILNGAP_{PJ,LC}) / 1000) * 0.25$$

ANIMALINV(J)..

$$PRODUCT_J \leq RES_{J,quant} * 2.00$$

FEEDPAST..

$$CROPS_{pastuse} * P_{pastfeed,pastuse} \geq FEED_{tpast}$$

FEEDSTRAW..

$$\sum_{IR,G1} (P_{G1,IR} * CROPS_{IR} * ENEC_{G1}) + \sum_{IG,G1,T,LC,ALR} (PG_{G1,IG,T,LC,ALR} * CROPSG_{IG,T,LC,ALR} * ENEC_{G1}) \geq FEED_{tstraw}$$

FEEDCON..

$$\sum_{G2} (TOTALPROD_{G2} * CONCENT_{G2} * ENEC_{G2}) \geq FEED_{tconcen}$$

FEEDCERI..

$$\sum_{G3} (FGRAIN_{G3} * FEEDGRAIN_{G3,enegr}) \geq FEED_{tgrain}$$

FEEDOIL..

$$\sum_{G4} (TOTALPROD_{G4} * CONOIL_{G4} * ENEC_{G4}) \geq FEED_{toil}$$

FEEDFODD..

$$\sum_{G5} (TOTALPROD_{G5} * ENEC_{G5}) \geq FEED_{tfodd}$$

TOTALFEED..

$$\sum_{TF} (FEED_{TF}) \geq \sum_{J} (Q_{tene,J} * PRODUCT_{J})$$

MINFEED(TF)..

$$FEED_{TF} \geq \sum_{J} (Q_{TF,J} * PRODUCT_{J})$$

MINGRCOIL..

$$FEED_{tgrain} + FEED_{tconcen} + FEED_{toil} \geq (Q_{tgrconoil,J} * PRODUCT_{J})$$

MINGROIL..

$$FEED_{tgrain} + FEED_{toil} \geq \sum_{J} (Q_{tgroil,J} * PRODUCT_{J})$$

MINGRAIN(G3)..

$$FGRAIN_{G3} * FEEDGRAIN_{G3,enegr} \geq FEED_{tgrain} * FEEDGRAIN_{G3,mingr}$$

PURCFERT(F)..

$$\left(\sum_{IR} (P_{F,IR} * CROPS_{IR})\right) + \left(\sum_{IG,T,LC,ALR} (PG_{F,IG,T,LC,ALR} * CROPSG_{IG,T,LC,ALR})\right) = PFERT_F$$

PRODCOST(E)..

$$\left(\sum_{IR} (PCOST_{E,IR} * CROPS_{IR})\right) + \left(\sum_{IG,T,LC,ALR} (PGCOST_{E,IG,T,LC,ALR} * CROPSG_{IG,T,LC,ALR})\right) = PRCOST_E$$

PRODUCTION(OAL)..

$$\sum_{IR} (P_{OAL,IR} * CROPS_{IR}) + \left(\sum_{IG,T,LC,ALR} (PG_{OAL,IG,T,LC,ALR} * CROPSG_{IG,T,LC,ALR})\right) + \sum_{J} (Q_{OAL,J} * PRODUCT_J) =$$

$$TOTALPROD_{OAL}$$

COMBAL(O)..

$$(TOTALPROD_O * (1\text{-}CONCENT_O) * (1\text{-}CONOIL_O) + IMPORT_O =$$

$$TOTALCONS_O + EXPORT_O + QQ_O * FGRAIN_O$$

CERBAL..

$$\sum_{BC,IR} (P_{BC,IR} * CROPS_{IR}) = CERAREA$$

FALBAL..

$$\sum_{IR} (P_{fallow,IR} * CROPS_{IR}) = FALAREA$$

MODEL TGAP /ALL/

SOLVE TGAP MAXIMIZING PROFIT USING NLP

5.3 Data, Calibration and Validation

5.3.1 Data Sources

The data used to construct the model can be grouped in two main clusters:

(a) micro level production coefficients which form the core of the model, and

(b) regional data such as the regional area, production, consumption and factor prices.

The data required for the core production matrix of the model will be put together from two sources. First data source is the previous studies conducted by governmental institutions. All of the previous studies conducted both at the farmer conditions and in the experiment stations relevant for the GAP Region are reviewed. The data for the production coefficients of ROT are based on the TOPRAKSU (recently Village Affair Services) studies estimates.

Second data source is based on surveys conducted in the GAP Region. The surveys are used for the crops missing in the studies mentioned above and to adjust the coefficients obtained under controlled experiments. The crop input output coefficients formed from these two sources are presented in the Appendix E.

5.3.2 Operational View of TURGAP Data Bases

The data employed in TURGAP goes through various stages of processing before it becomes the final data set. Furthermore, some of the data is generated within the model itself. Looking at the data requirements from this perspectives, the requirements of TURGAP can be categorized as follows:

i) The Raw Data

This is the data that is entered in TURGAP data base as they appear in published statistics and include:

production of crop and livestock products
area of annual crops
number of trees
yields
farm-gate prices
export and import values in TL and US dollar
animal stocks
number of tractors
tree land
irrigated land

ii) Processed Data

In addition to the data that is entered in raw form without processing, some of the data must be processed outside the data base system prior to its entry in the data base. Included in this category one can site:

input-output coefficients
input prices
price elasticities
dry and irrigated land availability
processing factors, costs and margins
conversion factors
aggregation share factors
labor availability
machine hour availability

iii) The Aggregated Data

The raw and processed data are further aggregated and categorized to be consistent with the data requirements of TURGAP, within the data base system. This step also involves the standardization of the data base in terms of units.

iv) Preliminary Base Model Data

The processed data base is then transformed into a form that can be used in a programming problem. This involves on the one hand the formulating the equations of TURGAP in matrix form through a matrix generator, and further estimation of parameters and functions from the processed data and parameters.

v) Final Base Model Data

The preliminary model data above is employed in initial calibration runs of the model and consistency checks are performed. Since the data used come from different sources, it is natural to expect inconsistencies. The initial model runs indicate clues to such inconsistencies which may result from errors in earlier parts or simply from the incompatibility of the data base parts. The data base corrected for such inconsistencies, becomes the final model data to be employed in policy simulations.

vi) Model Generated Data

Another category of data employed in TURGAP is the model generated data, based on the calibrated base model runs. These data are in principal the coefficient of the non-linear parts of the cost functions and input supply functions and are estimated from the shadow prices of the calibration constraints. The final base model data is augmented with this model generated data to form the bases for the TURGAP simulation runs.

5.3.3 Validation of TURGAP

Since the model equipped with PQP coefficients, calibrates exactly with the consumption, production, prices and stocks in the base year, the validation of the model can not be performed in the traditional way by comparing the simulated base year values with observed base year values.

The models performance in simulating directions of change is over 95% and simulating absolute magnitudes over 85%, which makes it a reliable tool for future projections and policy scenarios by all standards in the literature.

5.4. Projections With TURGAP

5.4.1 Introduction

Having calibrated the model for the base year 1988 and validated it by projecting it into 1990 and comparing simulated values with their observed levels, we are ready to proceed to the next steps of projections into the future and simulations of various policy scenarios.

The TURGAP model is employed to project the agricultural sector in the GAP Region and the rest of Turkey to the years 1995, 2000, 2005 and finally to 2010 which is the planned completion date for all GAP irrigation projects. The results of these projections are presented in section 5.4.2 and 5.4.3.

The TURGAP model is also employed to simulate the possible impacts of various changes in the exogenous conditions and/or the policy environment. The results of the scenarios are then compared to the benchmarks produced by the projection runs. Four types of scenarios are conducted by TURGAP:

i. *Domestic Demand Scenario*: This scenario simulates the likely impacts of changes in domestic demand on agricultural sector in the GAP Region and the rest of Turkey. The domestic demand parameters employed for this scenario are the population growth rate and the real income growth rate.

ii. *International Demand Scenario*: This scenario simulates the likely impacts of changes in the world markets and hence international trade prices and quantities on Turkish agriculture. For this scenario, the world trade prices and volumes predicted by the WTM under GATT negotiations are employed.

iii. *GAP Irrigation Project Management Scenarios*: These scenarios simulate the likely impacts of changes in the availability of water and irrigable land in the GAP irrigation project regions. The parameters employed for these simulations are the irrigation project efficiency and irrigated area by the projects.

iv. *Transportation Cost Scenario*: This scenario simulates the agriculture of the GAP Region with the assumption that there are no savings in transportation costs due to production in the region for self consumption, to stress the agro-ecological comparative advantages of the region and to play down the disadvantages related to geographical setting which may hide the advantages.

The results of the scenarios are presented and discussed in sections 5.4.4 and 5.4.5.

The projections of the agricultural sector in the GAP Region, irrigation projects and the rest of Turkey, rests critically upon the projections of the exogenous variables which must be performed outside TURGAP. Some of the exogenous variables do not have past observations on which their projections can be based. For example, two critical variables which have to be projected are the availabilities of irrigated area and water which depend on the completion dates of the irrigation projects. Some of the variables depend critically on the policy environment, such as the income growth rates, factor prices. Still other variables can be projected from their past values but such projections for two decades from now have to be reviewed very carefully especially in the light of important and fast changes in the world. It is therefore necessary that the model projections are updated continuously as additional information regarding these parameters becomes available over time. The TURGAP model requires among others the projection of the parameters presented in Table 5.4.1 both for base and scenario simulations. Table 5.4.1, also presents their values taken in this study for various simulations.

Table 5.4.1: Projected Values of Models Parameters

Changes in:	1988-95	1988-2000	1988-2005	1988-2010
i. Annual Population Growth Rate	2.0%	2.0%	1.9%	1.9%
ii. GNP Growth Rate	3.0%	3.0%	3.0%	3.0%
iii. Real Input Prices				
Labor ($/hr)	2.5%	5.0%	7.5%	10.0%
Tractor ($/hr)	2.5%	5.0%	7.5%	10.0%
Fertilizer ($/hr)	2.5%	5.0%	7.5%	10.0%
Irrigation charge($/ha)	2.5%	5.0%	7.5%	10.0%
Seed ($/kg)	2.5%	5.0%	7.5%	10.0%
Investment Costs ($/ha)	3.8%	7.5%	11.3%	15.0%
iv. Resource Availabilities Growth				
Labor (ROT)	0.3%	0.5%	0.8%	1.0%
Labor (GAP)	10.0%	20.0%	30.0%	40.0%
Tractor (ROT)	4.3%	8.5%	12.8%	17.0%
Tractor (GAP)	50.0%	100.0%	150.0%	200.0%
v. Technological Improvements				
Yields	5-10%	10-15%	15-30%	20-40%
Inputs	1.3-5%	2.5-10%	3.8-15%	5-20%
vi. Price and Income Elasticities Change		Unchanged		
vii. Agricultural Policies Change		Unchanged		
viii. Real Exchange Rate Change			6.4% (1988-2010)	

5.4.2 Results of Base Projections

5.4.2.1 Welfare

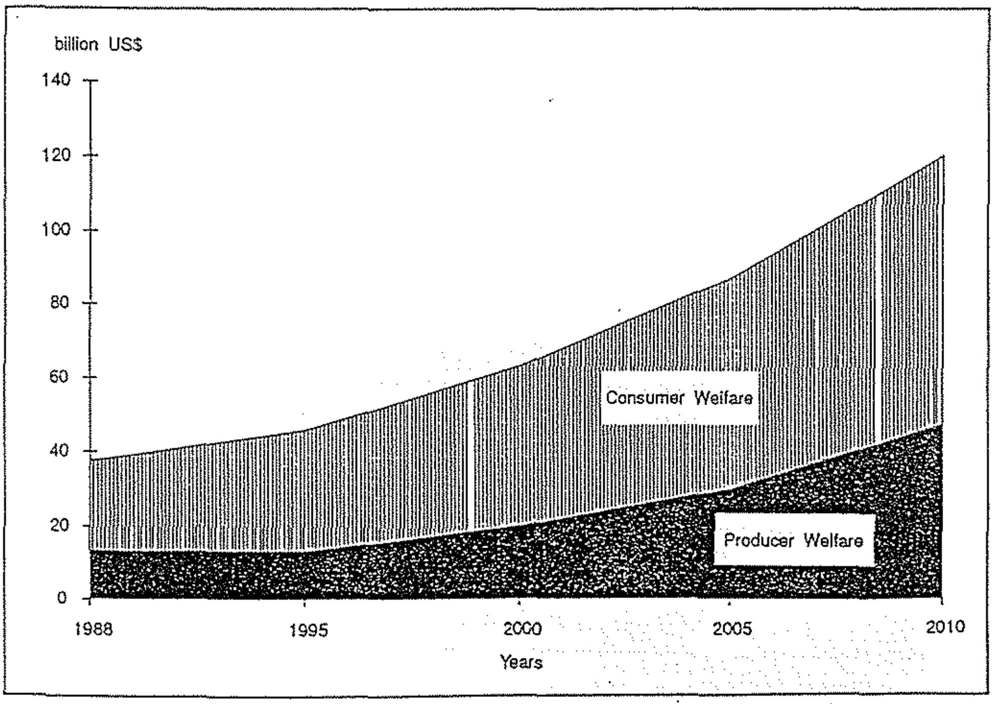
Developments in the agricultural sector have an impact on both the producers of the agricultural products, the owners of the resources which in many instances are the producers, and the consumers, again part of which is the producers themselves. The welfare of the society depends on the welfares of these economic agents. The models objective function is specified to maximize the sum of welfares of producers and consumers via the sum of consumer and producer surpluses, which also has the implication of equating market demand to market supply.

The developments in the consumer, producer and total surpluses are presented in Table 5.4.2 and illustrated in Figure 5.4.1. The surpluses presented in this table should be interpreted more in relative terms than in absolute terms, as shown by indexes presented in the last three columns of the table.

Table 5.4.2: Welfare Indices

YEAR	TOTAL WELFARE (billion $)	CONSUMER WELFARE (billion $)	PRODUCER WELFARE (billion $)	TOTAL WELFARE INDEX	CONSUMER WELFARE INDEX	PRODUCER WELFARE INDEX
1988	37.60	24.81	12.79	100.00	100.00	100.00
1995	45.92	32.70	13.23	122.13	131.80	103.44
2000	63.25	43.14	20.11	168.22	173.88	157.23
2005	86.91	56.83	30.07	231.14	229.06	235.11
2010	120.38	72.38	48.00	320.16	291.74	375.29

Figure 5.4.1: Welfare Indices



The TURGAP projections suggest that over the next two decades the developments in the agricultural sector will increase the welfare of both the producers and the consumers. The total consumer welfare between 1988 and 2010 is estimated to increase over 3 times. The producer surplus is projected to increase faster by nearly 4 times, compared to consumer surplus which is projected to increase by little less than 2 times. The consumer welfare increases the most in the 1995-2000 period, whereas the producer welfare registers the maximum increase in the 2005-2010 period.

5.4.2.2 Value of Production

The value of total production evaluated at current dollar prices increases by 4.6 times from \$16.43 Billion in 1988 to \$75.84 Billion in 2010. The crop production which constituted over 75 percent of the total value increase from \$12.56 Billion to \$40.31 by over 3 times. The value of livestock products on the otherhand increased from \$3.87 Billion in 1988 to \$35.53 Billion in 2010, registering an increase of 9 times.

In 1988 GAP Region constituted 11.15 percent of the value of crop production by \$1.4 Billion. Over the next two decades, the value of crop production in the GAP Region is projected to reach \$6.49 Billion, registering a nearly 5 times increase from 1988. The share of the GAP Region increases especially after 2005 when most of the irrigation projects are planned to be completed and reaches nearly 18 percent of the total crop value (Table 5.4.3 and Figure 5.4.2).

Figure 5.4.2: Value of Production in GAP and Turkey

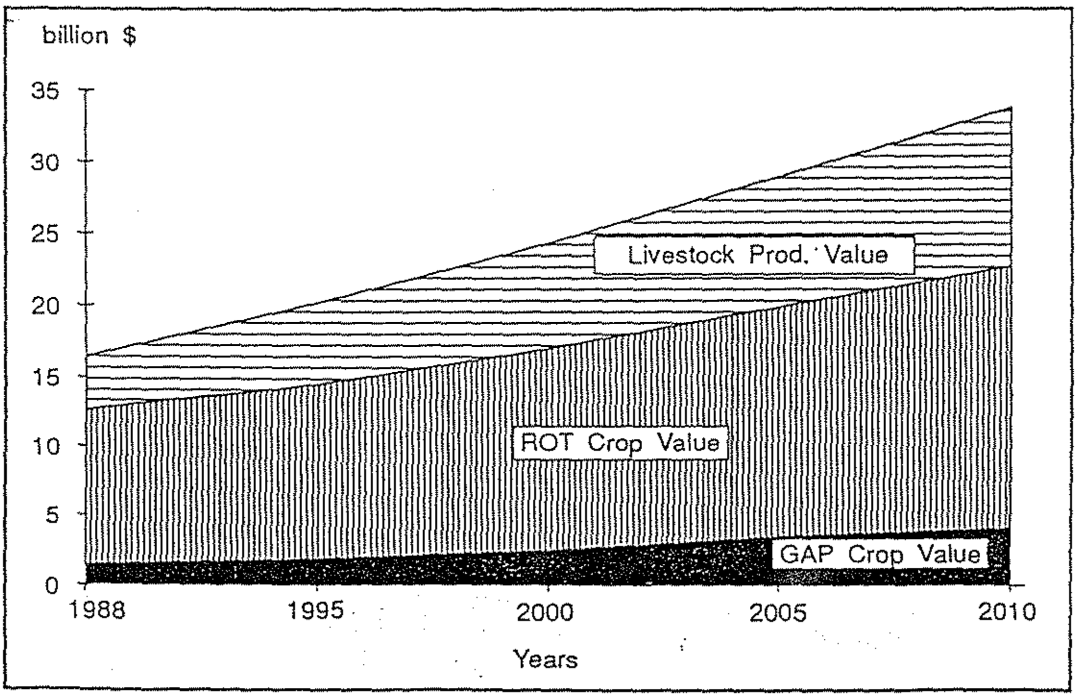


Table 5.4.3: Value of Production in the GAP Region and Turkey

	Value of Production (billion $)			Volume of Production (1988 Prices - billion $)		
Year	Turkey Total Value	Turkey Crop Value	GAP Crop Value	Turkey Total Volume	Turkey Crop Volume	GAP Crop Volume
1988	16,43	12,56	1,40	16,43	12,56	1,40
1995	25,80	17,37	2,16	20,14	14,46	1,87
2000	36,78	22,81	3,08	24,30	16,99	2,44
2005	51,58	29,53	4,72	28,97	19,85	3,42
2010	75,84	40,31	6,49	33,80	22,68	4,03
	Indices of Value (1988=100)			Indices of Volume (1988=100)		
Year	Turkey Total Value	Turkey Crop Value	GAP Crop Value	Turkey Total Volume	Turkey Crop Volume	GAP Crop Volume
1988	100,00	100,00	100,00	100,00	100,00	100,00
1995	157,03	138,30	154,29	122,58	115,13	133,57
2000	223,86	181,61	220,00	147,90	135,27	174,29
2005	313,94	235,11	337,14	176,32	158,04	244,29
2010	461,59	320,94	463,57	205,72	180,57	287,86

The changes in the value of production stem from the two components of value, namely quantity and price. Therefore, the increases in value of production discussed above are also divided into these components in Table 5.4.3 by constructing volume series where quantities are evaluated at constant dollar prices rather than current dollar prices.

Between 1988 and 2010, the volume of agricultural production in Turkey is projected to increase by 2 times, thus accounting for 45 percent of the increase in value. The price increases account for the remaining 55 percent. In crop production the contributions of quantity and price increases are reversed. Quantity increases constitute 56 percent of the value increase and price increases the remaining 44 percent. The volume of crop production in the GAP Region is predicted to increase by 2.9 times at a 50 percent higher rate than the national average between 1988 and 2010. The quantity increases account for 61 percent of the increases in value of crop production in the GAP Region over the next two decades and price increases the remaining 29 percent.

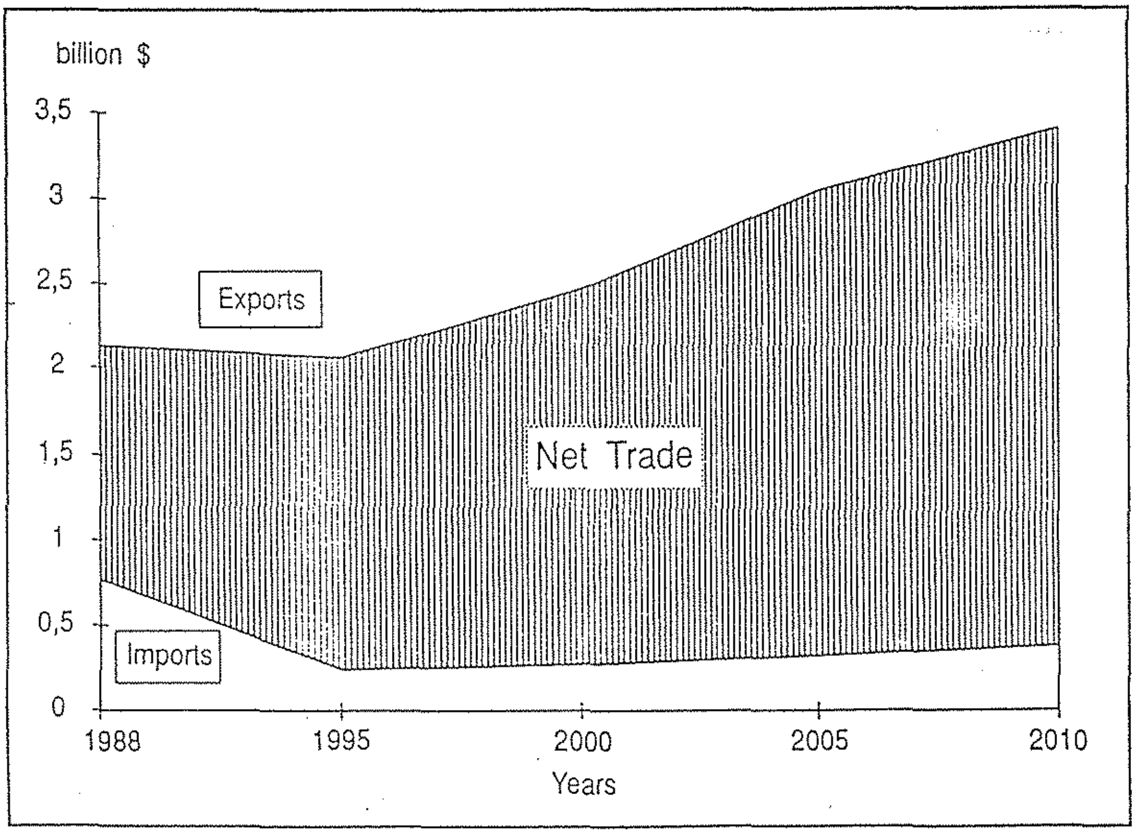
5.4.2.3 International Trade

Over the next two decades the value of agricultural products are predicted to increase by nearly 60 percent from $2.13 Billion in 1988 to $3.4 Billion in 2010, despite the very high growth of domestic demand resulting from high population and income growth rates. The value of imports which are moderate show a decline from $0.8 billion in 1988 to $0.3 Billion in 1995 and show an increasing trend thereafter reaching nearly $0.4 Billion in 2010. The net trade value of agricultural sector shows a consistently increasing trend, increasing by over 2.2 times from $1.36 Billion in 1988 to $3.02 Billion in 2010 (Table 5.4.4, Figure 5.4.3).

Table 5.4.4: International Trade in Agriculture

YEAR	EXPORTS (Bil. $)	IMPORTS (Bil. $)	NET TRADE (Bil. $)	NET TRADE INDEX
1988	2.13	0.77	1.36	100.00
1995	2.06	0.24	1.82	134.81
2000	2.47	0.27	2.20	162.96
2005	3.04	0.32	2.73	202.22
2010	3.40	0.38	3.02	226.67

Figure 5.4.3: International Trade in Agriculture



5.4.2.4 Factor Use and Factor Prices

The increases in supply as summarized in section 5.4.2 implies increases in demand for factors of production like labor, machinery, fertilizers and finally land. As a consequence there will also be a pressure towards increasing their prices as they are not available in unlimited amounts. Table 5.4.5 and Figure 5.4.4 summarize the predicted developments in net factor use of agriculture in the GAP Region and the rest of Turkey during the 1988-2010 period. A more detailed presentation of factor demands can be found in Appendix 5B.

On the overall, during the 1995-2010 period, labor demand in Turkish agriculture is predicted to increase by nearly 50 percent, whereas the demand for tractors by little over 25 percent. In the GAP Region the demand for labor will increase by 60 percent and for tractors by 100 percent between 1995 and 2010. In the rest of Turkey, the increase in demand for labor is 46 percent and for tractors only 19 percent over the studied period. The demand for labor and tractors is therefore predicted to grow at a faster rate than the rest of Turkey. The high growth rates in the GAP Region for labor although not high enough to fully employ the labor available and be a solution to under and unemployment in agriculture, it nevertheless will have a slowing down effect on out-migration from the region. The high demand for tractors on the otherhand in the GAP Region especially after year 2005 will certainly contribute to the fuller use of unused machine capacity in Turkey as agricultural machinery has been more mobile in the last decade.

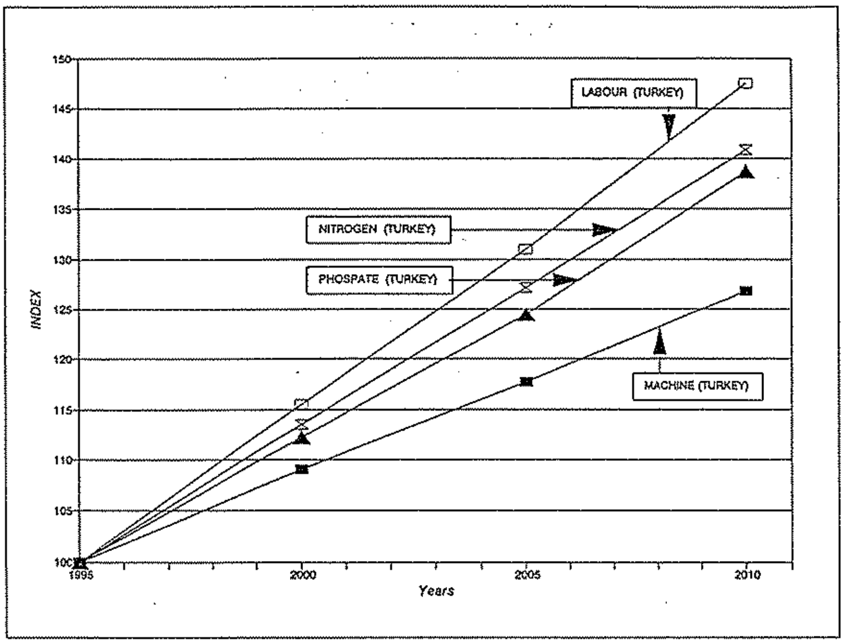
Table 5.4.5: Labor Machinery and Fertilizer Use Indices

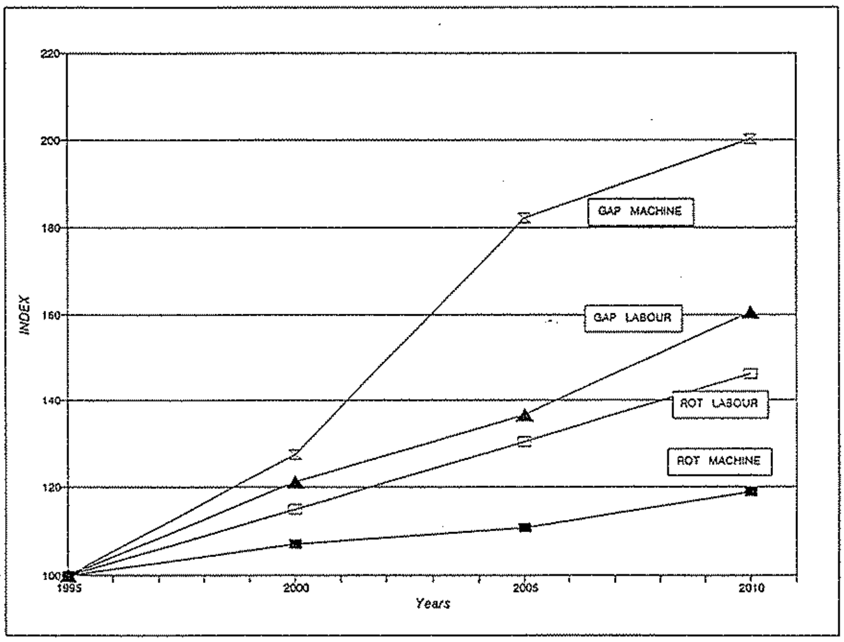
	TURKEY				ROT		GAP	
YEAR	LABOR	MACHINE	NITROGEN	PHOSPHATE	LABOR	MACHINE	LABOR	MACHINE
1995	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
2000	115.44	109.03	112.25	113.55	114.88	107.04	121.13	127.50
2005	131.01	117.67	124.50	127.11	130.46	110.72	136.62	182.16
2010	147.47	126.80	138.74	140.87	146.18	118.90	160.56	200.09

Fertilizer usage between 1988 and 2010 increase 18 percent for nitrogen fertilizers and almost double for phosphate fertilizers. Largest jump for phosphate fertilizers come in 1995, when the demand for nitrogen fertilizer fall due to shifts in crop patterns demanding more phosphate fertilizers.

The wage rates and tractor rental rates and land prices are all expected to increase both in the GAP Region and the rest of Turkey in the next two decades from national and international markets. Wage rates of agricultural labor in the GAP Region and rest of Turkey are expected to increase by over 50 percent between 1988 and 2010. The wage rates in GAP are projected to rise above that rest of Turkey in 1995, reach their peaks in 20005 and fall slightly below in 2010.

Figure 5.4.4: Resource Use Indices





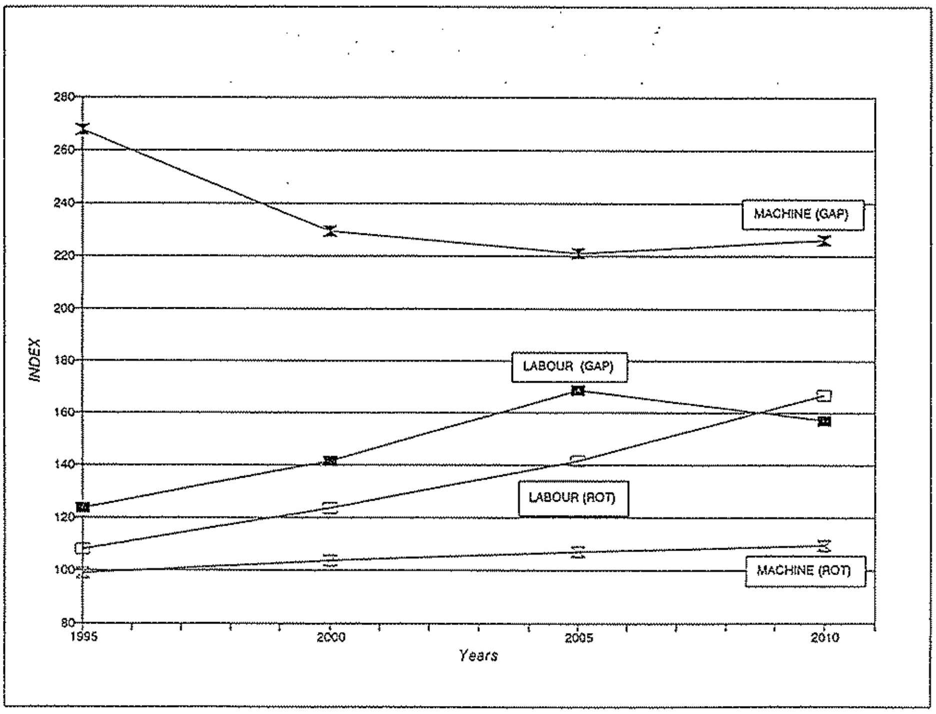
The machine rentals are projected to be above the Turkish average all through the decades, reaching their maximum in earlier years.

Land rentals in the GAP Region are expected to register very high increases in the earlier years, reach their maximum in 2005 and level off slightly starting in 2010 (Table 5.4.6, Figure 5.4.5).

Table 5.4.6: Resource Costs in the GAP Region and Rest of Turkey ($/hour and $/ha Peak Season)

	Labour		Machine	
	(1988 Turkey=100)		(1988 Turkey=100)	
YEAR	ROT	GAP	ROT	GAP
1995	107.84	123.53	98.80	267.38
2000	123.53	141.18	103.59	229.29
2005	141.18	168.63	106.83	220.92
2010	166.67	156.86	109.14	225.96

Figure 5.4.5: Labor and Machinery Cost Indices



The projected shadow prices for land in project regions and dry areas are presented in Tables 5.4.7 - 5.4.8 and illustrated in Figures 5.4.6 - 5.4.7. The shadow prices of land show the marginal values of land, and hence can be employed to rank the irrigation projects in terms of their contributions to producer and consumer welfare. The results of the study suggest that the marginal value of land in South GAP irrigation projects are in general higher than those in the North. The four projects with the highest values are Silopi, Mardin-Ceylanpinar, Suruç-Baziki and Urfa-Harran, all in the South. The four projects with the lowest values are Adiyaman-Göksu-Araban, Adiyaman-Kahta, Garzan and Batman-Silvan, all in the North (Table 5.4.7, Figure 5.4.6).

One of the important factors which determine the relative land values in the project regions is their land endowments. The shadow price of first class land in irrigated areas is nearly 3 times that of third class land and 50 percent more than that of second class land (Table 5.4.8, Figure 5.4.7).

A similar relationship is also true for different classes of land in non-irrigated areas.

The value of irrigated land in year 2010 is projected to be almost 3 times that of non-irrigated land in the GAP Region. The difference between values of irrigated and dry land will be higher in the South (almost 4 times) and lower in the North (nearly 2 times), as values of the dry land in the North are than those in the South, but the reverse is true for the irrigated land.

Table 5.4.7: Land Value Indices in the GAP Region in Year 2010

Code	Region	Land Value Index
	IRRIGATED	
N01	Siverek-Hilvan	92
N2A	Adiyaman-Kahta	72
N2B	Adiyaman-Goksu-Araban	71
N03	Dicle	110
N4A	Garzan	76
N4B	Batman	110
N4C	Batman-Silvan	76
S05	Urfa-Harran	113
S06	Mardin-Ceylanpinar	121
S07	Bozova	100
S08	Suruc-Baziki	116
S09	Gaziantep	95
S10	Nusaybin-Cizre-Idil	88
S11	Silopi	126
NOP	Non-Project	95
	DRY	
NHR	North-High Rainfall	46
NMR	North-Middle Rainfall	27
SMR	South-Middle Rainfall	35
SLR	South-Low Rainfall	15

Table 5.4.8: Land Value Indices in the GAP Region in Year 2010 by Land Classes

Code	Land Type	Land Classes			Weighted
		I	II	III	Average
IRR	Irrigated Land Average	148	93	53	100
DRY	Dry Land Average	62	43	23	35

Figure 5.4.6: Land Value Indices in GAP

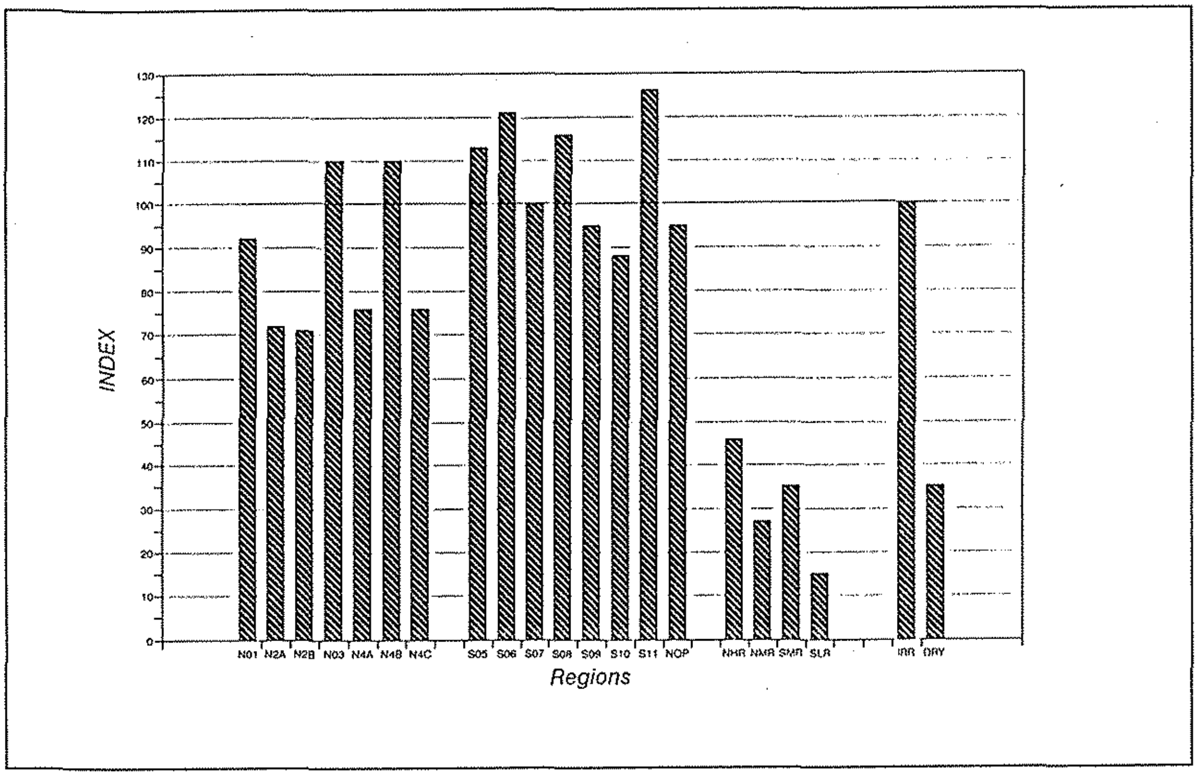
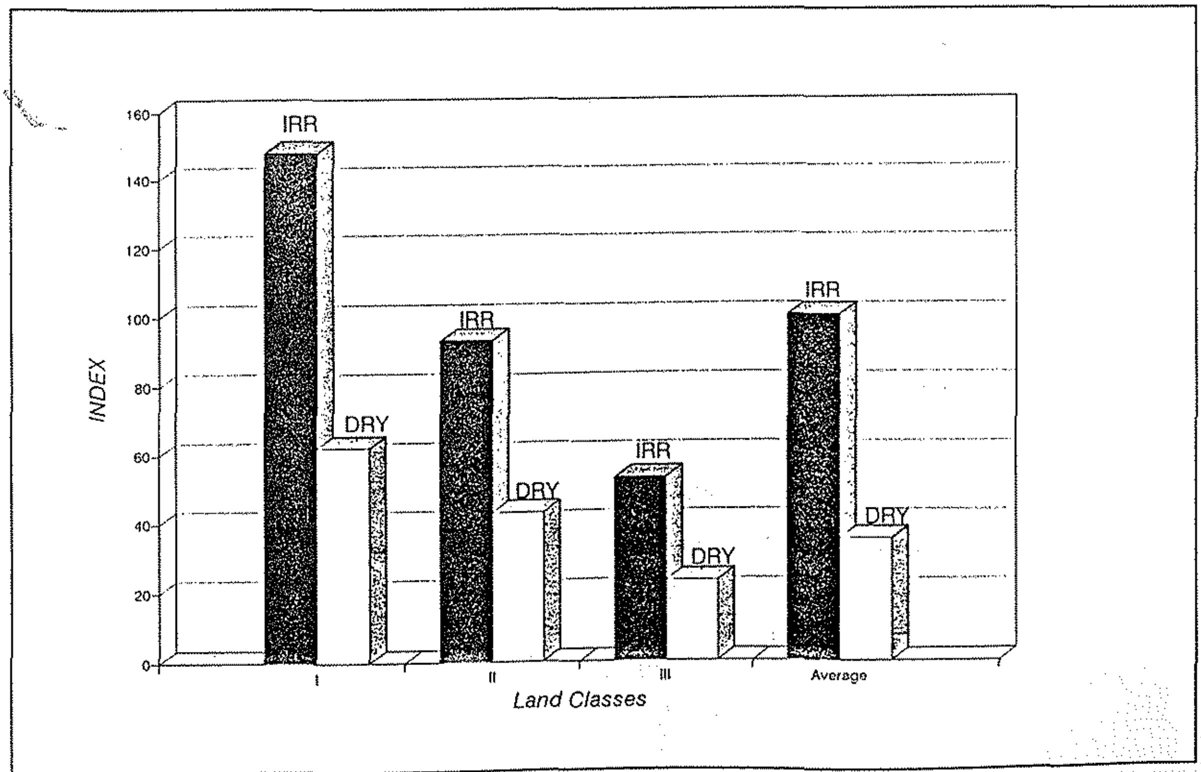


Figure 5.4.7: Land Value Indices in the GAP Region



5.4.2.5 Production and Market Balances in Turkey and GAP

The results of the projection to 2010 are presented in Table 5.4.9. One startling observation is that the production of almost all crops doubles; a higher increase is expected for the production of livestock products. At first, this situation might be surprising, but during the 22 years from 1988 to 2010, the population is expected to increase by more than 50% and the rate of increase for the livestock herd is expected to be around 2% per year. It seems obvious that Turkey might become more dependent on trade in agricultural products without an increase in the investment for agricultural infrastructure given these rather high rates of growth. The model results on the production of major products indicate the fact that Turkey will be able to achieve self sufficiency. Except for rice and some minor quantities in the import of livestock products, Turkey is expected to be either exporter or self sufficient in the agricultural products, given the assumptions imposed on the projection run of the model. Despite significant increases in the factors affecting domestic consumption Turkey will remain to be exporter of classical export products such as cotton, tobacco, pulses, and hazelnuts. In addition, corn will be an important cereal which is exported. The expansion of the livestock herd apart from the increase in population will be the major factor which will have significant impact on the exports of cereals in general because the proportion of cereals used as feed increases. GAP production will show quite a balanced structure in 2010. It is important to note that GAP Region will become either self-sufficient or provider of crops for the rest of Turkey in almost all products except in the crops that can not be grown in the Region. For instance, GAP becomes surplus region in the production of corn with the possibility to have more than one certainly crop in one year which affects the Turkey's export of corn. The production of pulses in the GAP Region will increase both in absolute quantities and relative to the overall production of Turkey. In tubers and vegetables in general, GAP Region will be able to produce the amount required for the local consumption. The possibility of double cropping affects the production of oil seeds dramatically, especially for groundnuts and soybeans. There exist no production of these two crops in the GAP Region in 1988, whereas in 2010 GAP has more than 80% share in total production of Turkey. Interesting developments should be expected for the production of industrial crops, namely sugarbeet and cotton, with respect to the share of GAP in total production. In 2010, GAP will have 17% of the total sugarbeet production. Yet, the introduction of the sugarbeet production is not observed until the irrigated land reaches relatively higher level compared to the base year (after 2000). Cotton production in GAP will increase from 14% in the base year to 37% in 2010. It seems that there will not be a clear winner of the competition between cotton production and double cropping activities. The crop pattern in 2010 indicates that it is quite flexible with respect to the level of domestic and international prices. There will be quite significant increase in the production of fruits and nuts, except in the production of pears.

Table 5.4.9: Simulated Market Balances for 2010 (.000 tons)

	PRODUCTION OBSERVED TURKEY 1988	PRODUCTION SIMULATED ROT 2010	PRODUCTION SIMULATED GAP 2010	PRODUCTION SIMULATED TRK 2010	NET-TRADE SIMULATED TRK 2010	CONSUMPTION SIMULATED ANIMAL 2010	CONSUMPTION SIMULATED HUMAN 2010
WHEAT	20500.00	23537.61	4020.62	27558.23		5211.92	22346.31
CORN	2000.00	3058.94	1189.81	4248.75	650.00	1603.67	1995.08
RYE	280.00	507.54	89.57	597.11		524.84	72.27
BARLEY	7500.00	11131.34	2087.28	13218.62	122.92	8168.23	4927.47
RICE	157.50	102.41	18.07	120.48	-432.29		552.77
CHICK-PEA	777.50	516.07	600.62	1116.69	509.54		607.14
DRY-BEAN	211.00	361.76	63.84	425.60			425.60
LENTIL	1040.00	360.61	1013.62	1374.23	268.15		1106.08
DRY-PEA	4.50	10.01		10.01			10.01
POTATOE	4351.00	8000.94	1411.93	9412.87			9412.87
ONION	1345.00	2269.21	400.45	2669.66			2669.66
TOMATOE	5250.00	8611.25	1519.63	10130.88			10130.88
AUBERGINE	730.00	1334.31	235.47	1569.78			1569.78
MELON	1950.00	3606.85	636.50	4243.36			4243.36
CAULIFLOWR	67.00	123.28	21.76	145.03			145.03
WAT-MELON	3300.00	6106.36	1077.59	7183.96			7183.96
CARROT	157.00	272.00	48.00	320.00			320.00
CABBAGE	510.00	914.02	161.30	1075.32			1075.32
CUCUMBER	800.00	1423.70	251.24	1674.94			1674.94
OKRA	21.00	38.11	6.72	44.83			44.83
PEPPER	730.00	1282.64	256.35	1538.99	30.00		1508.99
LETTUCE	135.00	239.77	42.31	282.08			282.08
SPINACH	140.00	250.67	44.24	294.90			294.90
SQUASH	300.00	396.32	69.94	466.26			466.26
LEEK	310.00	535.62	94.52	630.14			630.14
GROUNDNUT	60.00		155.41	155.41	30.00		125.41
SESAME	45.00	86.50	15.26	101.76	-10.00		111.76
SUNFLOWER	1150.00	3090.22	150.99	3241.21			3241.21
SOYABEAN	150.00	87.44	683.40	770.84			770.84
LINSEED	3.35	11.35		11.35	2.00		9.35
COLZA	1.40	3.49		3.49			3.49
COTTON	1395.64	2039.80	1180.30	3220.10	700.00		2520.10
TOBACCO	211.69	419.35	64.44	483.80	150.00		333.80
SUGARBEET	11534.15	23982.40	4832.19	28814.59	600.00		28214.59
PISTACHIO	30.00		45.96	45.96			45.96
HAZELNUT	402.50	301.87		301.87	146.00		155.87
OLIVE	1100.00	1592.17	179.85	1772.01			1772.01
TEA	752.66	1309.14		1309.14			1309.14
GRAPES	5227.67	5546.02	1794.82	7340.83	97.55		7243.29
FIG	350.00	512.71	90.48	603.18			603.18
ORANGE	740.00	1581.19		1581.19			1581.19
LEMON	360.00	604.71		604.71			604.71
APPLE	1950.00	3707.13	654.20	4361.32			4361.32
PEARS	410.00	934.61		934.61			934.61
PEACH	328.00	659.05	116.31	775.35			775.35
APRICOT	284.00	229.47	152.56	382.03			382.03
CHERRY	135.00	264.36	46.65	311.01			311.01
WILDCHERRY	80.00	60.00	113.63	173.63			173.63
POMEGRAN	48.00		86.44	86.44			86.44
SHEEP-MEAT	392.43			1095.04	525.00		570.04
SHEEP-MILK	1305.47			3642.75			3642.75
SHEEP-WOOL	58.23			162.48	-64.00		226.48
SHEEP-HIDE	35.40			98.78	-30.00		128.78
GOAT-MEAT	66.53			214.66	33.00		181.66
GOAT-MILK	367.31			1185.05			1185.05
GOAT-WOOL	4.77			15.40	2.00		13.40
GOAT-HIDE	6.47			20.89	-3.00		23.89
ANGOR-MEAT	6.10			19.12	9.00		10.12
ANGOR-MILK	21.36			67.01			67.01
ANGOR-WOOL	2.30			7.21	1.75		5.46
ANGOR-HIDE	0.47			1.47	-1.00		2.47
COW-MEAT	362.38			1057.46			1057.46
COW-MILK	8316.14			24267.49	-7.00		24274.49
COW-HIDE	42.70			124.60			124.60
BUFAL-MEAT	17.55			70.81			70.81
BUFAL-MILK	218.58			881.92			881.92
BUFAL-HIDE	2.68			10.83			10.83
POLTR-MEAT	143.31			372.66			372.66
EGGS	340.08			884.24			884.24

The domestic flow of crop products from and to GAP in the base year and in the year 2010 is presented in Table 5.4.10, Figure 5.4.8. The matrix is self-explanatory. It points out that GAP Region will become self-sufficient in almost all vegetables and exporter of the major cash-crops to the rest of Turkey. The development of the agricultural production of Turkey, and especially of GAP, in accordance with the step-wise implementation of the irrigation projects can be traced out from the tables which show the simulation results (Table 5.4.11 - Table 5.4.13). The major impact of GAP will be seen in 2005 when most of the projects are implemented. For example, total wheat production is expected to increase by approximately 17% between the considered periods. Yet, wheat production in GAP will increase by 22% between 1995-2000, 58% from 2000 to 2005, and 29% between 2005-2010. Another important crop cotton shows almost the same picture. Cotton production in Turkey will increase by 18% per period, whereas GAP's cotton production will jump from an increase of 18% between 1995-2000 to 47% from 2000 to 2005. Starting from 2000 the Region becomes rather competitive in the production vegetables. The evaluation of the production both in the base projection to 2010 and the other periods indicates that given the agro-climatic conditions prevailing in the Region, with the expansion of irrigated land, GAP will be able to compete with the most fertile agricultural regions in the rest of Turkey.

5.4.2.6 Producer Prices

The model treats domestic prices endogenously depending on the supply and demand conditions prevailing in a specific year. The producer prices for each simulation and the comparison of simulated prices with the observed prices in 1988 are presented in Table 5.4.14. The table shows the changes in real prices received by the farmers. They are affected not only from the domestic conditions, but also from the international prices which is incorporated in the model based on the results of the World Trade Model. In terms of the product groups, the highest growth occurs in the prices of the livestock products. The only decline will be observed in the price of rice. The price of the crops, which have high income elasticities such as vegetables and fruits, are expected to increase approximately by 100% by the year 2010. In cereals the increase in the price of barley and corn are relatively high due to the fact that they are heavily used as input in the production of livestock. It seems that GAP project will not be able to be a complete solution for the food-feed competition which prevails in almost all developing countries.

Table 5.4.10: Production in the GAP Region and Turkey

Crop	Share of GAP 1988	Share of GAP 2010	GAP2010/ GAP 1988	TUR2010/ TUR 1988
WHEAT	0.10	0.15	2.05	1.34
CORN	0.00	0.28	174.97	2.12
RYE	0.00	0.15	INF	2.13
BARLEY	0.16	0.16	1.69	1.76
RICE	0.03	0.15	4.11	0.77
CHICKPEA	0.18	0.54	4.41	1.44
DRYBEAN	0.03	0.15	11.39	2.02
LENTIL	0.79	0.74	1.24	1.32
DRYBEAN	0.00	0.00	0.00	2.22
POTATO	0.00	0.15	82.57	2.16
ONION	0.12	0.15	2.53	1.98
TOMATO	0.04	0.15	6.56	1.93
AUBERGINE	0.14	0.15	2.28	2.15
MELON	0.18	0.15	1.86	2.18
CAULIFLOWER	0.00	0.15	INF	2.16
WATER-MELON	0.18	0.15	1.84	2.18
CARROT	0.03	0.15	12.00	2.04
CABBAGE	0.00	0.15	100.81	2.11
CUCUMBER	0.05	0.15	9.19	2.09
OCRA	0.05	0.15	6.09	2.13
PEPPER	0.06	0.17	6.05	2.11
LETTUCE	0.04	0.15	8.46	2.09
SPINACH	0.01	0.15	29.47	2.11
SQUASH	0.03	0.15	8.13	1.55
LEEK	0.00	0.15	INF	2.03
GROUNDNUT	0.00	1.00	INF	2.59
SESAME	0.54	0.15	0.63	2.26
SUNFLOWER	0.00	0.05	INF	2.82
SOYABEAN	0.00	0.89	INF	5.14
LINSEED	0.15	0.00	0.00	3.35
COLZA	0.00	0.00	0.00	2.50
COTON	0.12	0.37	5.63	1.91
TOBACCO	0.12	0.13	2.46	2.21
SUGARBEET	0.00	0.17	1725.79	2.50
PISTACHIO	0.85	1.00	3.59	3.07
HAZELNUT	0.00	0.00	0.00	0.75
OLIVE	0.04	0.10	4.59	1.61
TEA	0.00	0.00	0.00	1.74
GRAPE	0.21	0.24	2.58	2.19
FIGS	0.03	0.15	7.48	1.72
ORANGE	0.00	0.00	0.00	2.14
LEMON	0.00	0.00	0.00	1.68
APPLE	0.00	0.15	114.77	2.24
PEARS	0.01	0.00	0.00	2.28
PEACH	0.01	0.15	68.41	2.36
APRICOT	0.02	0.40	31.14	1.35
CHERRY	0.01	0.15	66.71	2.30
WILD CHERRY	0.01	0.65	189.33	2.17
POMEGRANATE	0.21	1.00	9.00	1.92

Figure 5.4.8: Domestic Trade Flows Between GAP and ROT

Year	Produced in GAP Surplus Sold to ROT.	Produced in GAP no Surplus or Deficit	Produced in GAP Deficit Purchased from ROT	Not Produced in GAP Purchased from ROT
1988	BARLEY CHICKPEA LENTIL ONION MELON W.MELON SESAME LINSEED COTTON TOBACCO PISTACH. GRAPE POMEGR.	WHEAT	RICE DRYBEAN POTATO TOMATO AUBERG. CARROT CABBAGE CUCUMBER FIGS PEARS APRICOT W.CHERRY OKRA PEPPER LETTUCE SPINACH SQUASH LEEK SUGARB. OLIVE APPLE PEACH CHERRY	CORN RYE DRYPEA CAULIFL. GROUNDNUT SUNFLOWER SOYABEAN COLZA HAZELNUT TEA ORANGE LEMON
2010	CORN BARLEY CHICKPEA LENTIL PEPPER GROUNDNUT SOYABEAN COTTON SUGARBEET PISTACHIO GRAPE APRICOT W.CHERRY POMEGRAN	WHEAT RYE RICE DRYBEAN POTATO ONION TOMATO AUBERG. SPINACH LEEK FIGS PEACH MELON CAUILF W.MELON CARROT CABBAGE CUCUMBER OKRA LETTUCE SQUASH SESAME APPLE CHERRY	SUNFLOWER TOBACCO OLIVE	DRYPEA LINSEED COLZA HAZELNUT TEA ORANGE LEMON PEARS

Table 5.4.11: Simulated Market Balances for 2005 (.000 tons)

	PRODUCTION OBSERVED TURKEY 1988	PRODUCTION SIMULATED ROT 2005	PRODUCTION SIMULATED GAP 2005	PRODUCTION SIMULATED TRK 2005	NET-TRADE SIMULATED TRK 2005	CONSUMPTION SIMULATED ANIMAL 2005	CONSUMPTION SIMULATED HUMAN 2005
WHEAT	20500.00	21943.02	3108.28	25051.28		4544.86	20506.43
CORN	2000.00	2117.97	1699.50	3817.47	550.00	1398.42	1869.05
RYE	280.00	448.48	75.11	523.59	2.10	457.66	63.83
BARLEY	7500.00	10076.93	2502.13	12579.05	861.70	7122.80	4594.56
RICE	157.50	104.77		104.77	-359.41		464.18
CHICK-PEA	777.50	419.12	668.23	1087.35	600.00		487.35
DRY-BEAN	211.00	300.91	48.99	349.90			349.90
LENTIL	1040.00	296.00	953.24	1249.24	358.46		890.77
DRY-PEA	4.50	8.19		8.19			8.19
POTATOE	4351.00	6787.30	1104.91	7892.20			7892.20
ONION	1345.00	1897.86	308.95	2206.81			2206.81
TOMATOE	5250.00	7223.57	1175.93	8399.50			8399.50
AUBERGINE	730.00	1127.07	183.48	1310.55			1310.55
MELON	1950.00	3027.45	492.84	3520.29			3520.29
CAULIFLOWR	67.00	103.81	16.90	120.70			120.70
WAT-MELON	3300.00	5132.42	835.51	5967.93			5967.93
CARROT	157.00	230.15	37.47	267.62			267.62
CABBAGE	510.00	774.19	126.03	900.23			900.23
CUCUMBER	800.00	1204.06	206.01	1410.08	10.00		1400.08
OKRA	21.00	31.95	5.20	37.15			37.15
PEPPER	730.00	1086.53	201.88	1288.41	25.00		1263.41
LETTUCE	135.00	203.35	33.10	236.45			236.45
SPINACH	140.00	212.50	34.59	247.09			247.09
SQUASH	300.00	342.01	55.68	397.69			397.69
LEEK	310.00	454.66	74.01	528.67			528.67
GROUNDNUT	60.00	26.45	95.60	122.05	20.00		102.05
SESAME	45.00	71.84	11.69	83.53	-9.00		92.53
SUNFLOWER	1150.00	2392.87	280.97	2673.84			2673.84
SOYABEAN	150.00	515.57	104.73	620.30			620.30
LINSEED	3.35	9.80		9.80	2.00		7.80
COLZA	1.40	2.82		2.82			2.82
COTTON	1395.64	1572.97	1159.52	2732.49	630.00		2102.49
TOBACCO	211.69	405.11	18.64	423.75	150.00		273.75
SUGARBEET	11534.15	19792.95	3822.11	23615.06	600.00		23015.06
PISTACHIO	30.00		40.42	40.42			40.42
HAZELNUT	402.50	289.30		289.30	164.50		124.80
OLIVE	1100.00	1514.55	172.36	1686.90			1686.90
TEA	752.66	1194.56		1194.56			1194.56
GRAPES	5227.67	5315.02	1527.30	6842.34	92.01		6750.33
FIG	350.00	461.21	75.08	536.29			536.29
ORANGE	740.00	1317.31		1317.31			1317.31
LEMON	360.00	499.09		499.09			499.09
APPLE	1950.00	3247.66	489.74	3737.39			3737.39
PEARS	410.00	812.48		812.48			812.48
PEACH	328.00	564.73	91.93	656.66			656.66
APRICOT	284.00	219.89	59.36	279.25			279.25
CHERRY	135.00	253.35	3.29	256.64			256.64
WILDCHERRY	80.00	57.49	81.48	138.97			138.97
POMEGRAN	48.00		73.29	73.29	1.62		71.67
SHEEP-MEAT	392.43			902.88	425.00		477.88
SHEEP-MILK	1305.47			3003.52			3003.52
SHEEP-WOOL	58.23			133.97	-56.00		189.97
SHEEP-HIDE	35.40			81.44	-30.00		111.44
GOAT-MEAT	66.53			167.68	25.00		142.68
GOAT-MILK	367.31			925.70			925.70
GOAT-WOOL	4.77			12.03	2.00		10.03
GOAT-HIDE	6.47			16.31	-3.00		19.31
ANGOR-MEAT	6.10			14.29	7.00		7.29
ANGOR-MILK	21.36			50.08			50.08
ANGOR-WOOL	2.30			5.39	1.70		3.69
ANGOR-HIDE	0.47			1.10	-1.00		2.10
COW-MEAT	362.38			871.89			871.89
COW-MILK	8316.14			20009.01	-7.00		20016.01
COW-HIDE	42.70			102.73			102.73
BUFAL-MEAT	17.55			51.72			51.72
BUFAL-MILK	218.58			644.25			644.25
BUFAL-HIDE	2.68			7.91			7.91
POLTR-MEAT	143.31			307.27			307.27
EGGS	340.08			729.07			729.07

Table 5.4.12: Simulated Market Balances for 2000 (.000 tons)

	PRODUCTION OBSERVED TURKEY 1988	PRODUCTION SIMULATED ROT 2000	PRODUCTION SIMULATED GAP 2000	PRODUCTION SIMULATED TRK 2000	NET-TRADE SIMULATED TRK 2000	CONSUMPTION SIMULATED ANIMAL 2000	CONSUMPTION SIMULATED HUMAN 2000
WHEAT	20500.00	20914.38	1960.88	22875.26	90.39	3880.79	18904.07
CORN	2000.00	2559.08	832.39	3391.47	450.00	1194.09	1747.38
RYE	280.00	387.93	57.97	445.90		390.79	55.11
BARLEY	7500.00	8848.10	1322.13	10170.23		6082.06	4088.17
RICE	157.50	89.32		89.32	-307.48		396.80
CHICK-PEA	777.50	349.58	502.43	852.01	450.19		401.82
DRY-BEAN	211.00	291.58		291.58			291.58
LENTIL	1040.00	486.13	607.18	1093.32	364.44		728.87
DRY-PEA	4.50	7.07		7.07	0.30		6.77
POTATOE	4351.00	5912.33	779.31	6691.65			6691.65
ONION	1345.00	1607.57	240.21	1847.79			1847.79
TOMATOE	5250.00	6130.23	916.02	7046.24			7046.24
AUBERGINE	730.00	961.21	146.93	1108.14	3.30		1104.84
MELON	1950.00	2568.81	383.84	2952.65			2952.65
CAULIFLOWR	67.00	88.40	13.21	101.60			101.60
WAT-MELON	3300.00	4364.44	652.16	5016.60			5016.60
CARROT	157.00	196.87	29.42	226.29			226.29
CABBAGE	510.00	662.74	99.03	761.77			761.77
CUCUMBER	800.00	1031.60	162.15	1193.74	8.00		1185.74
OKRA	21.00	27.05	4.04	31.09			31.09
PEPPER	730.00	930.66	159.06	1089.73	20.00		1069.73
LETTUCE	135.00	174.33	26.05	200.38			200.38
SPINACH	140.00	182.14	27.22	209.36			209.36
SQUASH	300.00	297.42	44.44	341.86			341.86
LEEK	310.00	390.22	58.31	448.53			448.53
GROUNDNUT	60.00	73.13	25.93	99.06	15.00		84.06
SESAME	45.00	60.51	9.04	69.56	-8.00		77.56
SUNFLOWER	1150.00	1940.03	289.89	2229.92			2229.92
SOYABEAN	150.00	463.39	35.16	498.56			498.56
LINSEED	3.35	8.62		8.62	2.00		6.62
COLZA	1.40	2.31		2.31			2.31
COTTON	1395.64	1524.29	787.77	2312.05	560.00		1752.05
TOBACCO	211.69	197.53	179.52	377.04	150.00		227.04
SUGARBEET	11534.15	18946.35	441.86	19388.21	600.00		18788.21
PISTACHIO	30.00		34.17	34.17			34.17
HAZELNUT	402.50	276.72		276.72	175.22		101.50
OLIVE	1100.00	1380.28	102.82	1483.10			1483.10
TEA	752.66	1039.26		1039.26			1039.26
GRAPES	5227.67	5083.94	841.42	5925.37	114.96		5810.41
FIG	350.00	441.17	2.77	443.95			443.95
ORANGE	740.00	1082.46		1082.46			1082.46
LEMON	360.00	409.12		409.12			409.12
APPLE	1950.00	3026.07	42.82	3068.90			3068.90
PEARS	410.00	666.88		666.88			666.88
PEACH	328.00	527.80	6.80	534.61			534.61
APRICOT	284.00	210.33	36.06	246.39			246.39
CHERRY	135.00	216.89		216.89			216.89
WILDCHERRY	80.00	54.99	20.74	75.73			75.73
POMEGRAN	48.00		33.90	33.90			33.90
SHEEP-MEAT	392.43			726.52	325.00		401.52
SHEEP-MILK	1305.47			2416.82			2416.82
SHEEP-WOOL	58.23			107.80	-48.00		155.80
SHEEP-HIDE	35.40			65.54	-30.00		95.54
GOAT-MEAT	66.53			129.28	20.00		109.28
GOAT-MILK	367.31			713.71			713.71
GOAT-WOOL	4.77			9.27	2.00		7.27
GOAT-HIDE	6.47			12.58	-3.00		15.58
ANGOR-MEAT	6.10			10.47	5.00		5.47
ANGOR-MILK	21.36			36.71			36.71
ANGOR-WOOL	2.30			3.95	1.60		2.35
ANGOR-HIDE	0.47			0.80	-1.00		1.80
COW-MEAT	362.38			701.58			701.58
COW-MILK	8316.14			16100.55	-7.00		16107.55
COW-HIDE	42.70			82.67			82.67
BUFAL-MEAT	17.55			38.05			38.05
BUFAL-MILK	218.58			473.98			473.98
BUFAL-HIDE	2.68			5.82			5.82
POLTR-MEAT	143.31			247.25			247.25
EGGS	340.08			586.66			586.66

Table 5.4.13: Simulated Market Balances for 1995 (.000 tons)

	PRODUCTION OBSERVED TURKEY 1988	PRODUCTION SIMULATED ROT 1995	PRODUCTION SIMULATED GAP 1995	PRODUCTION SIMULATED TRK 1995	NET-TRADE SIMULATED TRK 1995	CONSUMPTION SIMULATED ANIMAL 1995	CONSUMPTION SIMULATED HUMAN 1995
WHEAT	20500.00	18891.78	1606.49	20498.26	103.37	3221.13	17173.76
CORN	2000.00	2298.13	613.38	2911.51	300.00	991.12	1620.39
RYE	280.00	326.47	44.52	370.99		324.37	46.62
BARLEY	7500.00	7666.72	1045.46	8712.18		5048.22	3663.96
RICE	157.50	72.91		72.91	-263.06		335.98
CHICK-PEA	777.50	285.65	485.68	771.33	446.73		324.60
DRY-BEAN	211.00	240.21		240.21			240.21
LENTIL	1040.00	521.29	252.76	774.05	181.68		592.37
DRY-PEA	4.50	5.85		5.85	0.30		5.55
POTATOE	4351.00	5622.24		5622.24			5622.24
ONION	1345.00	1347.16	183.70	1530.87			1530.87
TOMATOE	5250.00	5149.86	730.75	5880.61	28.50		5852.11
AUBERGINE	730.00	812.71	113.62	926.33	2.80		923.53
MELON	1950.00	2158.56	294.35	2452.91			2452.91
CAULIFLOWR	67.00	74.49	10.16	84.65			84.65
WAT-MELON	3300.00	3673.62	500.95	4174.57			4174.57
CARROT	157.00	166.79	22.74	189.53			189.53
CABBAGE	510.00	561.90	76.62	638.52			638.52
CUCUMBER	800.00	875.21	127.35	1002.55	8.00		994.55
OKRA	21.00	22.66	3.09	25.75			25.75
PEPPER	730.00	789.24	124.62	913.86	17.00		896.86
LETTUCE	135.00	148.07	20.19	168.26			168.26
SPINACH	140.00	154.62	21.09	175.71			175.71
SQUASH	300.00	256.96	35.04	292.00			292.00
LEEK	310.00	331.81	45.25	377.06			377.06
GROUNDNUT	60.00	60.21	19.21	79.42	11.00		68.42
SESAME	45.00	29.58	27.75	57.33	-7.00		64.33
SUNFLOWER	1150.00	1618.88	220.76	1839.64			1839.64
SOYABEAN	150.00	401.03		401.03			401.03
LINSEED	3.35	7.60		7.60	2.00		5.60
COLZA	1.40	1.86		1.86			1.86
COTTON	1395.64	1278.22	664.30	1942.52	490.00		1452.52
TOBACCO	211.69	164.20	172.39	336.59	150.00		186.59
SUGARBEET	11534.15	15955.20		15955.20	600.00		15355.20
PISTACHIO	30.00		28.31	28.31			28.31
HAZELNUT	402.50	264.14		264.14	182.60		81.55
OLIVE	1100.00	1153.21	98.14	1251.35			1251.35
TEA	752.66	898.19		898.19			898.19
GRAPES	5227.67	4852.86	485.56	5338.41	217.87		5120.53
FIG	350.00	383.17		383.17			383.17
ORANGE	740.00	878.87		878.87			878.87
LEMON	360.00	331.23		331.23			331.23
APPLE	1950.00	2489.80		2489.80			2489.80
PEARS	410.00	540.79		540.79			540.79
PEACH	328.00	430.04		430.04			430.04
APRICOT	284.00	192.28	16.67	208.95			208.95
CHERRY	135.00	178.64		178.64	4.00		174.64
WILDCHERRY	80.00	52.49	19.77	72.26			72.26
POMEGRAN	48.00		2.11	2.11			2.11
SHEEP-MEAT	392.43			565.95	225.00		340.95
SHEEP-MILK	1305.47			1882.67			1882.67
SHEEP-WOOL	58.23			83.97	-40.00		123.97
SHEEP-HIDE	35.40			51.05	-30.00		81.05
GOAT-MEAT	66.53			97.52	15.00		82.52
GOAT-MILK	367.31			538.38			538.38
GOAT-WOOL	4.77			7.00	1.90		5.10
GOAT-HIDE	6.47			9.49	-3.00		12.49
ANGOR-MEAT	6.10			7.89	4.00		3.89
ANGOR-MILK	21.36			27.64			27.64
ANGOR-WOOL	2.30			2.98	1.60		1.38
ANGOR-HIDE	0.47			0.61	-1.00		1.61
COW-MEAT	362.38			546.52	-1.55		548.07
COW-MILK	8316.14			12542.09	-7.00		12549.09
COW-HIDE	42.70			64.40			64.40
BUFAL-MEAT	17.55			27.59			27.59
BUFAL-MILK	218.58			343.69			343.69
BUFAL-HIDE	2.68			4.22			4.22
POLTR-MEAT	143.31			192.60			192.60
EGGS	340.08			457.00			457.00

Table 5.4.14: Observed and Simulated Producer Prices (1988, 1995, 2000, 2005, 2010)

	PRICES OBS-1988 [$/ton]	PRICES SIM-1995 [$/ton]	PRICES 1995/1988	PRICES SIM-2000 [$/ton]	PRICES 2000/1988 [$/ton]	PRICES SIM-2005	PRICES 2005/1988 [$/ton]	PRICES SIM-2010 [$/ton]	PRICES 2010/1988
WHEAT	100.80	107.25	1.06	109.17	1.08	110.18	1.09	113.42	1.13
CORN	108.67	130.17	1.20	138.11	1.27	143.07	1.32	152.39	1.40
RYE	82.00	82.34	1.00	82.27	1.00	80.40	0.98	81.82	1.00
BARLEY	88.13	99.06	1.12	103.39	1.17	110.88	1.26	113.64	1.29
RICE	421.60	280.04	0.66	305.25	0.72	329.67	0.78	356.04	0.84
CHICK-PEA	251.78	257.78	1.02	266.79	1.06	286.41	1.14	293.75	1.17
DRY-BEAN	632.67	631.66	1.00	706.47	1.12	792.40	1.25	901.60	1.43
LENTIL	276.33	266.87	0.97	282.20	1.02	292.07	1.06	302.30	1.09
DRY-PEA	291.33	317.22	1.09	346.36	1.19	375.63	1.29	419.42	1.44
POTATOE	109.66	121.37	1.11	138.34	1.26	157.18	1.43	181.73	1.66
ONION	112.67	133.53	1.19	153.71	1.36	176.39	1.57	205.90	1.83
TOMATOE	199.73	241.03	1.21	281.18	1.41	325.07	1.63	383.48	1.92
AUBERGINE	234.67	293.17	1.25	340.50	1.45	392.52	1.67	460.88	1.96
MELON	134.00	170.10	1.27	197.37	1.47	227.33	1.70	267.71	2.00
CAULIFLOWR	300.00	360.41	1.20	415.65	1.39	478.34	1.59	559.05	1.86
WAT-MELON	95.33	123.63	1.30	144.24	1.51	167.31	1.75	197.52	2.07
CARROT	190.00	235.56	1.24	275.25	1.45	319.80	1.68	376.89	1.98
CABBAGE	127.33	163.06	1.28	190.47	1.50	221.28	1.74	260.76	2.05
CUCUMBER	233.33	300.89	1.29	351.88	1.51	409.43	1.75	480.46	2.06
OKRA	587.33	701.03	1.19	794.09	1.35	899.82	1.53	1042.07	1.77
PEPPER	280.00	361.31	1.29	422.05	1.51	490.79	1.75	578.09	2.06
LETTUCE	133.33	172.45	1.29	202.23	1.52	235.57	1.77	278.04	2.09
SPINACH	182.67	235.07	1.29	275.40	1.51	320.79	1.76	378.44	2.07
SQUASH	192.00	403.04	2.10	468.00	2.44	540.21	2.81	630.16	3.28
LEEK	146.67	186.54	1.27	219.68	1.50	256.83	1.75	303.94	2.07
GROUNDNUT	388.00	390.86	1.01	416.67	1.07	445.78	1.15	486.85	1.25
SESAME	680.67	818.26	1.20	931.38	1.37	1059.55	1.56	1222.83	1.80
SUNFLOWER	224.00	299.07	1.34	334.32	1.49	374.34	1.67	426.76	1.91
SOYABEAN	165.33	182.19	1.10	186.63	1.13	180.29	1.09	186.38	1.13
LINSEED	244.16	264.95	1.09	273.64	1.12	281.02	1.15	293.20	1.20
COLZA	200.00	213.70	1.07	221.75	1.11	231.78	1.16	244.00	1.22
COTTON	452.27	451.71	1.00	454.45	1.00	438.83	0.97	457.26	1.01
TOBACCO	1936.00	2248.03	1.16	2344.38	1.21	2432.38	1.26	2581.50	1.33
SUGARBEET	22.00	27.63	1.26	30.02	1.36	31.45	1.43	34.72	1.58
PISTACHIO	3256.00	3268.17	1.00	3505.91	1.08	3878.12	1.19	4985.75	1.53
HAZELNUT	1085.33	1558.08	1.44	1589.24	1.46	1621.02	1.49	1653.44	1.52
OLIVE	250.48	1199.99	4.79	1411.83	5.64	1747.23	6.98	2471.57	9.87
TEA	833.33	1052.17	1.26	1213.77	1.46	1391.10	1.67	1725.02	2.07
GRAPE	138.91	222.78	1.60	255.50	1.84	245.20	1.77	333.43	2.40
FIGS	329.33	388.52	1.18	478.24	1.45	526.39	1.60	682.87	2.07
ORANGE	243.78	303.07	1.24	367.21	1.51	440.47	1.81	583.28	2.39
LEMON	295.33	294.16	1.00	357.70	1.21	430.42	1.46	570.56	1.93
APPLE	222.33	298.95	1.34	358.97	1.61	427.54	1.92	608.88	2.74
PEARS	276.67	376.83	1.36	451.26	1.63	536.33	1.94	792.39	2.86
PEACH	266.67	335.41	1.26	388.15	1.46	446.97	1.68	626.22	2.35
APRICOT	336.67	293.22	0.87	467.01	1.39	735.89	2.19	587.72	1.75
CHERRY	362.67	476.60	1.31	555.55	1.53	738.87	2.04	932.06	2.57
WILDCHERRY	288.00	767.58	2.67	1103.33	3.83	580.01	2.01	662.67	2.30
POMEGRAN	166.67	782.23	4.69	541.30	3.25	306.30	1.84	337.68	2.03
SHEEP-MEAT	848.33	1034.84	1.22	1485.66	1.75	1952.38	2.30	2534.68	2.99
SHEEP-MILK	260.67	298.72	1.15	342.55	1.31	415.81	1.60	562.40	2.16
SHEEP-WOOL	1701.33	2310.81	1.36	3061.86	1.80	4145.50	2.44	5961.49	3.50
SHEEP-HIDE	2501.33	4369.80	1.75	5968.12	2.39	7814.26	3.12	10176.32	4.07
GOAT-MEAT	800.00	1027.76	1.28	1186.23	1.48	1346.31	1.68	1638.47	2.05
GOAT-MILK	260.67	280.49	1.08	279.25	1.07	276.82	1.06	311.50	1.20
GOAT-HIDE	2500.00	3990.68	1.60	5116.21	2.05	6351.20	2.54	7953.27	3.18
ANGOR-MEAT	833.33	1370.14	1.64	1456.58	1.75	1611.94	1.93	1651.81	1.98
ANGOR-MILK	260.67	410.40	1.57	433.17	1.66	387.63	1.49	362.80	1.39
ANGOR-HIDE	2500.00	4118.61	1.65	6050.21	2.42	7928.78	3.17	10147.07	4.06
COW-MEAT	843.33	1670.31	1.98	1701.04	2.02	1764.62	2.09	1929.71	2.29
COW-MILK	223.33	360.94	1.62	501.88	2.25	677.30	3.03	913.80	4.09
COW-HIDE	666.67	788.72	1.18	981.17	1.47	1249.29	1.87	1683.86	2.53
BUFAL-MILK	223.33	335.81	1.50	419.75	1.88	501.30	2.24	583.65	2.61
BUFAL-HIDE	666.67	695.61	1.04	675.81	1.01	594.08	0.89	453.81	0.68
POLTR-MEAT	1454.67	1813.05	1.25	2030.20	1.40	2340.96	1.61	2863.43	1.97
EGGS	1040.00	1259.88	1.21	1409.21	1.36	1625.28	1.56	1993.79	1.92

5.4.3 Projections at the Project and Administrative Level

5.4.3.1 Crop Pattern and Land Use Intensity

This section is about general discussion of the projection results at the crop, project or rainfall zone and land class level. The projections of the parameters at the macro level would certainly find their way down to the smallest level of decision i.e. cropping pattern of a specific land class of a project. The share of cereals in total cultivated land is expected to be 38.1% in 2010 (Table 5.4.15 and Figures 5.4.9-5.4.29). Among cereals, wheat is the major crop grown in all project regions quite extensively. An interesting observation is that starting from the year 2000, double cropping of wheat and corn replaces the cotton production in the Urfa-Harran Project. Pulses occupy almost 20% of the total irrigated area whereas industrial crops, mostly cotton, are grown on 16.5% of the irrigated area. The share of the oil seeds which can be double cropped with wheat and barley is 10%. Vegetables have a higher share in the irrigated area than the tuber crops which usually requires water use in a year. Southern projects are more diversified than the projects in the north in terms of fruit production. Shorter growing periods for the crops in the South, because of higher temperature, makes it possible to have more differentiation in almost all crop groups for the projects in the South compared to the crop pattern of the ones in the North. Land use intensity seems to be higher in the Southern projects. Land class intensity, as it is expected, supports this point (Table 5.4.16 and Figures 5.4.30 - 5.4.31). For land classes I and II, The projects in the South have always higher intensity than the projects in the North GAP. All projects are expected to be fully operational in 2010. Hence, the projection to 2010 is taken as the ultimate target. All other base projections will be compared either to the final target or the period just before the period under study. All of the projects, except the Siverek-Hilvan Project, are fully or partially operational in 2005. The decline of cereals from 2005 to 2010 is mainly due to the crop pattern and the availability of the irrigated land brought by the project mentioned above. The distribution of the crop groups in total irrigated land does not show significant difference in 2005 compared to the base projection to 2010, except for cotton which declines from 14.5% to 11.7% (Table 5.4.17 and Figures 5.4.32 - 5.4.37). For almost all projects, as it is expected, land use intensity is lower in 2005. The demand factor plays an important role in the lesser intensity. The injection of significant irrigated area given lesser demand in 2005 implies the fact that the available land is not used at its potential capacity. Highest land intensity is observed in the Urfa-Harran Project which is one of the largest project in the Region. In addition, it becomes operational at an early period. This situation allows the project area to have two crops in a year given the agronomic constraints incorporated into the model. The general tendency of the project regions to have corn or corn-silage as the second crop in the South and oil seeds in the North remains valid in 2005. Overall irrigated land intensity slightly decreases. The increase in the intensity of land class II is not enough to compensate the decrease in land class I. The projection results for the cropping pattern of the project regions in 2000 are presented in Table 5.4.16 and Figures 5.4.38 - 5.4.43. Only 5 projects out of 14 are fully or partially operational in 2000. Due to restricted availability of water and irrigated land, more irrigated land, especially in Northern projects, is allocated to cotton. Barley is the most common cereal in the Northern projects whereas corn or corn-silage are dominant in all of the Southern project areas (Table 5.4.18). This last observation leads more intensive use of irrigated land in the South compared to the North especially in the second land class (Table 5.4.16). The picture of crop pattern according to the projects is not highly different in the year 1995 (Table 5.4.19 and Figures 5.4.44 - 5.4.49). Only 3 projects are partially implemented in 1995. The pressure of the scarcity of the irrigated land can be easily seen from the land intensity for the irrigated land. Although overall intensity declines compared to the year 2000, the cropping intensity of the irrigated land slightly increases. It is interesting to note in 1995 sugarbeet production in the region does not appear in the cropping pattern. It starts to appear in the crop pattern in 2000 and with the additional availability of irrigated it is spread in GAP by the year 2010.

TABLE 5.4.15: Distribution of Crops for the Project Regions and Rainfed Agriculture in GAP- 2010 (%)

	Siverek Hilvan	Adiyaman Kahta	Adiyaman Goksu Araban	Dicle	Garzan	Batman	Batman Silvan	Urfa Harran	Mardin Ceylan-pinar	Bozova	Suruc Bazikl	Gaziantep	Nusaybin Cizre Idil	Silopi	Non-Project Region	Total All Projects	Total Rainfed Zones	Overall Total
CEREALS	*46.7*	*48.2*	*49.7*	*41.3*	*44.2*	*48.1*	*44.1*	*105.2*	*30.5*	*31.9*	*34.9*	*57.0*	*55.6*	*41.2*	*50.0*	*47.7*	*24.1*	*38.1*
WHEAT	31.1	16.1	20.3	29.9	13.0	33.4	10.6	41.5	19.7	11.1	18.6	32.3	33.1	23.9	38.4	24.1	21.2	23.0
CORN								55.2			2.1	5.0	5.1	13.5		5.9		3.5
BARLEY	15.6	32.0	29.4	11.4	31.3	14.6	33.4	8.5	10.8	20.8	14.3	17.7	16.8	3.8	11.6	17.6		10.4
RICE												2.1	0.5			0.1		0.1
RYE																	2.9	1.2
PULSES	*20.8*	*22.4*	*25.6*	*9.9*	*23.4*	*18.5*	*28.7*	*7.5*	*14.7*	*19.0*	*13.4*	*32.2*	*30.5*	*13.7*	*17.5*	*19.1*	*16.1*	*17.8*
CHICK PEA	10.9	22.4	25.6	8.0	23.4	18.5	24.9								17.5	8.6		5.1
DRY BEAN	9.8			1.9			3.8									1.5		0.9
LENTIL								7.5	14.7	19.0	13.4	32.2	30.5	13.7		8.9	16.1	11.8
INDUSTRIAL CROPS	*13.7*	*14.9*	*4.0*	*26.0*	*11.9*	*25.5*	*12.3*		*28.9*	*28.0*	*30.7*	*1.2*		*35.4*	*1.3*	*16.5*	*4.0*	*11.4*
COTTON	13.7	14.9	4.0	26.0	8.0	25.5	8.4		17.5	15.7	12.3	1.2		35.4	1.3	11.7		6.9
SUGAR BEET					4.0		3.9		11.4	12.3	18.4					4.8		2.8
TOBACCO																	4.0	1.6
OIL SEEDS	*14.0*	*7.9*	*12.9*	*22.3*	*7.6*	*21.6*	*2.3*		*15.7*		*9.2*	*10.6*			*23.5*	*10.0*	*7.0*	*8.8*
SUNFLOWER																	6.0	2.4
SOYBEAN	7.1	1.9	12.9	11.0	0.1	21.6	0.4		15.7		9.2	10.6			23.5	8.0		4.7
GROUNDNUT	7.0			11.3	7.5		1.8									2.0		1.2
SESAME																	1.0	0.4
TUBER CROPS		*0.1*	*1.7*					*28.3*	*3.8*				*0.5*	*10.1*	*8.9*	*3.9*		*2.3*
POTATO		0.1	1.7					28.3							8.9	3.0		1.8
ONION									3.8				0.5	10.1		0.9		0.6
VEGETABLES		*0.6*	*5.5*	*2.4*	*0.7*			*1.4*	*8.7*	*8.2*	*9.2*	*6.5*	*8.4*	*10.8*	*10.8*	*4.8*	*1.1*	*3.3*
TOMATO									4.0	2.3	3.0	2.6				1.2		0.7
EGGPLANT											2.1					0.2		0.1
MELON								0.6	2.8	4.1	2.9					1.0		0.6
CAULIFLOWER														1.8				
WATER MELON									2.0		0.2	3.9	8.0	5.2		1.1	1.1	1.1
CARROT											0.6							
CABBAGE		0.1	1.7												3.1	0.2		0.1
CUCUMBER			2.2												4.5	0.3		0.2
OKRA													0.4	0.5				
PEPPER		0.5	1.7	2.4											3.1	0.4		0.2
LETTUCE					0.7						0.2							
SPINACH										0.5				3.4		0.1		
SQUASH								0.9								0.1		
LEEK										1.3	0.1					0.1		
FRUITS AND NUTS	*11.9*	*13.9*	*15.0*	*9.1*	*13.2*	*8.0*	*13.1*	*13.2*	*13.0*	*15.0*	*15.0*	*12.7*	*14.4*	*7.0*	*15.0*	*12.9*	*33.6*	*21.3*
OLIVE																	13.2	5.4
GRAPE			12.6					13.2	7.7	3.2	2.3	11.1	9.0	5.8	9.3	5.1	10.0	7.1
FIG									0.9	0.2	4.3			1.1		0.6		0.3
APPLE	8.2	13.9		9.1	13.2	4.4	13.1									4.2		2.5
PEAR																		
PEACH										5.6	4.2	0.9	0.4			0.6		0.4
APRICOT	3.7		2.4			3.5									5.7	0.8		0.4
CHERRY											4.1					0.3		0.2
WILDCHERRY									4.4							0.8		0.5
POMEGRANADE										6.0		0.7	5.1			0.5		0.3
PISTACHIO																	10.3	4.2
FEED CROPS									*2.1*	*0.9*			*0.2*	*3.2*		*0.5*		*0.3*
CORN-SILAGE									2.1	0.9			0.2	3.2		0.5		0.3
TOTAL	*107.1*	*102.0*	*114.4*	*111.0*	*101.1*	*121.6*	*100.4*	*155.5*	*117.4*	*102.9*	*112.5*	*120.3*	*109.5*	*121.4*	*127.0*	*115.3*	*85.9*	*103.4*

Fig. 5.4.9: Projected Crop Pattern 2010
TOTAL GAP REGION

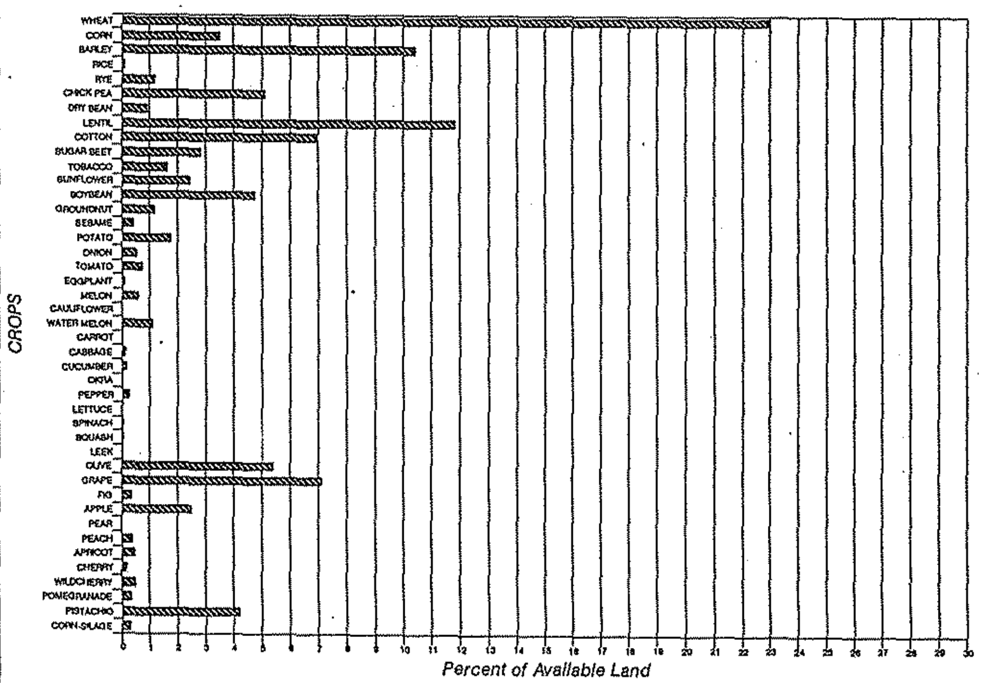


Fig.5.4.10: Projected Crop Pattern 2010
TOTAL GAP REGION

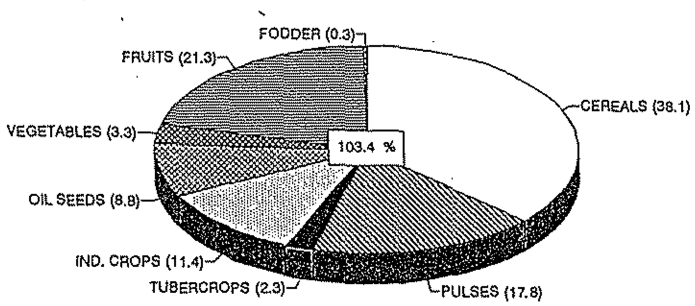


Fig.5.4.11: Projected Crop Pattern 2010
IRRIGATED GAP REGION

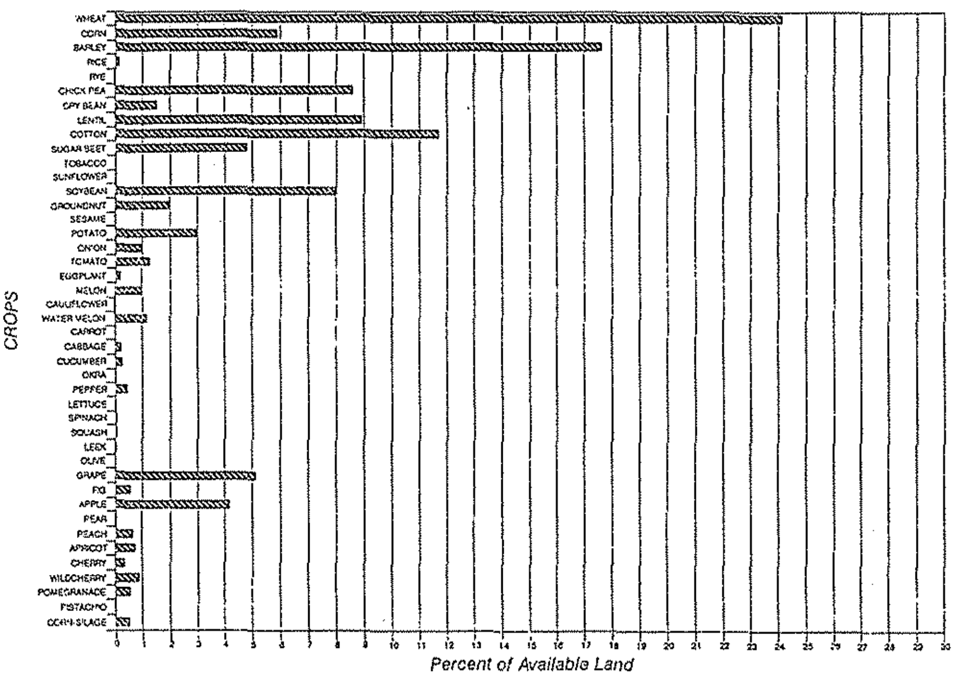


Fig.5.4.12: Projected Crop Pattern 2010
IRRIGATED GAP REGION

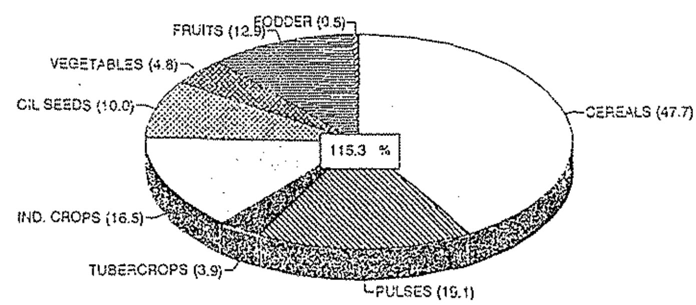


Fig.5.4.13: Projected Crop Pattern 2010
DRY GAP REGION

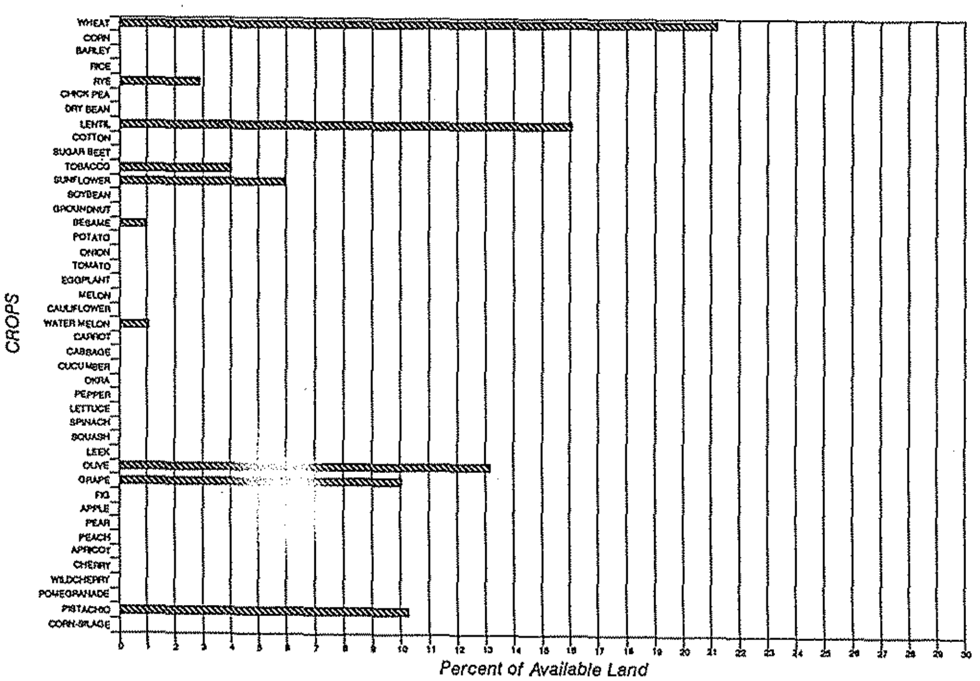


Fig.5.4.14: Projected Crop Pattern 2000
DRY GAP REGION

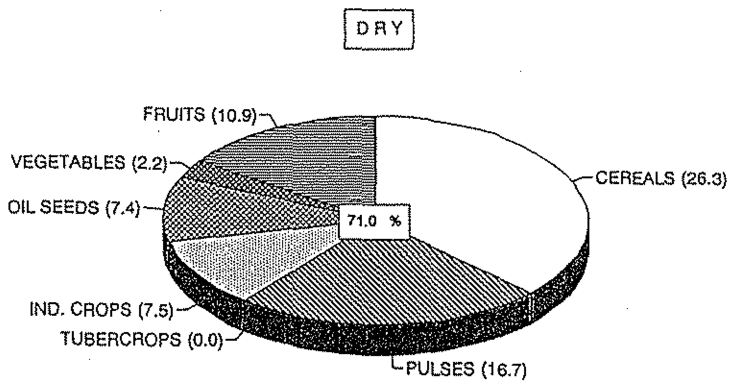


Table 5.4.16: Intensity of Land Use According to Land Classes (%)

	LAND CLASSES I	II	III	Overall Irrigated Intensity
Year 2010				
Irrigated	138	103	100	115
North	130	100	100	
South	140	106	100	
Dry	100	100	99	
Year 2005				
Irrigated	132	104	100	114
North	117	100	100	
South	136	107	100	
Dry	100	88	62	
Year 2000				
Irrigated	132	106	94	116
North	112	100	99	
South	141	121	85	
Dry	100	80	54	
Year 1995				
Irrigated	127	113	81	115
North	117	98	96	
South	131	140	65	
Dry	69	86	53	

Fig.5.4.15: Projected Crop Pattern 2010
N01

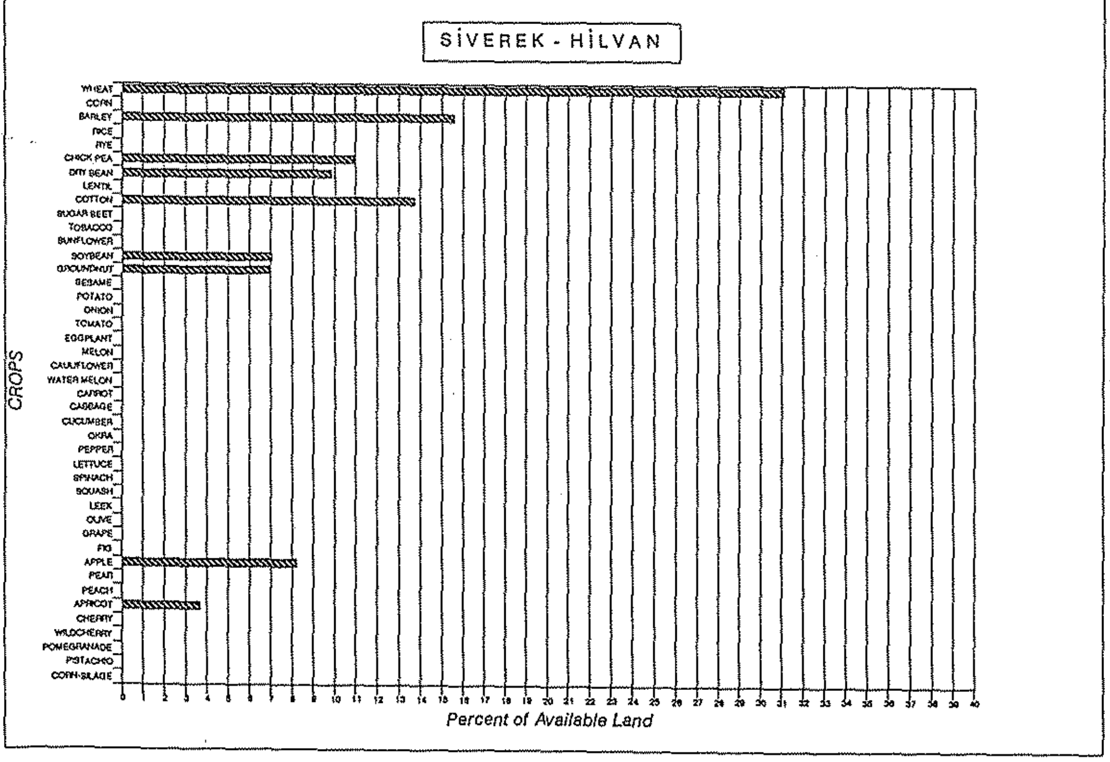


Fig.5.4.16: Projected Crop Pattern 2010
N2A

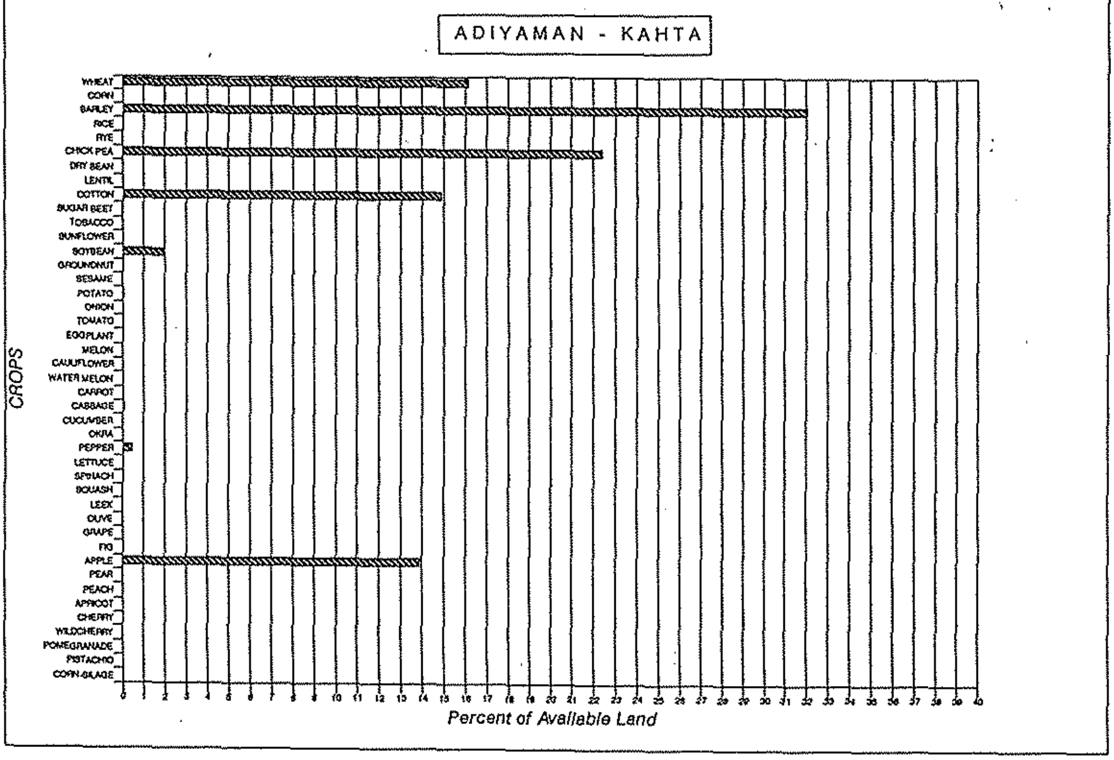


Fig.5.4.17: Projected Crop Pattern 2010
N2B

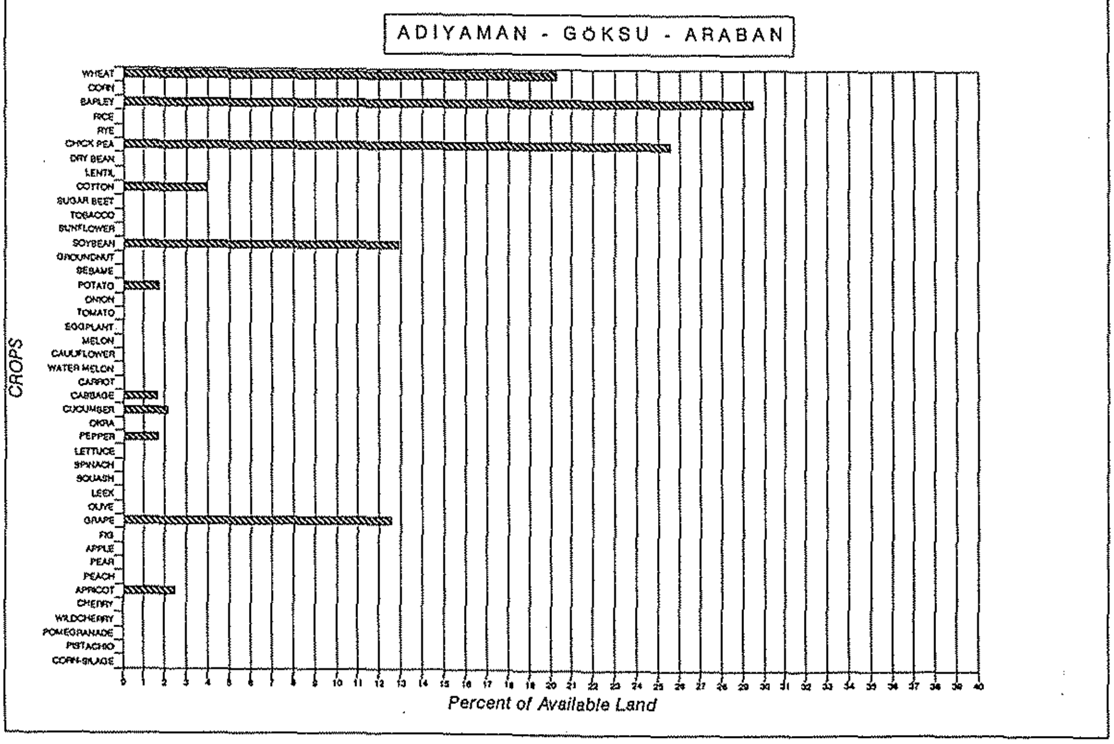


Fig.5.4.18: Projected Crop Pattern 2010
N03

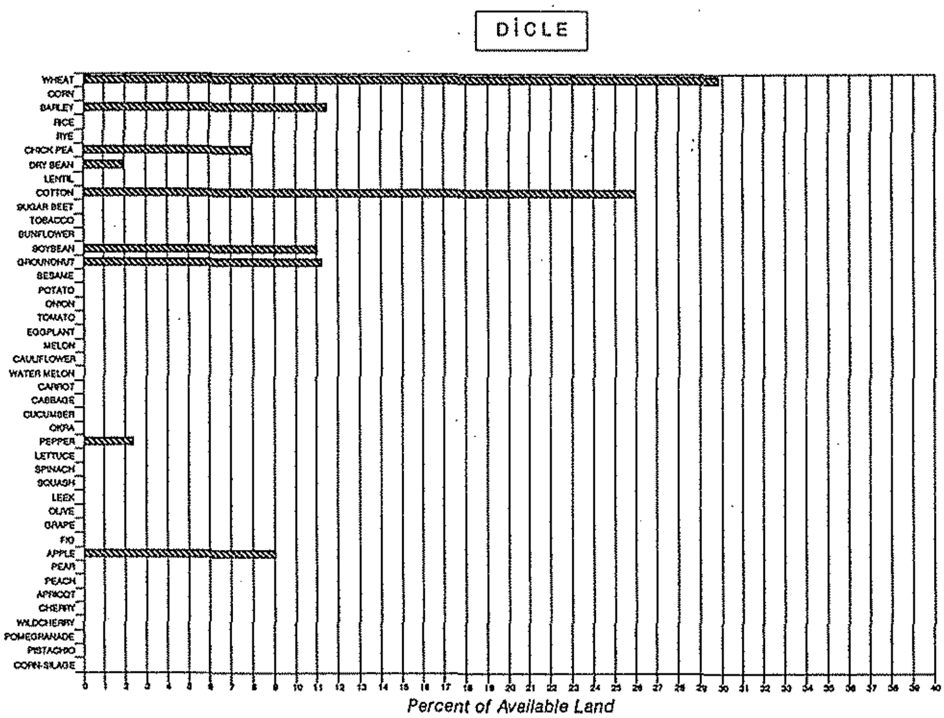
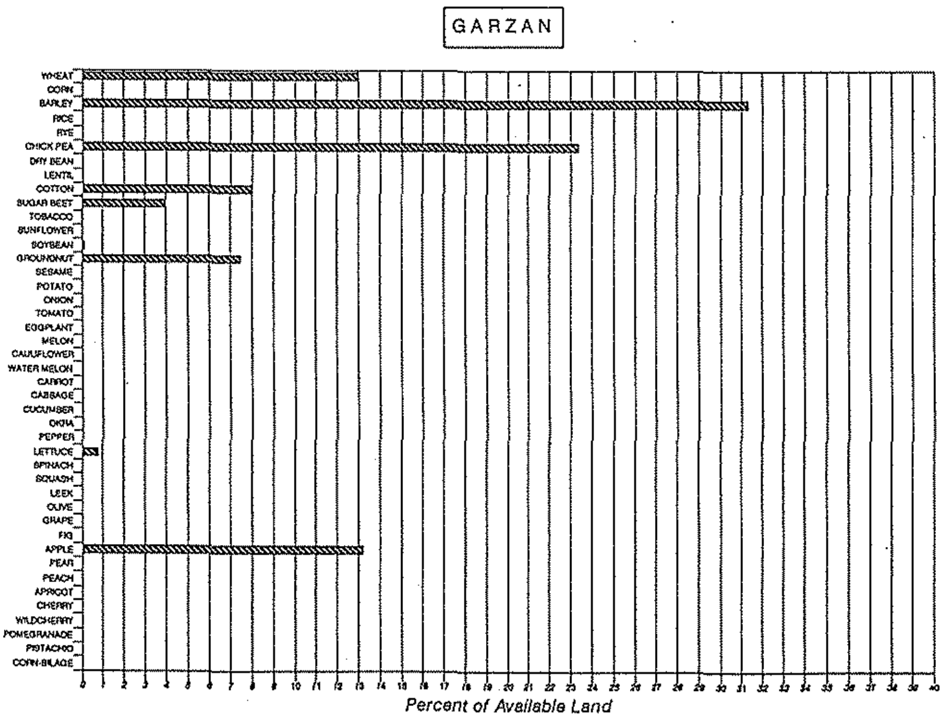


Fig.5.4.19: Projected Crop Pattern 2010
N4A



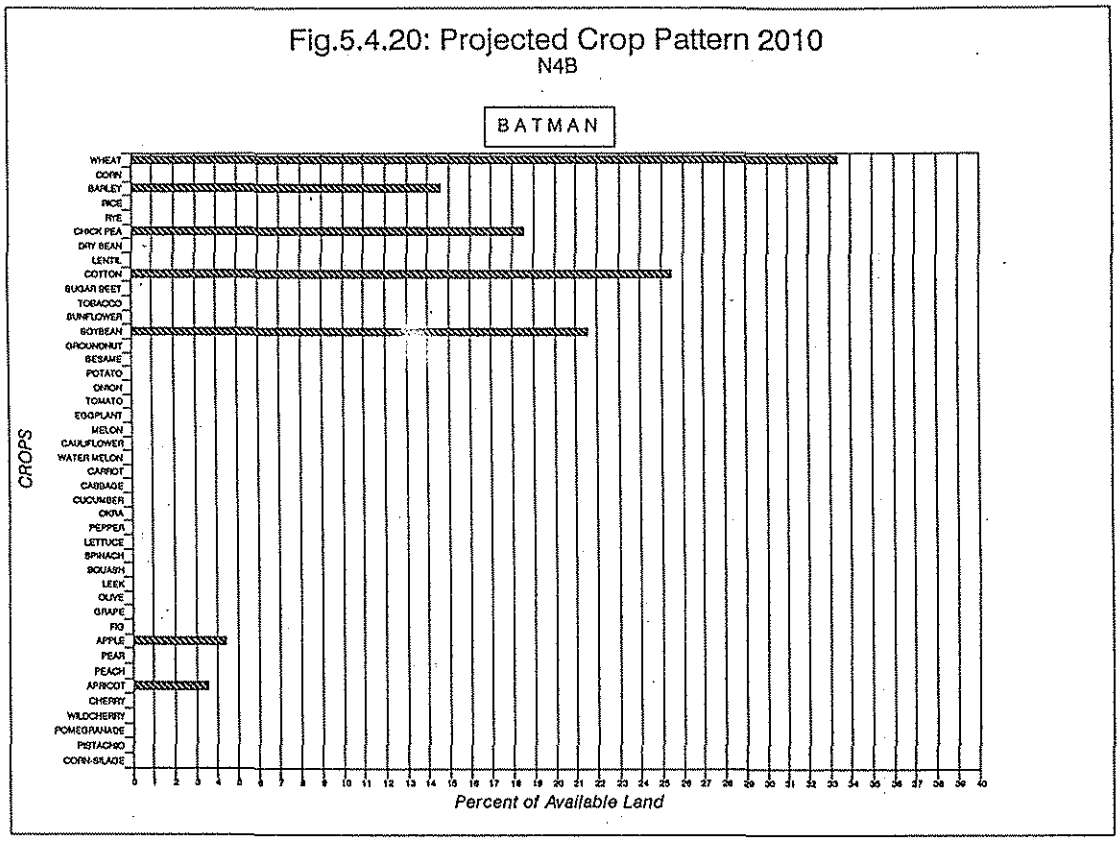


Fig.5.4.20: Projected Crop Pattern 2010
N4B
BATMAN
CROPS
WHEAT
CORN
BARLEY
RICE
RYE
CHICK PEA
DRY BEAN
LENTIL
COTTON
SUGAR BEET
TOBACCO
SUNFLOWER
SOYBEAN
GROUNDNUT
SESAME
POTATO
ONION
TOMATO
EGGPLANT
MELON
CAULIFLOWER
WATER MELON
CARROT
CABBAGE
CUCUMBER
OKRA
PEPPER
LETTUCE
SPINACH
SQUASH
LEEK
OLIVE
GRAPE
FIG
APPLE
PEAR
PEACH
APRICOT
CHERRY
WILDCHERRY
POMEGRANADE
PISTACHIO
CORN-SILAGE
Percent of Available Land

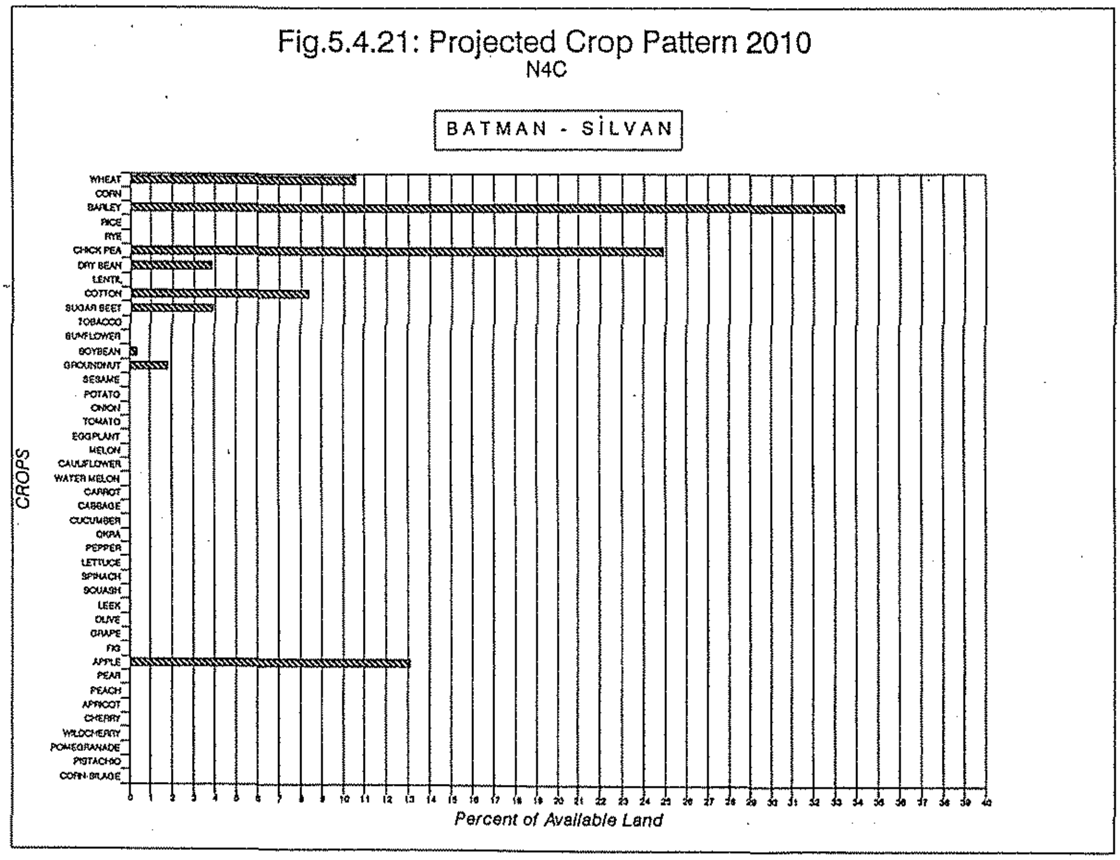


Fig.5.4.21: Projected Crop Pattern 2010
N4C
BATMAN - SİLVAN
CROPS
WHEAT
CORN
BARLEY
RICE
RYE
CHICK PEA
DRY BEAN
LENTIL
COTTON
SUGAR BEET
TOBACCO
SUNFLOWER
SOYBEAN
GROUNDNUT
SESAME
POTATO
ONION
TOMATO
EGGPLANT
MELON
CAULIFLOWER
WATER MELON
CARROT
CABBAGE
CUCUMBER
OKRA
PEPPER
LETTUCE
SPINACH
SQUASH
LEEK
OLIVE
GRAPE
FIG
APPLE
PEAR
PEACH
APRICOT
CHERRY
WILDCHERRY
POMEGRANADE
PISTACHIO
CORN-SILAGE
Percent of Available Land

Fig.5.4.22: Projected Crop Pattern 2010
S05

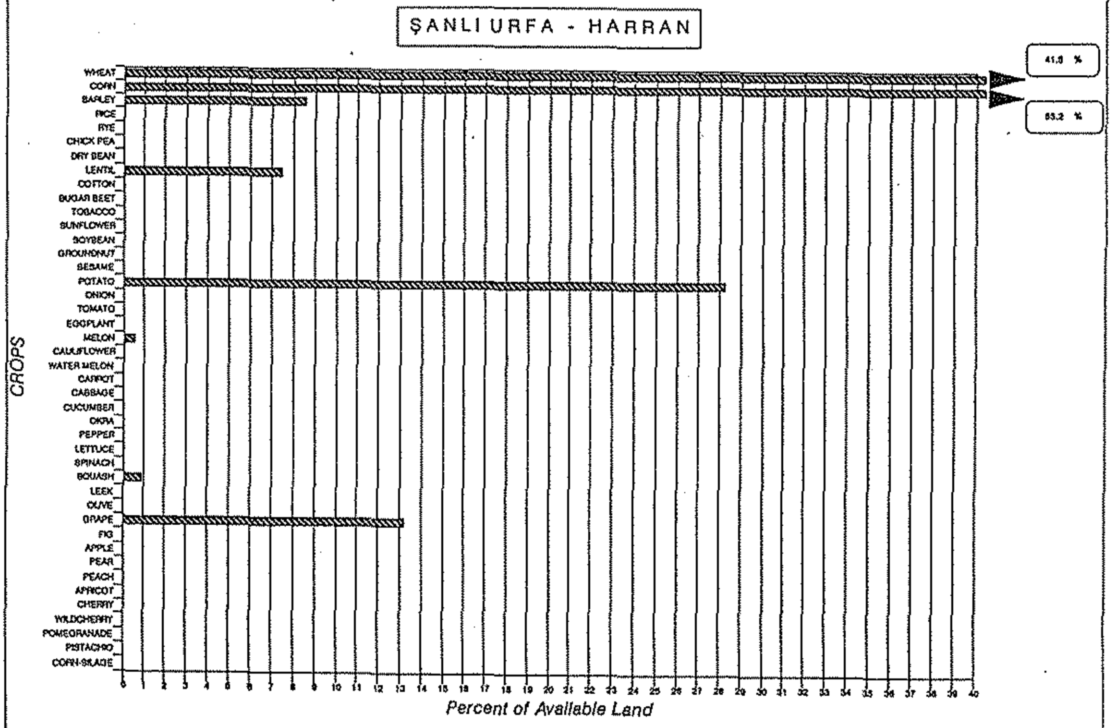


Fig.5.4.23: Projected Crop Pattern 2010
S06

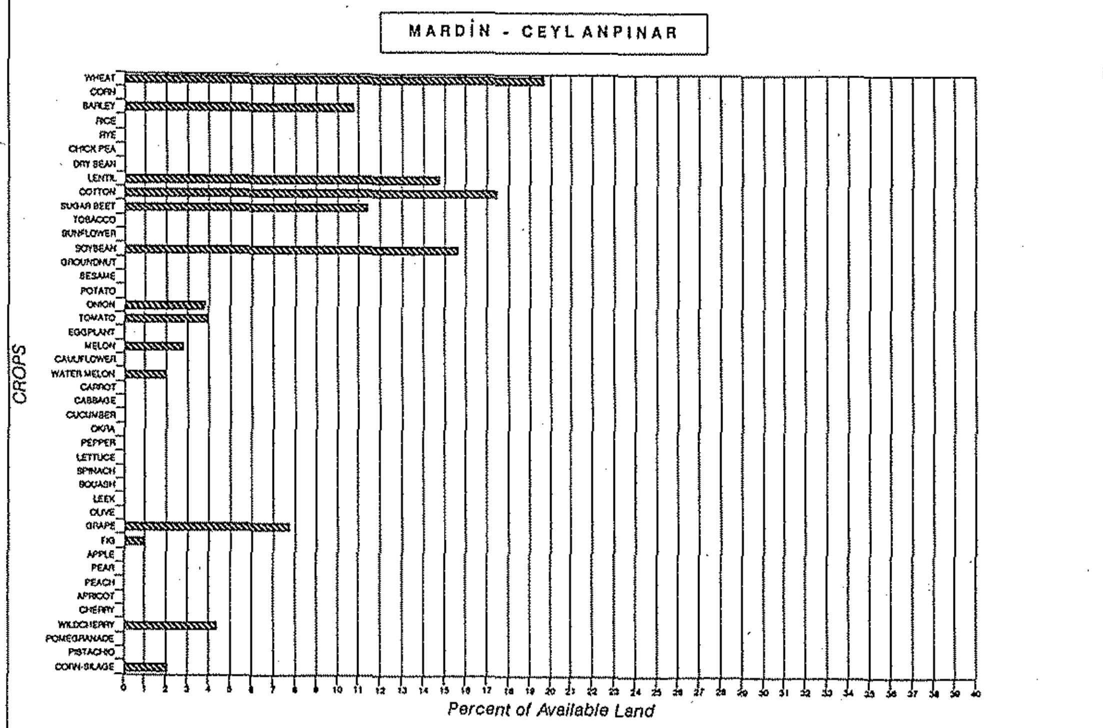


Fig.5.4.24: Projected Crop Pattern 2010
S07

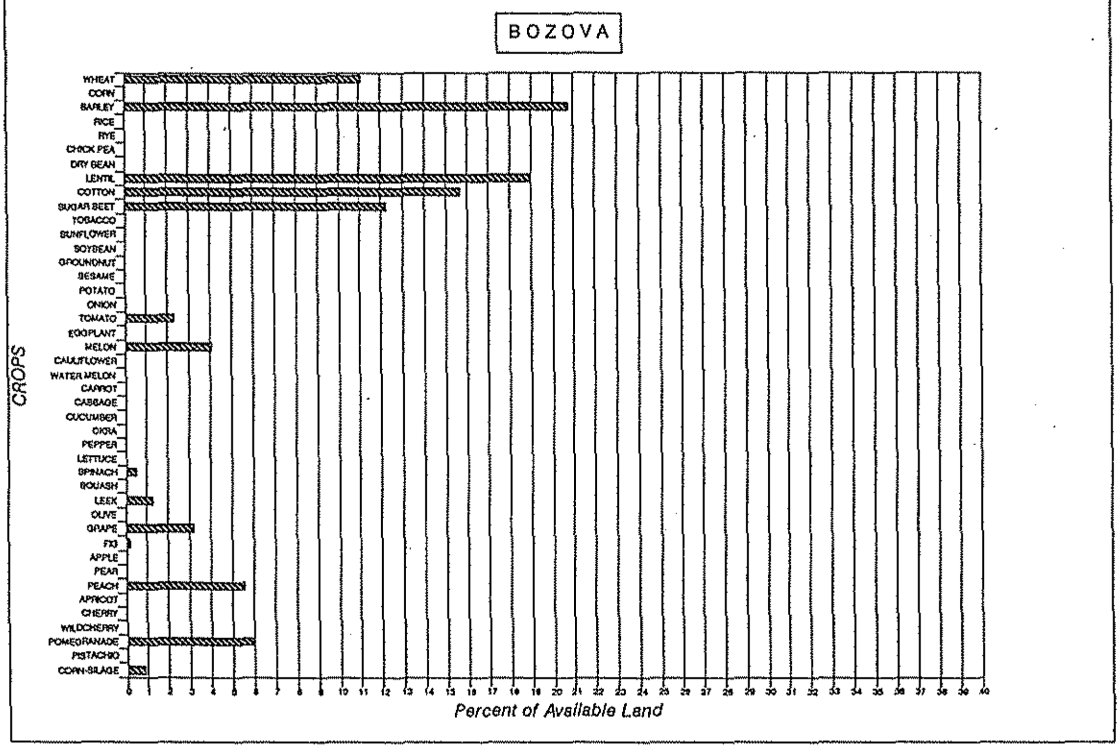


Fig.5.4.25: Projected Crop Pattern 2010
S08

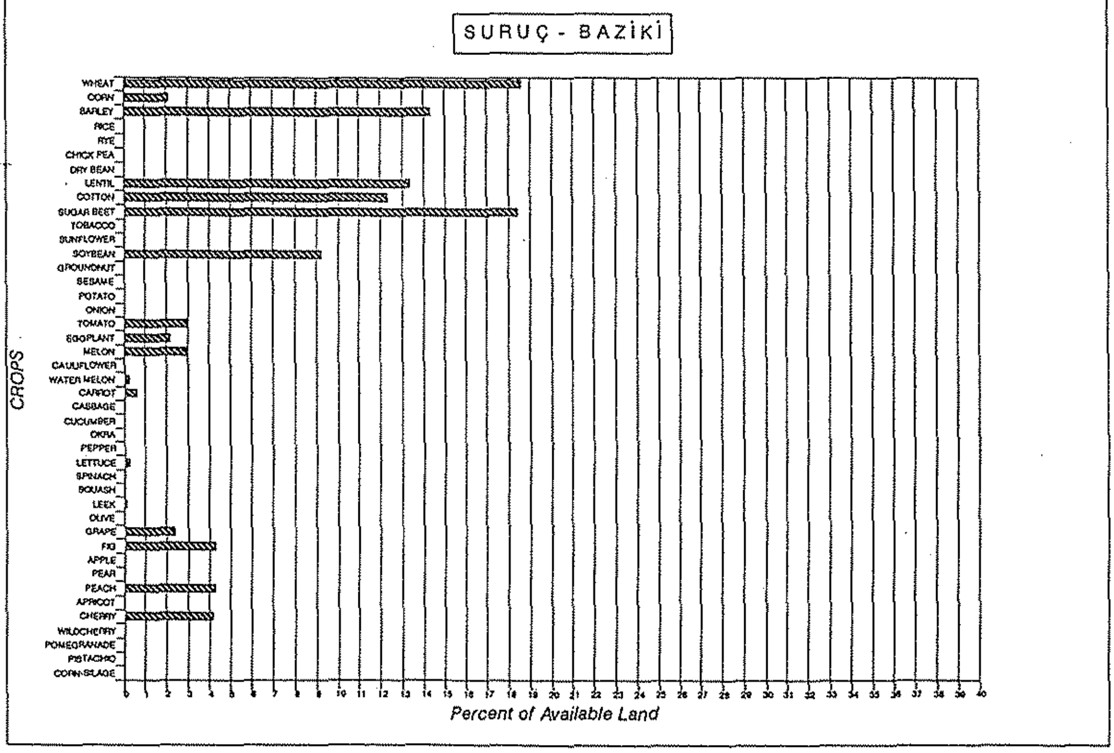


Fig.5.4.26: Projected Crop Pattern 2010
S09

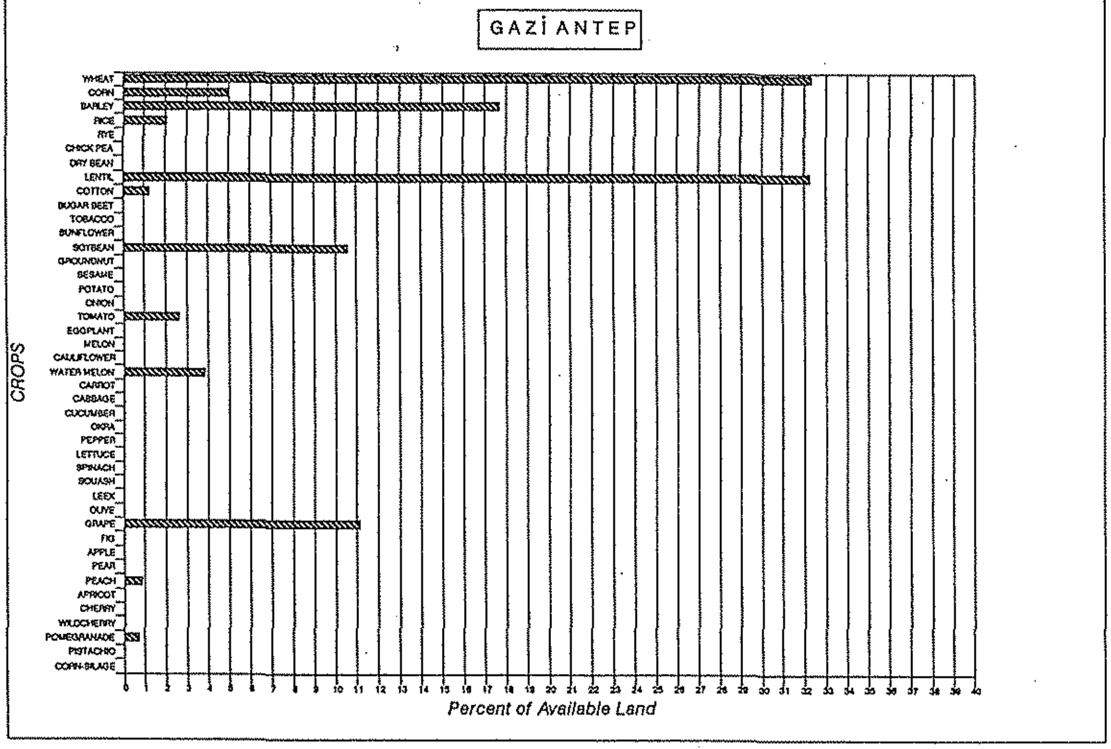
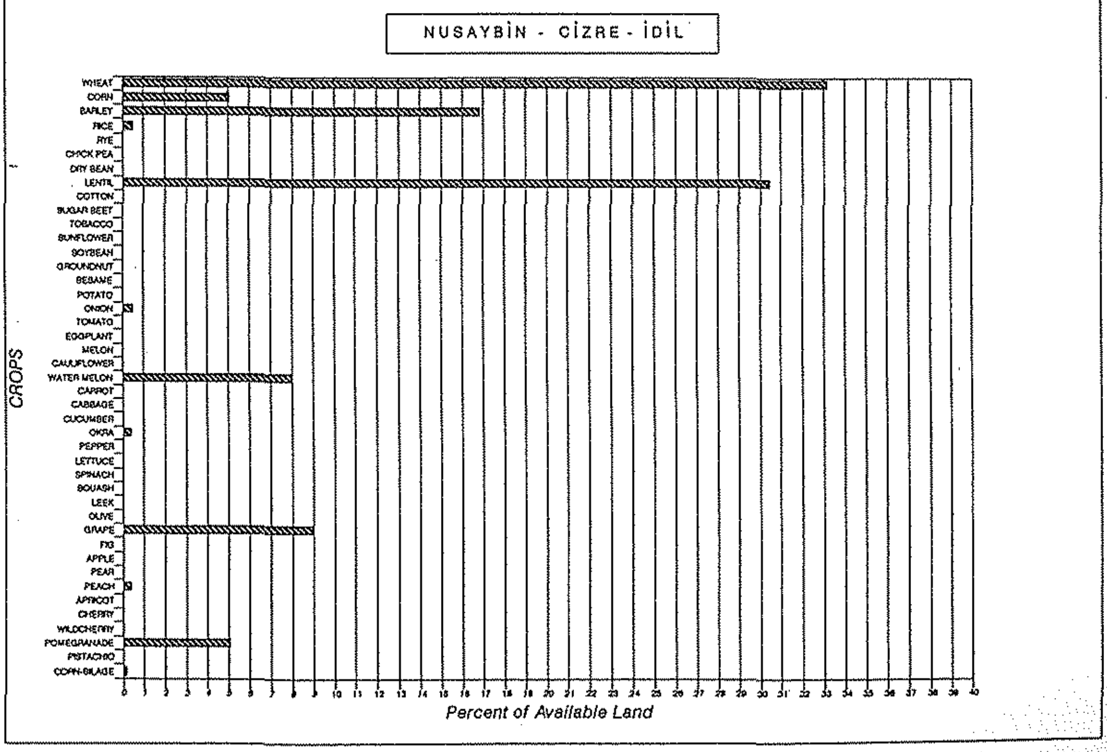


Fig.5.4.27: Projected Crop Pattern 2010
S10



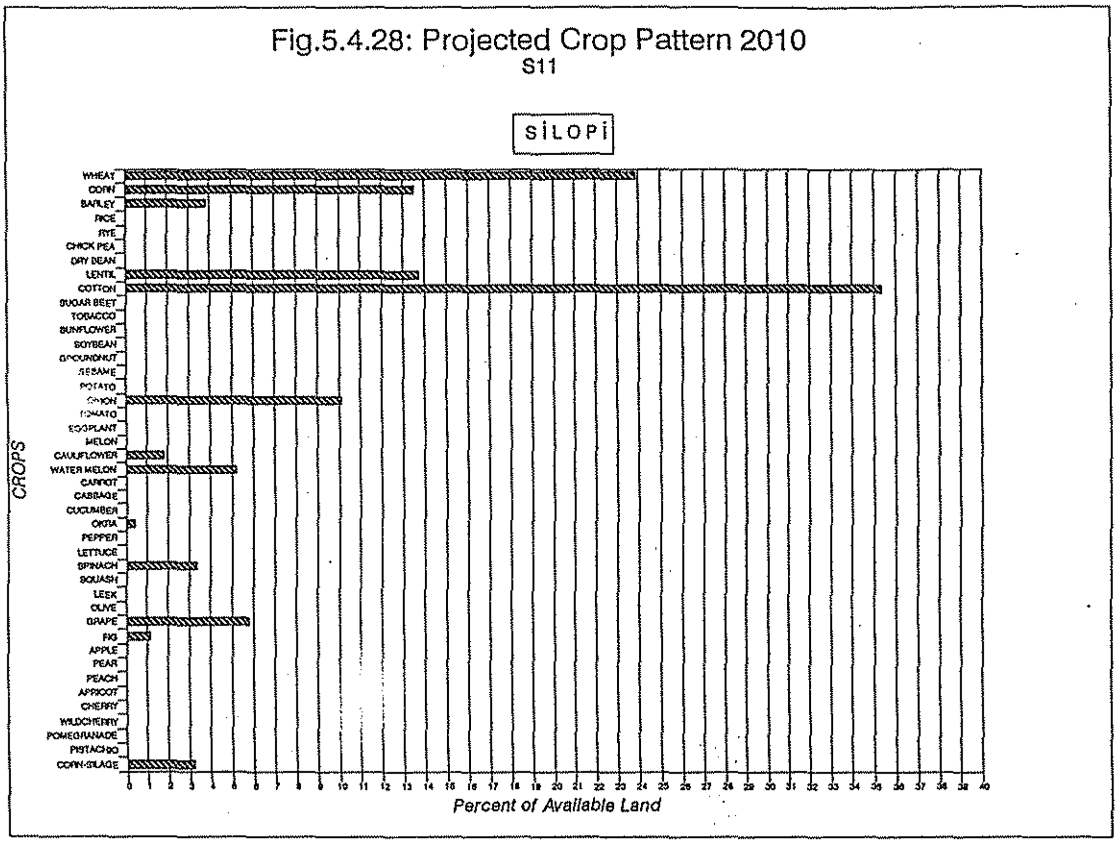


Fig.5.4.28: Projected Crop Pattern 2010
S11
SİLOPİ
CROPS
Percent of Available Land

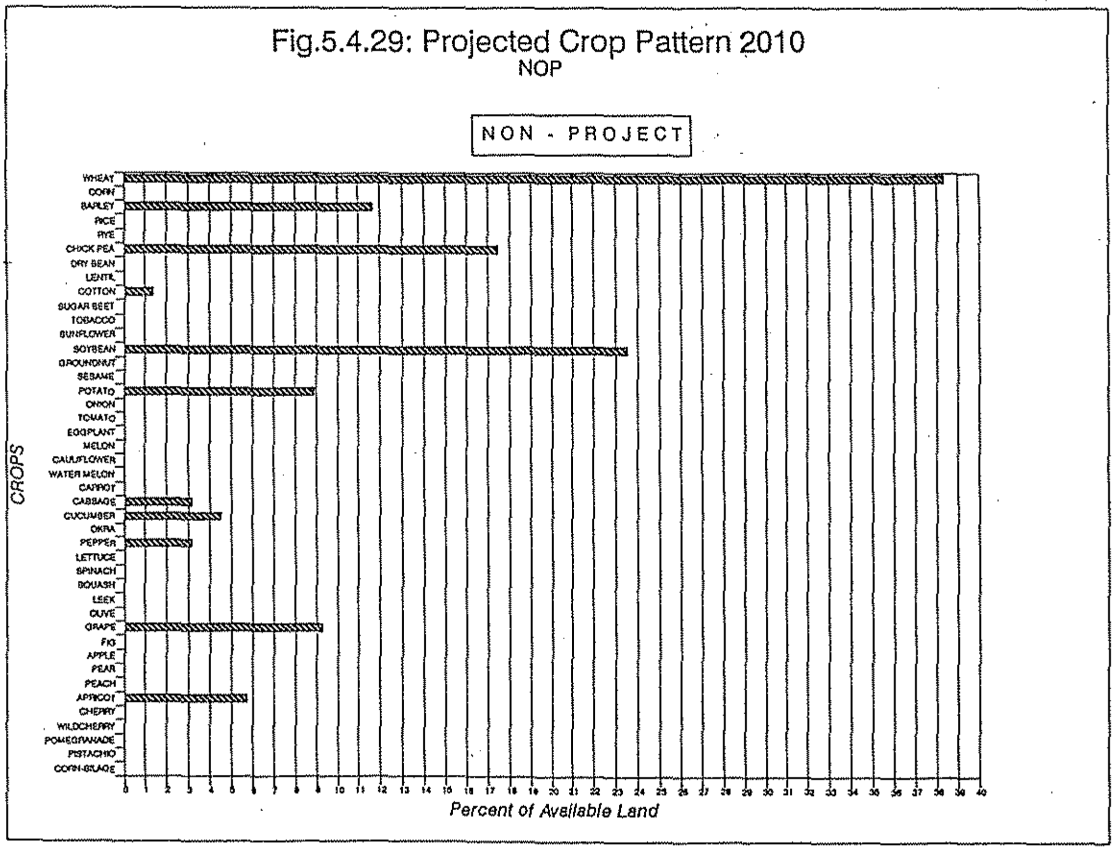


Fig.5.4.29: Projected Crop Pattern 2010
NOP
NON - PROJECT
CROPS
Percent of Available Land

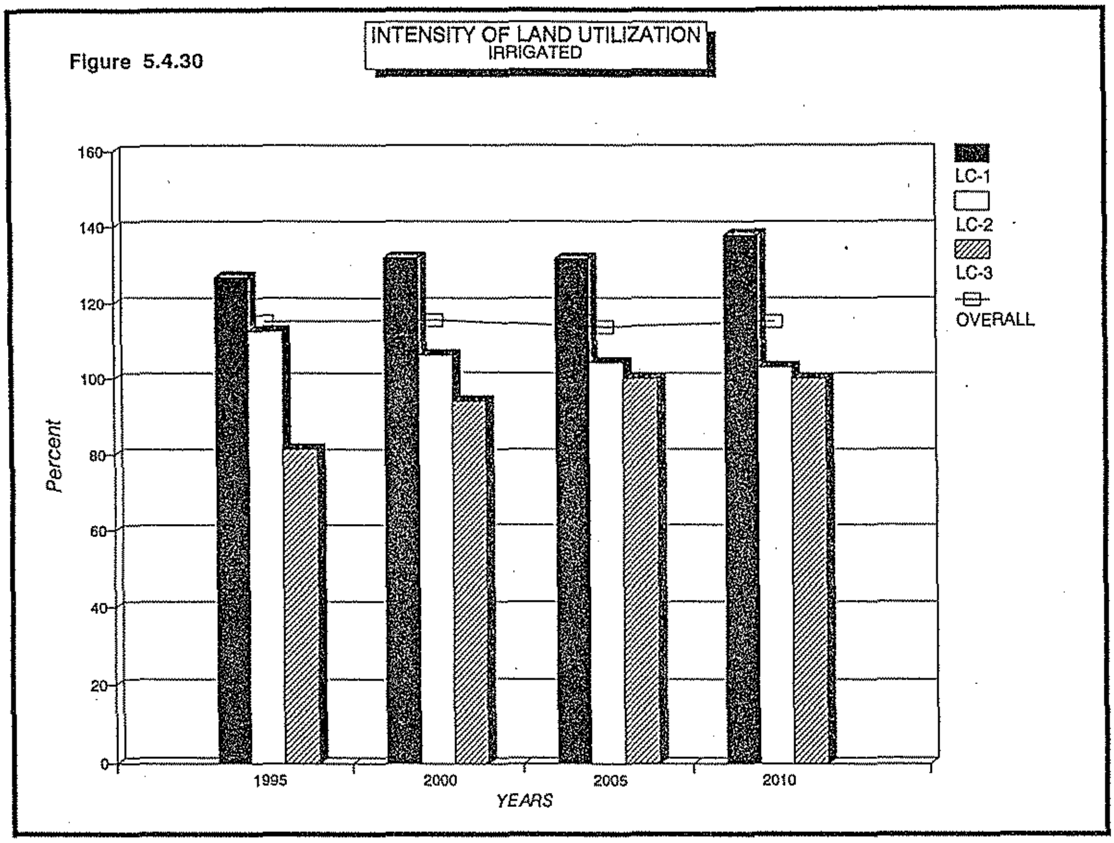


Figure 5.4.30
INTENSITY OF LAND UTILIZATION
IRRIGATED
160
140
120
100
80
60
40
20
0
Percent
1995
2000
2005
2010
YEARS
LC-1
LC-2
LC-3
OVERALL

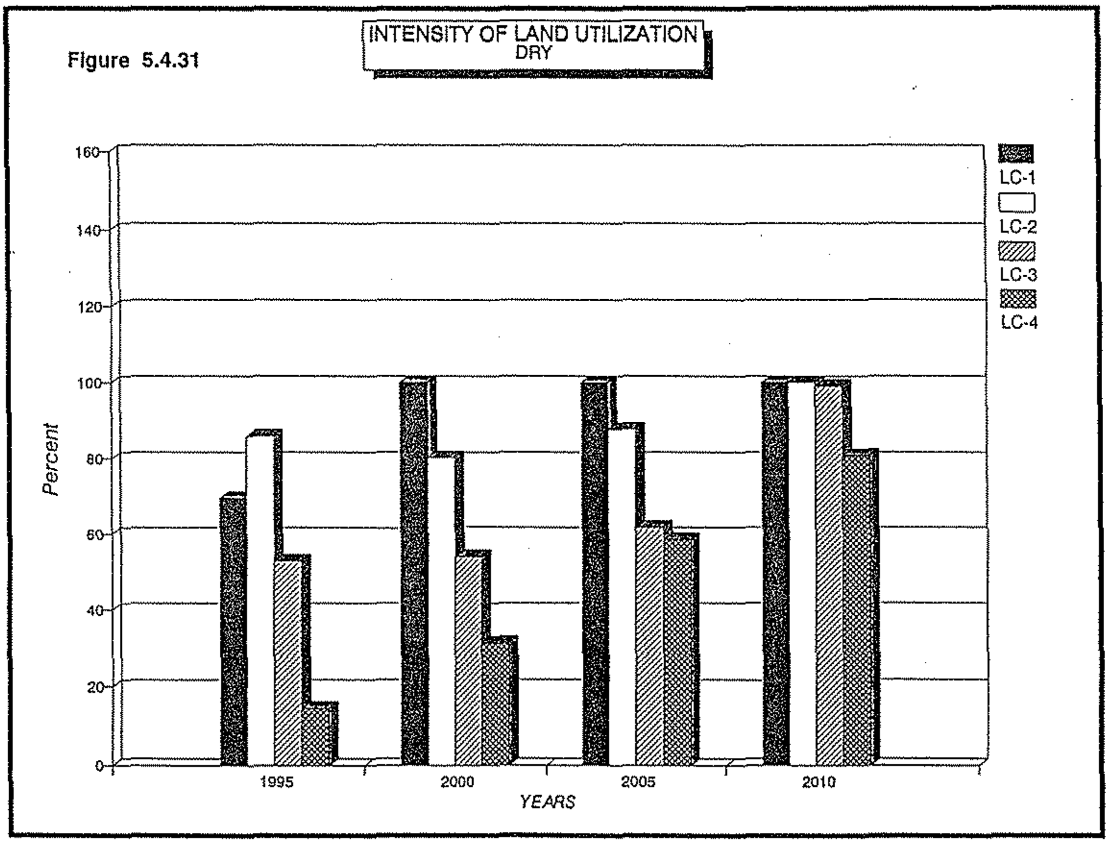


Figure 5.4.31
INTENSITY OF LAND UTILIZATION
DRY
160
140
120
100
80
60
40
20
0
Percent
1995
2000
2005
2010
YEARS
LC-1
LC-2
LC-3
LC-4

Fig.5.4.32: Projected Crop Pattern 2005
TOTAL GAP REGION

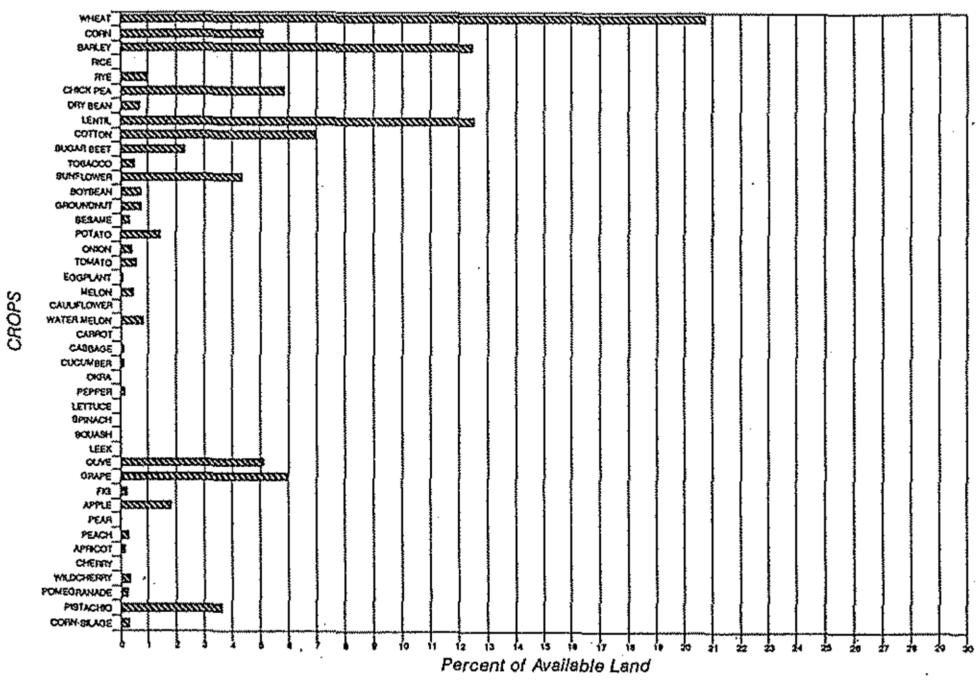


Fig.5.4.33: Projected Crop Pattern 2005
TOTAL GAP REGION

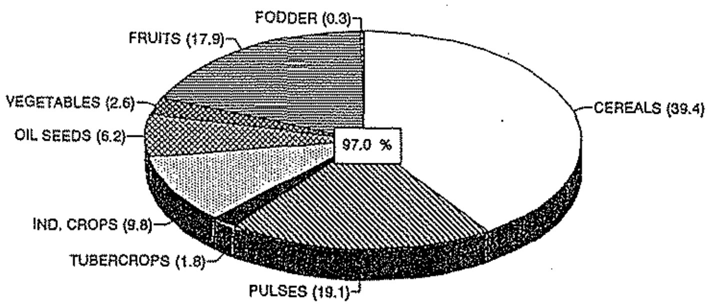


Fig.5.4.34: Projected Crop Pattern 2005
IRRIGATED GAP REGION

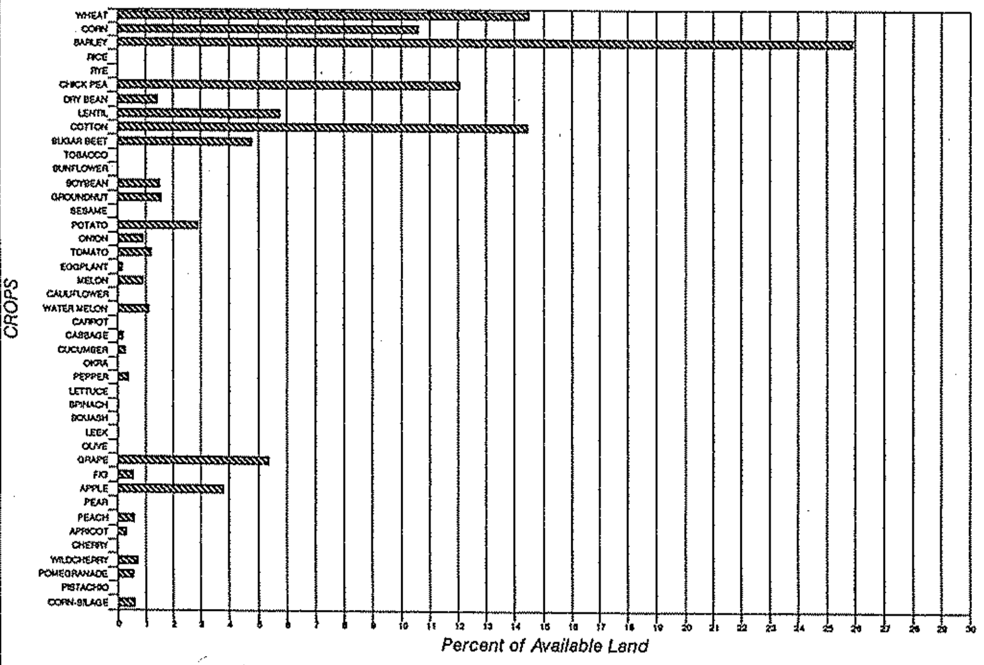


Fig.5.4.35: Projected Crop Pattern 2005
IRRIGATED GAP REGION

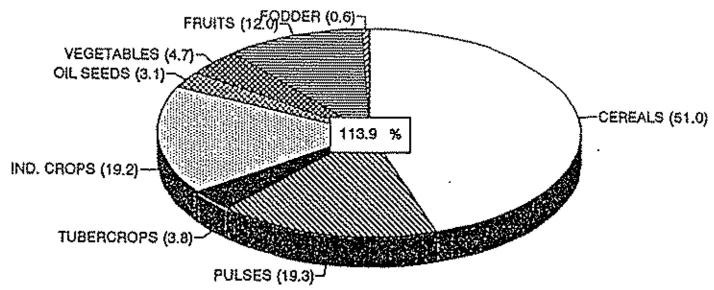


Fig.5.4.36: Projected Crop Pattern 2005
DRY GAP REGION

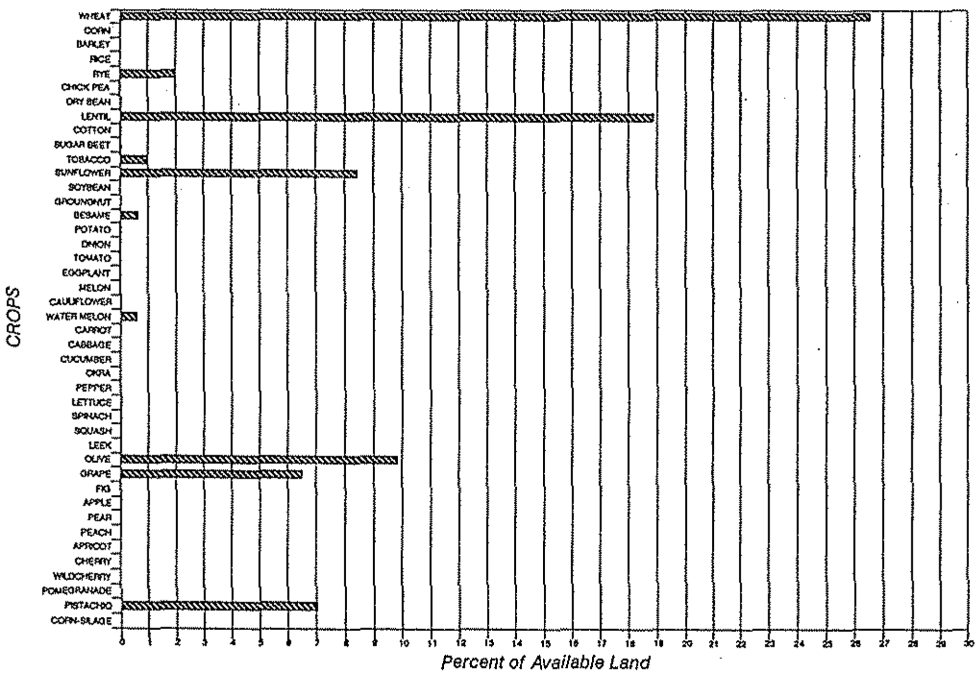


Fig.5.4.37: Projected Crop Pattern 2005
DRY GAP REGION

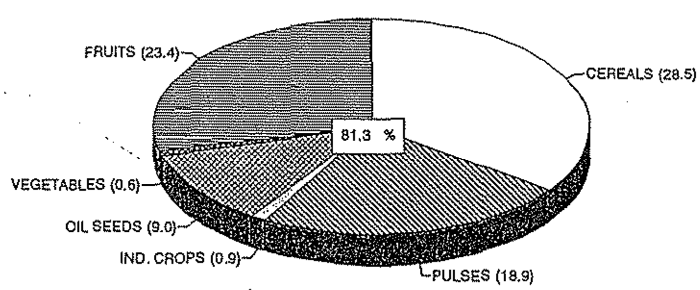


Fig.5.4.38: Projected Crop Pattern 2000
TOTAL GAP REGION

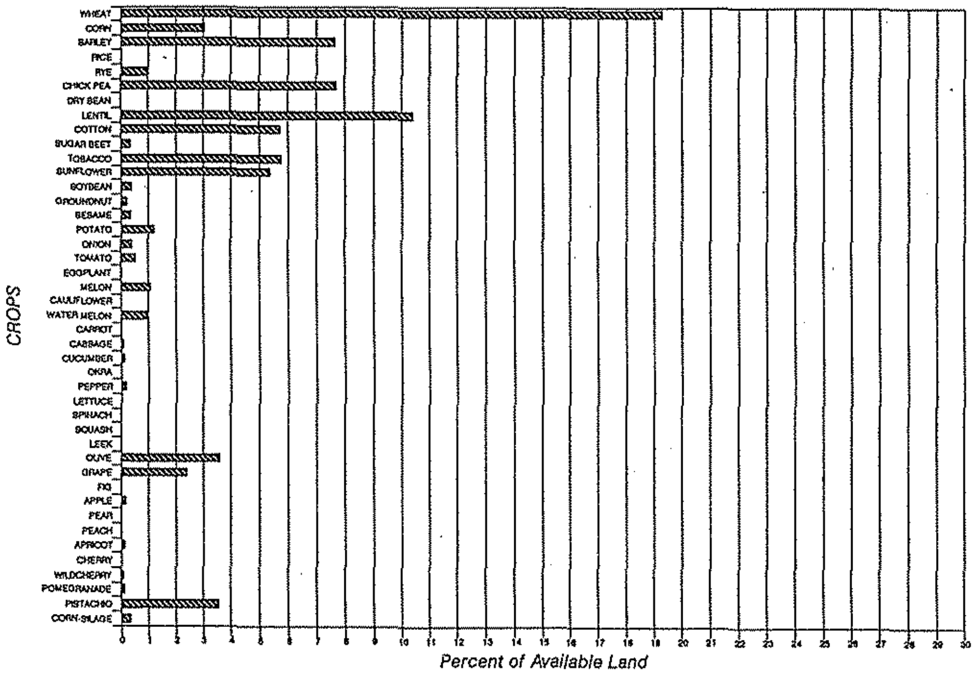


Fig.5.4.39: Projected Crop Pattern 2000
TOTAL GAP REGION

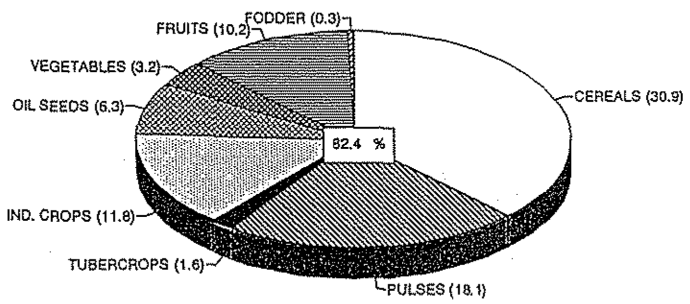


Fig.5.4.40: Projected Crop Pattern 2000
IRRIGATED GAP REGION

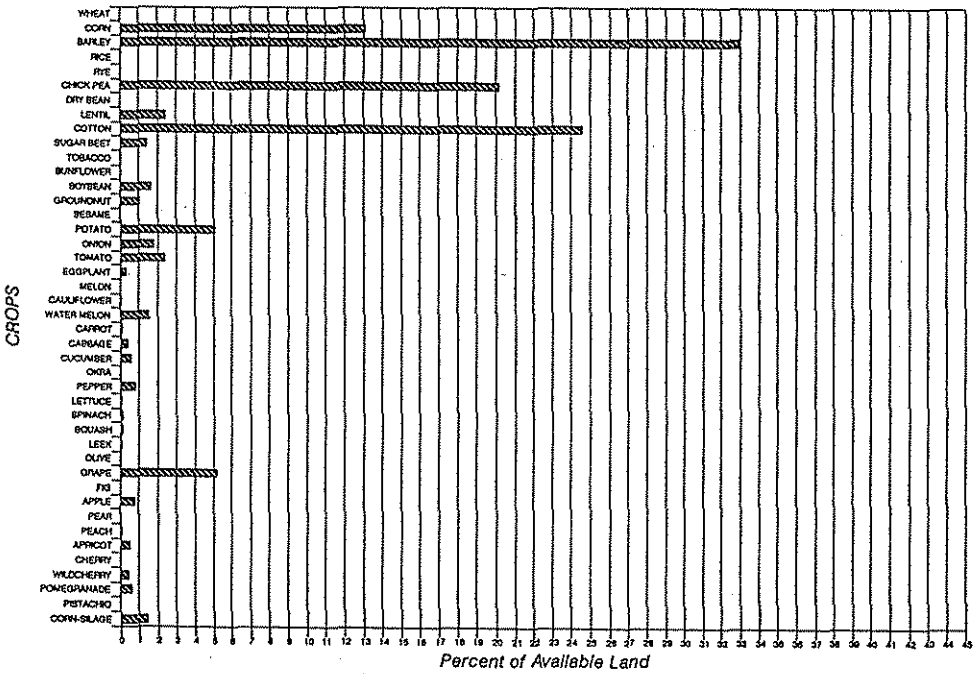


Fig.5.4.41: Projected Crop Pattern 2000
IRRIGATED GAP REGION

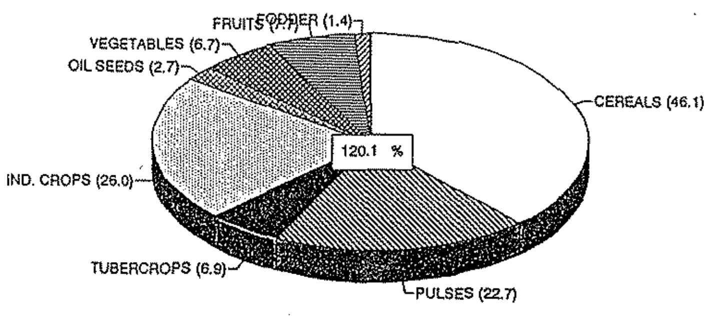


Fig.5.4.42: Projected Crop Pattern 2000
DRY GAP REGION

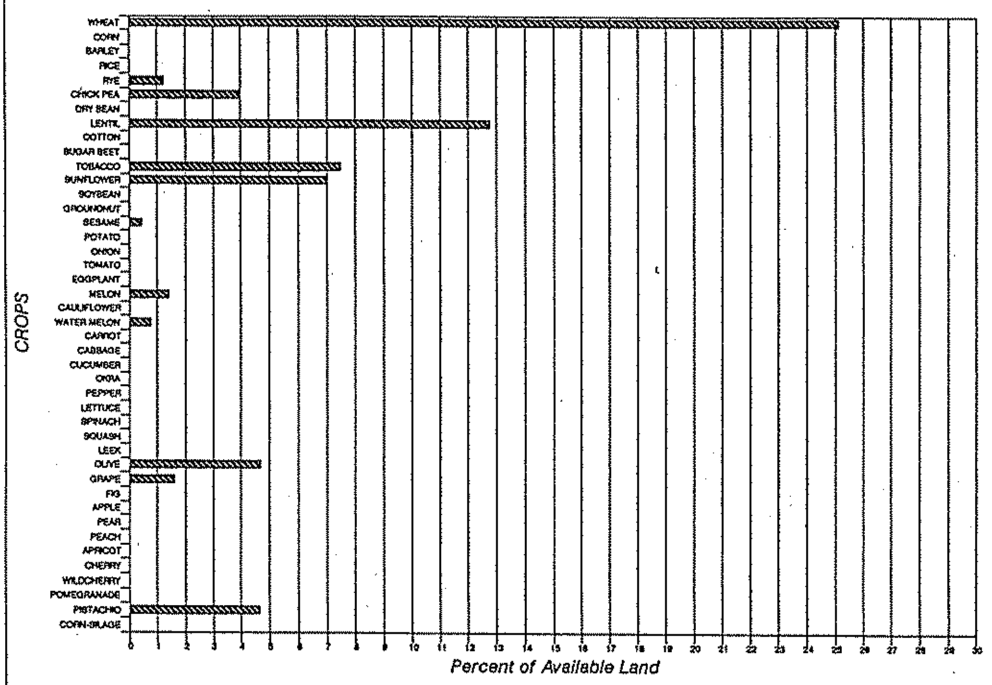


Fig.5.4.43: Projected Crop Pattern 2000
DRY GAP REGION

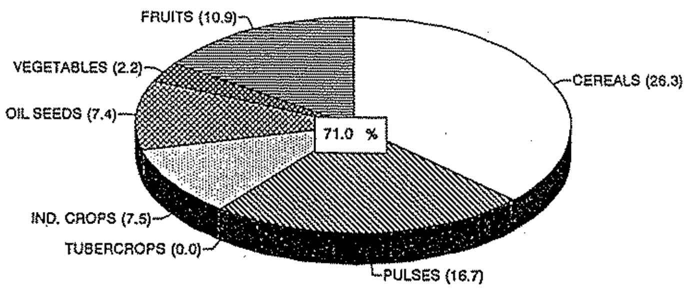


Fig.5.4.46: Projected Crop Pattern 1995
IRRIGATED GAP REGION

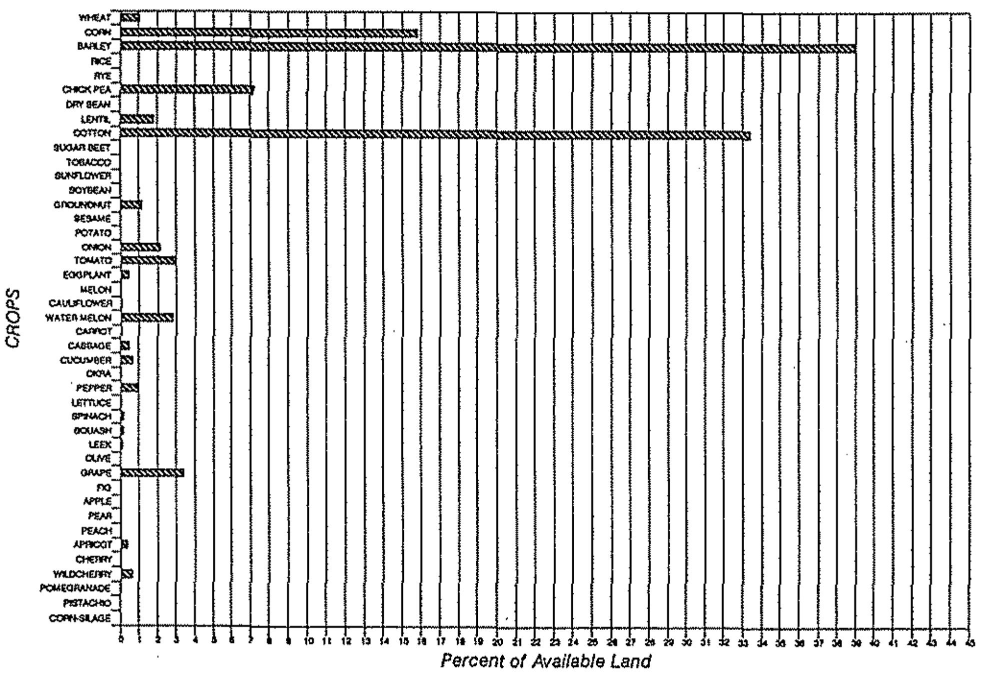


Fig.5.4.47: Projected Crop Pattern 1995
IRRIGATED GAP REGION

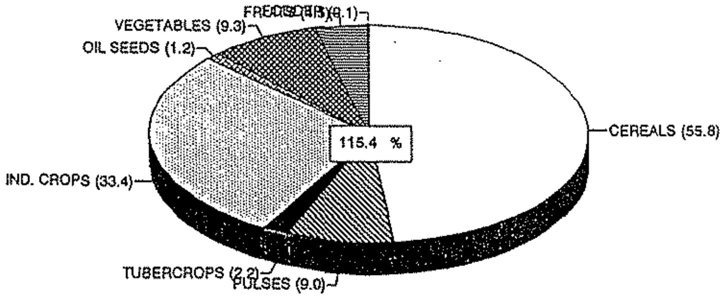


Fig.5.4.44: Projected Crop Pattern 1995
TOTAL GAP REGION

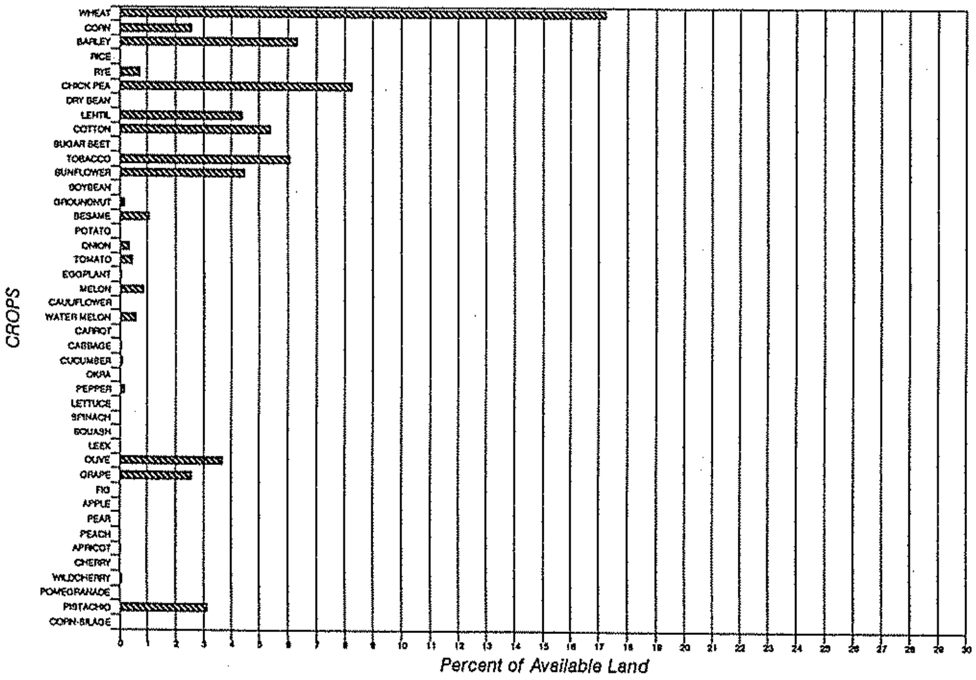


Fig.5.4.45: Projected Crop Pattern 1995
TOTAL GAP REGION

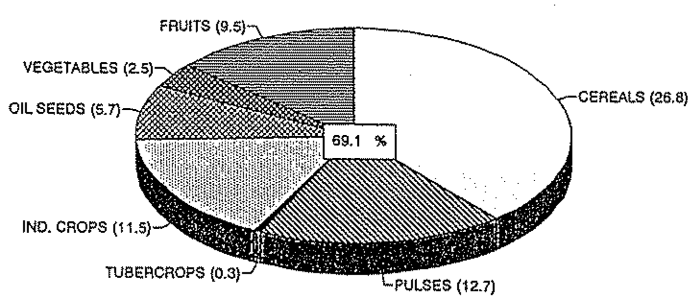


Fig.5.4.48: Projected Crop Pattern 1995
DRY GAP REGION

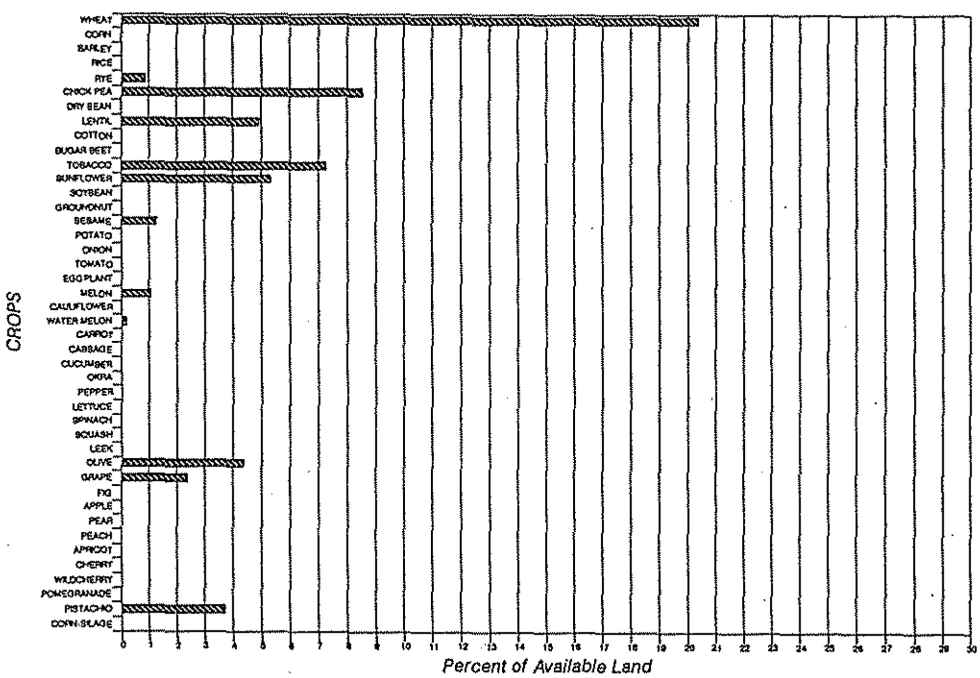


Fig.5.4.49: Projected Crop Pattern 1995
DRY GAP REGION

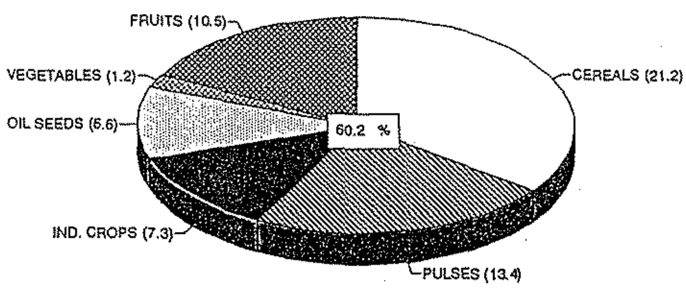


TABLE 5.4.17: Distribution of Crops for the Project Regions and Rainfed Agriculture in GAP- 2005 (%)

	Siverek Hilvan	Adiyaman Kahta	Adiyaman Goksu Araban	Dicle	Garzan	Batman	Batman Silvan	Urfa Harran	Mardin Ceylan-pinar	Bozova	Suruc Baziki	Gaziantep	Nusaybin Cizre Idil	Silopi	Non-Project Region	Total All Projects	Total Rainfed Zones	Overall Total
CEREALS	*42.6*	*48.3*	*50.0*	*33.9*	*43.9*	*33.4*	*43.5*	*94.0*	*54.7*	*37.0*	*48.5*	*38.7*	*49.5*	*43.6*	*50.0*	*51.0*	*28.5*	*39.4*
WHEAT		16.3	20.3	22.5	10.7	18.8	10.2	26.9	16.4	1.8	13.2			4.0	43.5	14.5	26.6	20.8
CORN								45.6	17.7	3.8	13.8		2.3	15.3		10.6		5.1
BARLEY	42.6	32.1	29.7	11.4	33.2	14.6	33.3	21.5	20.6	31.4	21.5	38.7	47.1	24.2	6.5	25.9		12.5
RICE																		
RYE																	1.9	1.0
PULSES	*18.4*	*31.6*	*25.6*	*16.1*	*30.7*	*18.5*	*29.0*	*6.6*	*13.2*	*21.7*	*14.7*	*26.0*	*28.7*	*15.1*	*13.4*	*19.3*	*18.9*	*19.1*
CHICK PEA	18.4	22.4	20.6	8.0	30.7	18.5	29.0		4.9	13.8	9.7	11.0	5.8	3.8	13.4	12.1		5.8
DRY BEAN		9.1	4.8	8.1												1.5		0.7
LENTIL								6.6	8.3	7.9	5.0	15.0	23.0	11.2		5.8	18.9	12.6
INDUSTRIAL CROPS	*14.1*	*4.9*	*2.7*	*30.1*	*11.4*	*31.1*	*12.8*		*31.7*	*19.1*	*36.2*	*18.9*	*2.2*	*34.9*		*19.2*	*0.9*	*9.9*
COTTON	9.9	4.9	2.7	26.0	8.0	31.1	8.6		25.0	19.1	17.4	11.5		34.9		14.5		7.0
SUGAR BEET	4.2			4.1	3.4		4.2		6.6		18.8	7.4	2.2			4.8		2.3
TOBACCO																	0.9	0.5
OIL SEEDS	*11.4*	*2.9*	*18.4*	*8.7*		*7.0*	*1.4*		*0.1*	*2.2*	*1.6*	*4.8*			*17.7*	*3.1*	*9.0*	*6.2*
SUNFLOWER																	8.4	4.4
SOYBEAN		2.1	13.4	3.7		7.0									17.7	1.5		0.7
GROUNDNUT	11.4	0.8	5.0	5.1			1.4		0.1	2.2	1.6	4.8				1.6		0.8
SESAME																	0.6	0.3
TUBER CROPS				*3.2*		*9.0*		*23.7*	*1.3*				*1.9*	*10.0*	*18.8*	*3.8*		*1.8*
POTATO				2.5				23.7							18.6	2.9		1.4
ONION				0.7		9.0			1.3				1.9	10.0	0.2	0.9		0.4
VEGETABLES	*1.0*	*0.5*	*1.7*	*4.7*	*0.8*		*0.3*	*11.2*	*6.4*	*3.6*	*2.8*	*2.8*	*9.7*	*13.8*	*3.9*	*4.7*	*0.6*	*2.6*
TOMATO									3.9	2.3	0.5	2.8	0.4			1.2		0.6
EGGPLANT											1.7		0.4			0.2		0.1
MELON								8.8								0.9		0.4
CAULIFLOWER									0.1									
WATER MELON									2.4				8.0	5.3		1.1	0.6	0.8
CARROT											0.5							
CABBAGE				2.2												0.2		0.1
CUCUMBER								2.3							3.9	0.3		0.1
OKRA													0.4	0.3				
PEPPER	1.0	0.5	1.7	2.5	0.8		0.3									0.4		0.2
LETTUCE														2.2				
SPINACH											0.2			3.3		0.1		
SQUASH													0.4	2.8		0.1		
LEEK										1.3						0.1		
FRUITS AND NUTS	*12.8*	*13.9*	*15.0*	*9.1*	*13.2*	*8.0*	*13.0*	*13.2*	*11.2*	*12.2*	*11.4*	*12.4*	*14.4*	*5.9*	*15.0*	*12.0*	*23.4*	*17.9*
OLIVE																	9.9	5.1
GRAPE			12.6					13.2	7.1	3.2	2.3	11.8	9.0	5.9	5.7	5.4	6.5	6.0
FIG									0.9		4.2					0.6		0.3
APPLE	7.8	13.9		9.1	13.2	4.4	13.0									3.8		1.8
PEAR																		
PEACH										3.0	4.6	0.8	0.4			0.6		0.3
APRICOT	5.0		2.4			3.5									9.3	0.4		0.2
CHERRY											0.3							
WILDCHERRY									3.3							0.7		0.4
POMEGRANADE										6.0			5.0			0.6		0.3
PISTACHIO																	7.0	3.6
FEED CROPS									*0.4*	*10.9*			*0.2*	*0.3*		*0.6*		*0.3*
CORN-SILAGE									0.4	10.9			0.2	0.3		0.6		0.3
TOTAL	*100.2*	*102.1*	*113.4*	*105.9*	*100.0*	*107.0*	*100.0*	*148.5*	*119.2*	*106.8*	*115.1*	*103.6*	*106.6*	*123.7*	*118.8*	*113.9*	*81.3*	*97.0*

TABLE 5.4.18: Distribution of Crops for the Project Regions and Rainfed Agriculture in GAP- 2000 (%)

	Siverek Hilvan	Adiyaman Kahta	Adiyaman Goksu Araban	Dicle	Garzan	Batman	Batman Silvan	Urfa Harran	Mardin Ceylan-pinar	Bozova	Suruc Bazlki	Gaziantep	Nusaybin Cizre Idil	Silopi	Non-Project Region	Total All Projects	Total Rainfed Zones	Overall Total
CEREALS	*29.3*	*32.1*	*40.4*	*16.9*	*47.6*	*30.3*	*31.4*	*61.0*	*98.0*	*40.0*	*109.9*	*51.3*	*101.2*	*70.9*	*37.8*	*46.1*	*26.3*	*30.9*
WHEAT																	25.1	19.3
CORN								23.8	48.0	7.6	59.9	12.7	51.2	34.5		13.1		3.0
BARLEY	29.3	32.1	40.4	16.9	47.6	30.3	31.4	37.2	50.0	32.4	50.0	38.5	50.0	36.4	37.8	33.0		7.6
RICE																		
RYE																	1.2	0.9
PULSES	*26.2*	*25.1*	*22.4*	*32.6*	*24.8*	*27.8*	*46.0*	*24.8*		*14.4*	*3.5*	*12.8*	*12.8*		*13.4*	*22.7*	*16.7*	*18.1*
CHICK PEA	26.2	25.1	22.4	32.6	24.8	27.8	46.0	23.8							13.4	20.2	4.0	7.7
DRY BEAN																		
LENTIL								1.0		14.4	3.5	12.8	12.8			2.5	12.8	10.4
INDUSTRIAL CROPS		*26.8*	*20.8*	*44.4*	*27.6*	*34.1*	*16.4*	*22.7*		*24.6*		*24.5*	*7.6*	*40.3*	*19.4*	*26.0*	*7.5*	*11.8*
COTTON		23.7	20.8	40.1	27.6	34.1	16.4	22.7		24.6		24.5	2.1	40.3	19.4	24.6		5.7
SUGAR BEET		3.1		4.3									5.5			1.4		0.3
TOBACCO																	7.5	5.7
OIL SEEDS	*34.6*	*8.6*		*2.2*	*39.3*	*11.8*										*2.7*	*7.4*	*6.3*
SUNFLOWER																	7.0	5.4
SOYBEAN	31.5			2.2	39.3	11.8										1.6		0.4
GROUNDNUT	3.0	8.6														1.0		0.2
SESAME																	0.5	0.3
TUBER CROPS	*4.2*			*2.2*				*14.9*	*15.4*	*6.2*	*21.6*				*14.4*	*6.9*		*1.6*
POTATO	4.2			2.2				14.9		6.2					14.4	5.1		1.2
ONION									15.4		21.6					1.8		0.4
VEGETABLES	*1.0*	*0.5*	*2.0*	*6.3*		*5.5*	*6.1*	*5.0*	*15.7*	*5.9*	*36.5*	*6.9*	*7.1*	*3.8*		*6.7*	*2.2*	*3.2*
TOMATO								5.0	5.0	3.8	6.2	4.6	5.0	3.8		2.4		0.5
EGGPLANT											5.9		1.0			0.3		0.1
MELON																	1.4	1.1
CAULIFLOWER									1.7							0.1		
WATER MELON									9.1		21.6					1.5	0.8	1.0
CARROT										1.0						0.1		
CABBAGE				1.9												0.4		0.1
CUCUMBER	1.0			1.4		2.9	6.1									0.6		0.1
OKRA										0.6						0.1		
PEPPER		0.5	2.0	2.5		1.3										0.8		0.2
LETTUCE						1.3										0.1		
SPINACH										0.6		2.3	1.0			0.2		
SQUASH											2.8					0.2		
LEEK				0.5												0.1		
FRUITS AND NUTS	*5.0*	*7.0*	*13.0*			*3.5*		*13.2*	*15.0*	*9.4*	*0.2*	*12.1*	*12.4*	*13.4*	*15.0*	*7.7*	*10.9*	*10.2*
OLIVE																	4.7	3.6
GRAPE			13.0					13.2	1.6	3.2	0.2	9.4	10.1	13.4	5.7	5.2	1.6	2.4
FIG									1.3							0.1		
APPLE		7.0														0.8		0.2
PEAR																		
PEACH												2.7				0.1		
APRICOT	5.0					3.5									9.3	0.5		0.1
CHERRY																		
WILDCHERRY									12.1							0.5		0.1
POMEGRANADE										6.2			2.3			0.6		0.1
PISTACHIO																	4.6	3.6
FEED CROPS									*3.3*	*7.5*		*9.1*	*13.3*	*5.8*		*1.4*		*0.3*
CORN-SILAGE									3.3	7.5		9.1	13.3	5.8		1.4		0.3
TOTAL	*100.2*	*100.0*	*98.6*	*104.6*	*139.3*	*113.1*	*100.0*	*141.6*	*147.5*	*108.1*	*171.7*	*116.7*	*154.3*	*134.2*	*100.1*	*120.1*	*71.0*	*82.4*

TABLE 5.4.19: Distribution of Crops for the Project Regions and Rainfed Agriculture in GAP- 1995 (%)

	Siverek Hilvan	Adiyaman Kahta	Adiyaman Goksu Araban	Dicle	Garzan	Batman	Batman Silvan	Urfa Harran	Mardin Ceylan-pinar	Bozova	Suruc Baziki	Gaziantep	Nusaybin Cizre Idil	Silopi	Non-Project Region	Total All Projects	Total Rainfed Zones	Overall Total
CEREALS	*26.4*	*29.7*	*45.0*	*42.8*	*37.7*	*33.8*	*49.9*	*53.9*	*70.1*	*65.3*	*105.8*	*85.2*	*96.2*	*70.6*	*40.1*	*55.8*	*21.2*	*26.8*
WHEAT												21.0				1.0	20.3	17.2
CORN				8.6		1.8		12.6	20.1	15.1	55.8	45.6	46.2	30.4		15.8		2.6
BARLEY	26.4	29.7	45.0	34.1	37.7	32.0	49.9	41.3	50.0	50.1	50.0	18.6	50.0	40.3	40.1	39.0		6.3
RICE																		
RYE																	0.9	0.7
PULSES	*19.2*	*11.2*	*0.4*	*18.2*	*7.5*	*14.7*	*25.6*	*1.0*	*1.7*	*15.3*	*1.7*	*9.2*	*23.0*	*1.9*	*11.3*	*9.0*	*13.4*	*12.7*
CHICK PEA	19.2	11.2	0.4	18.2	7.5	14.7	25.6							1.9	11.3	7.2	8.5	8.3
DRY BEAN																		
LENTIL								1.0	1.7	15.3	1.7	9.2	23.0			1.8	4.9	4.4
INDUSTRIAL CROPS	*31.5*	*30.9*	*26.7*	*44.2*	*51.4*	*30.7*	*24.1*	*38.5*	*23.9*	*24.1*	*4.5*	*19.6*	*14.4*	*46.6*	*40.8*	*33.4*	*7.3*	*11.5*
COTTON	31.5	30.9	26.7	44.2	51.4	30.7	24.1	38.5	23.9	24.1	4.5	19.6	14.4	46.6	40.8	33.4		5.4
SUGAR BEET																		
TOBACCO																	7.3	6.1
OIL SEEDS	*9.9*	*8.3*				*11.0*										*1.2*	*6.6*	*5.7*
SUNFLOWER																	5.3	4.5
SOYBEAN																		
GROUNDNUT	9.9	8.3				11.0										1.2		0.2
SESAME																	1.3	1.1
TUBER CROPS									*5.3*		*23.1*					*2.2*		*0.3*
POTATO																		
ONION									5.3		23.1					2.2		0.3
VEGETABLES	*1.8*	*7.8*	*3.3*	*5.4*		*11.7*		*8.1*	*8.7*	*14.0*	*32.8*	*9.0*	*14.7*			*9.3*	*1.2*	*2.5*
TOMATO								5.0	8.7	7.0	6.2	4.6	2.7			3.0		0.5
EGGPLANT											4.9		1.1			0.4		0.1
MELON																	1.1	0.9
CAULIFLOWER				0.3												0.1		
WATER MELON								3.1			19.0		9.8			2.8	0.2	0.6
CARROT				0.4							0.1					0.1		
CABBAGE	0.5	2.6		0.8		2.9										0.5		0.1
CUCUMBER	0.3	2.6		0.7		5.8										0.7		0.1
OKRA										3.5			0.7			0.1		
PEPPER	1.0	2.6	3.3	2.5		2.9										1.0		0.2
LETTUCE												2.1				0.1		
SPINACH										3.5	0.2	2.3	0.4			0.2		
SQUASH											2.4					0.2		
LEEK				0.5												0.1		
FRUITS AND NUTS	*5.0*		*10.7*			*3.6*		*6.7*	*13.7*	*6.6*	*0.2*	*9.4*	*12.4*	*13.4*		*4.5*	*10.5*	*9.5*
OLIVE																	4.4	3.7
GRAPE			10.7					6.7	1.6	6.5	0.2	9.4	10.1	13.4		3.4	2.4	2.5
FIG																		
APPLE																		
PEAR																		
PEACH																		
APRICOT	5.0					3.6										0.4		0.1
CHERRY																		
WILDCHERRY									12.1							0.7		0.1
POMEGRANADE										0.1			2.3			0.1		
PISTACHIO																	3.7	3.1
FEED CROPS													*0.7*	*6.1*		*0.1*		
CORN-SILAGE													0.7	6.1		0.1		
TOTAL	*93.8*	*87.9*	*86.1*	*110.5*	*96.6*	*105.5*	*99.6*	*108.2*	*123.3*	*125.3*	*168.1*	*132.4*	*161.3*	*138.7*	*92.2*	*115.4*	*60.2*	*69.1*

5.4.3.2 Land Values in GAP

The crop pattern for a project provides two types of valuable information related to projects and rainfed zones. First is the total and per hectare value of production which mainly interest the farmers. Second type of information is the value of land (on project and rainfed zone basis) at the margin. The latter information is crucial for the decision makers. It provides clues about the relative position of each land class in each project region. In addition, the weighted averages for each project provide information about the ranking of the projects. In other words, the decision maker should give priority to the irrigation projects which have higher values of land at the margin.

The total and per hectare values of production for each project and rainfed zone are presented in Table 5.4.20. Despite significant increase in the availability of irrigated land, revenue per hectare for irrigated areas in GAP increases by more than 25% from 1995 to 2010. A slight decrease is observed in 2005. This is principally due to the fact that most of the irrigation projects will be completed by the year 2005. Yet, it shows a significant increase in 2010. The ranking in terms of crop production value per hectare reveals that, generally, the projects in the South outscore the projects in the North GAP. Suruc-Baziki and Urfa-Harran projects are in the first and second rank respectively. This North-South differentiation is principally due to structure of land distribution according to land classes in the project regions. The projects in the South are relatively more endowed with the first class land than the projects in the North.

The projected shadow prices for land in the project regions and rainfed zones are presented in Table 5.4.21. and Figure 5.4.50. The shadow prices show the marginal values of land in terms of their contribution to producer and consumer welfare (objective function of the model). In terms of land classes, as expected, first land class scores better than the other land classes for all projects and rainfed zones. The shadow price of irrigated first class land is at least 30% higher than the second class land in the project areas. Overall, first class land shadow price is 50% more than the second class land. More significant difference is observed between the first and third class land. The value of first class land is three times higher than the third class land for almost all projects.

In terms of rainfed agriculture, the high rainfall area has the closest land values to the project areas. Other rainfed zones land class values are at least one third of the respective projects' land class values. Overall, the value of the irrigated land is 65% higher than the value of land under rainfed conditions.

The land class endowments of the irrigated areas affect the project specific land values at the margin. The results of the study point out that the marginal values of land for the projects in the South GAP are, in general, higher than those in the North. The top four projects with highest land values (i.e. Silopi, Mardin-Ceylanpinar, Suruc-Baziki, Urfa-Harran) are all located in the South GAP, whereas the bottom four projects according to land values (i.e. Adiyaman-Goksu-Araban, Adiyaman-Kahta, Garzan, Batman-Silvan) are all located in the North GAP.

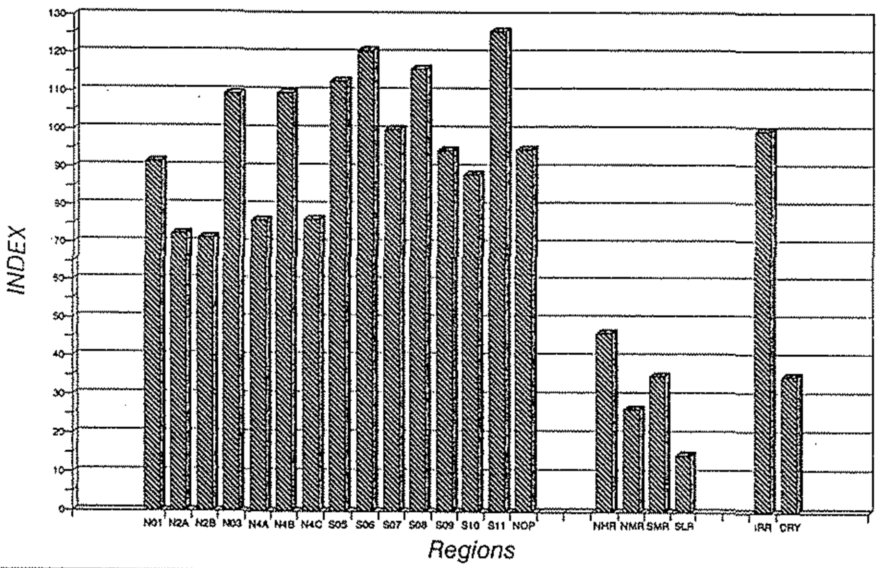
Table 5.4.20: Land Revenues in the GAP Region

	1995 TOTAL [1000 $]	1995 [$/ha]	2000 TOTAL [1000 $]	2000 [$/ha]	2005 TOTAL [1000 $]	2005 [$/ha]	2010 TOTAL [1000 $]	2010 [$/ha]
NHR	615338.47	954.06	694261.07	1174.43	529950.53	1213.23	718619.02	1967.81
NMR	296372.82	495.08	373513.38	658.76	377953.34	791.04	466994.03	1376.25
SMR	218609.55	411.27	283081.2	589.18	225201.19	733.64	286587.94	1327.47
SLR	31803.09	93.18	116169.8	352.85	115019.43	457.66	69444.04	1295.84
N01	9250.94	1479.2	11357.39	1816.02	12594.11	2013.77	312338.11	2160.82
N2A	10757.19	1857.89	103645.14	1501.23	110794.37	1604.79	143654.91	2080.75
N2B	14101.05	1445.52	63119.43	1540.14	127324.83	1763.28	200991.75	2783.47
N03	207782.76	2044.6	306246.37	2417.92	323782.68	2556.37	343640.13	2713.16
N4A	2140.66	1464.2	2369.9	1621	69101.21	1624.61	97839.93	2077.41
N4B	87872.45	2590.5	90588.84	2434.14	82421.45	2214.68	79057.29	2124.28
N4C	8547.87	1117.51	16733.69	2187.7	280425.38	1567.52	382452.87	1932.32
S05	307341.55	2346.75	439100.23	3058.46	557175.17	3880.89	575127.47	4005.93
S06	67355.62	3020.57	100419.88	4503.34	946249.26	3052.2	1183894.87	3818.74
S07	15560.53	2588.25	141114.07	2494.77	145605.2	2341.67	218017.65	3506.23
S08	165785.52	5046.9	218051.07	6637.98	332971.05	2756.31	606212.83	4642.61
S09	45295.26	2268.39	46887.98	2348.16	150969.66	1891.54	212070.11	2500.74
S10	29425.55	2782.56	30260.64	2861.53	176889.87	2238.01	197246.76	2276.44
S11	5675.49	1816.16	7889.22	2524.55	103374.72	3930.6	112149.92	3884.11
NOP	20369.94	1270.1	32649.81	2035.78	52967.53	3302.63	283642.38	4415.08
IRR	997262.39	2442.55	1610433.67	2710.04	3472646.48	2533.72	4948336.96	3081.92
DRY	1162123.93	549.09	1467025.46	745.5	1248124.49	847.4	1541645.03	1582.81
GAP	2159386.32	855.29	3077459.12	1201.15	4720770.97	1660.22	6489981.99	2515.89
ROT	15214874.83	711.71	19730338.28	921.44	24805003.44	1156.84	33817357.17	1585.19
TURKEY	17374261.15	726.87	22807797.4	951.33	29525774.4	1215.78	40307339.16	1685.59

Table 5.4.21: Land Value Indices for the GAP Region in 2010
(Weighted Average Irrigated Land Value=100)

	REGIONS	LAND CLASSES I	II	III	Weighted Region Average
	IRRIGATED REGIONS				
N01	Siverek-Hilvan	159	88	52	92
N2A	Adiyaman-Kahta	161	90	54	72
N2B	Adiyaman-Goksu-Araban	128	78	44	71
N03	Dicle	161	90	54	110
N4A	Garzan	162	90	56	76
N4B	Batman	156	88	54	110
N4C	Batman-Silvan	161	90	56	76
S05	Urfa-Harran	127	94	49	113
S06	Mardin-Ceylanpinar	153	98	54	121
S07	Bozova	153	98	54	100
S08	Suruc-Bazikl	153	98	54	116
S09	Gaziantep	153	99	54	95
S10	Nusaybin-Cizre-Idil	153	100	55	88
S11	Silopi	154	100	55	126
NOP	Non-Project	128	78	44	95
	DRY REGIONS				
NHR	North-High Rain	93	77	37	46
NMR	North-Medium Rain	58	34	12	27
SMR	South-Medium Rain	57	34	10	35
SLR	South-Low Rain	26	5		15
IRR	ALL IRR. REGIONS AVG.	148	93	53	100
DRY	ALL DRY REGIONS AVG.	62	43	23	35

Fig.5.4.50: Land Value Indices in GAP
(Average Irrigated Land Value=100)



5.4.3.3 Crop Pattern by Administrative Regions

The projected crop patterns for each of the irrigation projects and the dry areas were presented at the land class levels in the previous section, for years 1995, 200, 2005 and 2010. In this section we present the projected crop patterns in year 2010 by administrative regions.

The summary crop pattern at the province level are presented and illustrated in Tables 5.4.22 - 5.4.24 and Figures 5.4.5 - 5.4.58. The allocations of cultivated land to different crops in absolute amounts are presented in Table 5.4.24. The percentage distributions of cultivated land in each province to different products are presented in Table 5.4.22. Finally the percentage shares of each province in the total cultivated land in the GAP Region for each of the products are presented in Table 5.4.23.

The absolute amounts of cultivated land of each product, and their shares in total cultivated land in each of the districts of the eight provinces in the GAP Region are presented in Tables 5.4.25 - 5.4.40.

We can make the following observations regarding the projected crop pattern in the eight provinces of the GAP Region:

i. The share of cereals in cultivated land will be highest in Sirnak (42 %) and lowest in Mardin (30 %).

ii. The share of pulses is predicted to be highest in Gaziantep (22 %) and lowest in Sanliurfa (15 %).

iii. The share of industrial crops is predicted to be highest in Mardin (14 %) and lowest in Gaziantep (1 %).

iv. The share of vegetables in cultivated land is highest in year 2010 in Sirnak (6 %) and lowest in Siirt (1 %).

vi. The share of fruits range between 16 % (Sirnak) and 30 % (Siirt).

vii. Sanliurfa and Diyarbakir will constitute over 50 % of the total cultivated area in all crop groups.

Table 5.4.22. Crop Pattern by Provinces - 2010 by Provinces - 2010 (%)

	ADIYAMAN	BATMAN	DIYARBAKIR	GAZIANTEP	MARDIN	SIIRT	SIRNAK	URFA
CEREALS	36.66	33.20	35.86	39.53	29.69	31.47	42.12	38.51
WHEAT	17.11	15.19	20.29	26.43	24.43	16.29	26.01	22.77
CORN	0.00	0.00	0.00	1.29	0.52	0.00	5.43	7.27
BARLEY	16.47	14.29	13.62	10.96	3.85	9.00	10.17	8.18
RICE	0.00	0.00	0.00	0.53	0.05	0.00	0.24	0.00
RYE	3.08	3.71	1.94	0.31	0.83	6.18	0.28	0.29
PULSES	18.41	19.18	19.25	21.68	16.94	15.71	21.49	14.29
CHICK PEA	12.51	12.10	10.31	6.85	0.83	6.65	0.00	1.20
DRY BEAN	0.00	0.00	1.64	0.00	0.11	0.01	0.00	1.24
LENTIL	5.90	7.08	7.29	14.84	16.00	9.05	21.49	11.86
IND.CROPS	11.38	13.60	12.58	0.96	13.75	10.86	8.08	12.63
COTTON	6.62	5.00	8.80	0.91	6.64	4.96	8.07	7.41
SUGAR BEET	0.00	0.86	1.27	0.00	3.92	1.68	0.00	5.01
TOBACCO	4.76	7.74	2.52	0.05	3.19	4.22	0.01	0.21
OIL SEEDS	7.02	7.60	9.23	10.75	10.74	10.73	2.08	7.73
SUNFLOWER	3.08	3.71	3.12	1.74	2.95	6.18	2.04	1.57
SOYABEAN	3.93	2.79	3.19	8.42	5.64	0.73	0.00	4.98
GROUNDNUT	0.00	1.10	2.92	0.00	0.11	3.82	0.00	0.88
SESAME	0.00	0.00	0.00	0.58	2.04	0.00	0.04	0.30
TUBER CROPS	0.47	0.00	0.00	1.89	1.35	0.00	2.54	4.33
POTATO	0.47	0.00	0.00	1.89	0.00	0.00	0.00	3.60
ONION	0.00	0.00	0.00	0.00	1.35	0.00	2.54	0.72
VEGETABLES	1.98	0.91	1.46	4.43	3.94	0.96	6.49	3.63
TOMATO	0.00	0.00	0.00	0.68	1.36	0.00	0.00	1.23
EGGPLANT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25
MELON	0.00	0.00	0.00	0.00	0.83	0.00	0.00	1.20
CAULIFLOWER	0.00	0.00	0.00	0.00	0.00	0.00	0.41	0.00
WATER MELON	0.39	0.75	1.01	1.17	1.65	0.50	5.02	0.63
CARROT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
CABBAGE	0.46	0.00	0.00	0.75	0.00	0.00	0.00	0.00
CUCUMBER	0.55	0.00	0.00	1.06	0.00	0.00	0.00	0.00
OKRA	0.00	0.00	0.00	0.00	0.04	0.00	0.29	0.00
PEPPER	0.59	0.00	0.45	0.75	0.06	0.14	0.00	0.00
LETTUCE	0.00	0.16	0.00	0.00	0.00	0.32	0.00	0.03
SPINACH	0.00	0.00	0.00	0.00	0.00	0.00	0.77	0.03
SQUASH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11
LEEK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09
FRUITS & NUTS	24.08	25.52	21.63	20.77	22.87	30.28	16.39	18.44
OLIVE	16.10	19.86	8.46	0.42	6.66	25.79	0.83	0.88
GRAPE	2.11	0.00	3.62	13.43	8.95	0.00	8.93	7.69
FIG	0.00	0.00	0.00	0.00	0.14	0.00	0.26	0.73
APPLE	5.25	4.99	6.25	0.00	0.41	4.49	0.00	0.96
PEACH	0.00	0.00	0.00	0.23	0.05	0.00	0.18	0.81
APRICOT	0.61	0.66	0.13	1.32	0.04	0.00	0.00	0.46
CHERRY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.48
WILDCHERRY	0.00	0.00	0.00	0.00	1.50	0.00	0.00	0.84
POMEGRANADE	0.00	0.00	0.00	0.18	0.31	0.00	2.79	0.33
PISTACHIO	0.00	0.00	3.18	5.19	4.80	0.00	3.40	5.28
FEED CROPS	0.00	0.00	0.00	0.00	0.72	0.00	0.80	0.44
CORN-SILAGE	0.00	0.00	0.00	0.00	0.72	0.00	0.80	0.44

Table 5.4.23. Shares of Provinces in the GAP Production - 2010 (%)

	ADIYAMAN	BATMAN	DIYARBAKIR	GAZIANTEP	MARDIN	SIIRT	SIRNAK	URFA
CEREALS	6.48	2.60	21.18	12.53	7.88	2.12	5.17	42.04
WHEAT	5.02	1.97	19.91	13.92	10.76	1.82	5.30	41.29
CORN	0.00	0.00	0.00	4.47	1.52	0.00	7.27	86.74
BARLEY	10.64	4.09	29.42	12.70	3.74	2.22	4.56	32.64
RICE	0.00	0.00	0.00	79.55	6.69	0.00	13.77	0.00
RYE	17.72	9.45	37.33	3.22	7.19	13.54	1.11	10.45
PULSES	6.95	3.21	24.30	14.69	9.61	2.26	5.63	33.35
CHICK PEA	16.50	7.06	45.48	16.20	1.64	3.34	0.00	9.77
DRY BEAN	0.00	0.00	41.26	0.00	1.28	0.02	0.00	57.44
LENTIL	3.36	1.79	13.87	15.16	13.67	1.96	8.49	41.70
IND.CROPS	6.71	3.55	24.80	1.01	12.17	2.44	3.30	46.01
COTTON	6.42	2.15	28.52	1.58	9.66	1.83	5.43	44.41
SUGAR BEET	0.00	0.91	10.08	0.00	13.99	1.52	0.00	73.50
TOBACCO	19.53	14.05	34.48	0.39	19.61	6.59	0.02	5.33
OIL SEEDS	5.40	2.59	23.74	14.84	12.41	3.15	1.11	36.75
SUNFLOWER	8.51	4.54	28.83	8.64	12.24	6.50	3.92	26.82
SOYABEAN	5.58	1.75	15.12	21.45	12.02	0.39	0.00	43.68
GROUNDNUT	0.00	2.81	56.50	0.00	0.96	8.42	0.00	31.31
SESAME	0.00	0.00	0.00	17.38	51.28	0.00	0.43	30.91
TUBER CROPS	1.36	0.00	0.00	9.86	5.88	0.00	5.13	77.77
POTATO	1.78	0.00	0.00	12.98	0.00	0.00	0.00	85.23
ONION	0.00	0.00	0.00	0.00	24.49	0.00	21.37	54.14
VEGETABLES	4.09	0.83	10.06	16.40	12.22	0.76	9.30	46.33
TOMATO	0.00	0.00	0.00	11.27	18.77	0.00	0.00	69.96
EGGPLANT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
MELON	0.00	0.00	0.00	0.00	14.39	0.00	0.00	85.61
CAULIFLOWER	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00
WATER MELON	2.37	2.04	20.72	12.96	15.24	1.18	21.43	24.06
CARROT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
CABBAGE	25.25	0.00	0.00	74.75	0.00	0.00	0.00	0.00
CUCUMBER	22.34	0.00	0.00	77.66	0.00	0.00	0.00	0.00
OKRA	0.00	0.00	0.00	0.00	23.84	0.00	76.16	0.00
PEPPER	16.55	0.00	41.86	37.66	2.39	1.53	0.00	0.00
LETTUCE	0.00	19.55	0.00	0.00	0.00	32.68	0.00	47.76
SPINACH	0.00	0.00	0.00	0.00	0.00	0.00	76.38	23.62
SQUASH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
LEEK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
FRUITS & NUTS	7.62	3.57	22.88	11.79	10.86	3.65	3.60	36.04
OLIVE	20.19	11.03	35.46	0.94	12.55	12.32	0.72	6.78
GRAPE	2.01	0.00	11.47	22.85	12.75	0.00	5.87	45.06
FIG	0.00	0.00	0.00	0.00	4.27	0.00	3.71	92.02
APPLE	14.36	6.04	57.07	0.00	1.69	4.68	0.00	16.16
PEACH	0.00	0.00	0.00	7.45	1.36	0.00	2.24	88.95
APRICOT	9.16	4.41	6.52	35.87	0.92	0.00	0.00	43.12
CHERRY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	100.00
WILDCHERRY	0.00	0.00	0.00	0.00	30.30	0.00	0.00	69.70
POMEGRANADE	0.00	0.00	0.00	6.77	9.78	0.00	40.51	42.94
PISTACHIO	0.00	0.00	17.13	14.99	11.61	0.00	3.80	52.47
FEED CROPS	0.00	0.00	0.00	0.00	24.75	0.00	12.73	62.52
CORN-SILAGE	0.00	0.00	0.00	0.00	24.75	0.00	12.73	62.52

Table 5.4.24 Crop Pattern by Provinces - 2010 (1000 ha)

	ADIYAMAN	BATMAN	DIYARBAKIR	GAZIANTEP	MARDIN	SIIRT	SIRNAK	URFA	GAP
CEREALS	66.83	26.80	218.54	129.30	81.26	21.86	53.29	433.74	1031.63
WHEAT	31.19	12.27	123.68	86.47	66.86	11.31	32.91	256.43	621.12
CORN	0.00	0.00	0.00	4.22	1.44	0.00	6.86	81.90	94.42
BARLEY	30.02	11.54	83.02	35.84	10.54	6.25	12.86	92.10	282.17
RICE	0.00	0.00	0.00	1.75	0.15	0.00	0.30	0.00	2.20
RYE	5.62	3.00	11.84	1.02	2.28	4.29	0.35	3.31	31.72
PULSES	33.57	15.48	117.31	70.93	46.37	10.91	27.19	160.98	482.74
CHICK PEA	22.80	9.77	62.86	22.40	2.27	4.62	0.00	13.51	138.23
DRY BEAN	0.00	0.00	10.01	0.00	0.31	0.00	0.00	13.93	24.26
LENTIL	10.76	5.72	44.43	48.54	43.79	6.29	27.19	133.53	320.25
IND.CROPS	20.75	10.98	76.67	3.13	37.62	7.54	10.22	142.23	309.15
COTTON	12.07	4.03	53.61	2.96	18.17	3.45	10.21	83.49	187.98
SUGAR BEET	0.00	0.70	7.73	0.00	10.73	1.16	0.00	56.38	76.70
TOBACCO	8.69	6.25	15.33	0.17	8.72	2.93	0.01	2.37	44.47
OIL SEEDS	12.79	6.14	56.24	35.15	29.41	7.45	2.63	87.05	236.87
SUNFLOWER	5.62	3.00	19.03	5.70	8.08	4.29	2.59	17.71	66.02
SOYABEAN	7.17	2.25	19.42	27.56	15.44	0.51	0.00	56.11	128.46
GROUNDNUT	0.00	0.89	17.79	0.00	0.30	2.65	0.00	9.86	31.49
SESAME	0.00	0.00	0.00	1.89	5.59	0.00	0.05	3.37	10.90
TUBER CROPS	0.85	0.00	0.00	6.18	3.69	0.00	3.22	48.73	62.66
POTATO	0.85	0.00	0.00	6.18	0.00	0.00	0.00	40.58	47.61
ONION	0.00	0.00	0.00	0.00	3.69	0.00	3.22	8.15	15.05
VEGETABLES	3.61	0.74	8.88	14.48	10.79	0.67	8.21	40.90	88.28
TOMATO	0.00	0.00	0.00	2.24	3.73	0.00	0.00	13.90	19.87
EGGPLANT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.80	2.80
MELON	0.00	0.00	0.00	0.00	2.27	0.00	0.00	13.47	15.74
CAULIFLOWER	0.00	0.00	0.00	0.00	0.00	0.00	0.52	0.00	0.52
WATER MELON	0.70	0.61	6.15	3.84	4.52	0.35	6.36	7.14	29.66
CARROT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.76	0.76
CABBAGE	0.83	0.00	0.00	2.46	0.00	0.00	0.00	0.00	3.29
CUCUMBER	1.00	0.00	0.00	3.48	0.00	0.00	0.00	0.00	4.48
OKRA	0.00	0.00	0.00	0.00	0.11	0.00	0.37	0.00	0.48
PEPPER	1.08	0.00	2.73	2.46	0.16	0.10	0.00	0.00	6.53
LETTUCE	0.00	0.13	0.00	0.00	0.00	0.22	0.00	0.32	0.67
SPINACH	0.00	0.00	0.00	0.00	0.00	0.00	0.97	0.30	1.27
SQUASH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.25	1.25
LEEK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.96	0.96
FRUITS & NUTS	43.90	20.60	131.86	67.95	62.60	21.03	20.73	207.73	576.41
OLIVE	29.36	16.04	51.56	1.36	18.24	17.91	1.05	9.86	145.39
GRAPE	3.86	0.00	22.05	43.92	24.51	0.00	11.29	86.62	192.24
FIG	0.00	0.00	0.00	0.00	0.38	0.00	0.33	8.19	8.90
APPLE	9.58	4.03	38.07	0.00	1.12	3.12	0.00	10.78	66.71
PEACH	0.00	0.00	0.00	0.76	0.14	0.00	0.23	9.07	10.20
APRICOT	1.11	0.53	0.79	4.33	0.11	0.00	0.00	5.21	12.08
CHERRY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.40	5.40
WILDCHERRY	0.00	0.00	0.00	0.00	4.10	0.00	0.00	9.43	13.53
POMEGRANADE	0.00	0.00	0.00	0.59	0.85	0.00	3.53	3.74	8.71
PISTACHIO	0.00	0.00	19.40	16.98	13.15	0.00	4.30	59.43	113.25
FEED CROPS	0.00	0.00	0.00	0.00	1.97	0.00	1.01	4.98	7.97
CORN-SILAGE	0.00	0.00	0.00	0.00	1.97	0.00	1.01	4.98	7.97
TOTAL	182.32	80.73	609.50	327.14	273.71	69.47	126.50	1126.34	2795.71

Table 5.4.25. Crop Pattern for the Districts of Adiyaman - 2010 (% of Cultivated Land)

	MERKEZ	BESNI	CELIKHAN	GERGER	GOLBASI	KAHTA	SAMSAT	SINCIK	TUT
CEREALS	38.27	37.48	29.61	27.44	26.97	39.90	33.72	25.00	25.64
WHEAT	18.24	21.72	19.10	14.63	12.66	10.60	19.60	0.00	3.83
CORN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BARLEY	18.47	15.22	7.50	0.00	0.81	26.75	9.68	0.00	0.00
RICE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RYE	1.56	0.54	3.01	12.81	13.50	2.55	4.44	25.00	21.80
PULSES	17.72	19.22	9.27	14.63	10.49	25.32	14.23	0.00	3.83
CHICK PEA	12.93	13.72	5.25	0.00	2.22	18.72	6.78	0.00	0.00
DRY BEAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LENTIL	4.79	5.50	4.02	14.63	8.28	6.59	7.45	0.00	3.83
INDUSTRIAL CROPS	18.27	6.47	30.36	0.00	5.33	6.70	17.91	0.00	0.00
COTTON	11.15	3.40	29.14	0.00	0.42	3.62	9.46	0.00	0.00
SUGAR BEET	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOBACCO	7.12	3.07	1.22	0.00	4.91	3.09	8.45	0.00	0.00
OIL SEEDS	2.62	11.63	13.32	12.81	14.88	3.00	5.34	25.00	21.80
SUNFLOWER	1.56	0.54	3.01	12.81	13.50	2.55	4.44	25.00	21.80
SOYABEAN	1.06	11.08	10.31	0.00	1.37	0.45	0.90	0.00	0.00
GROUNDNUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SESAME	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TUBER CROPS	0.06	1.48	0.55	0.00	0.18	0.02	0.05	0.00	0.00
POTATO	0.06	1.48	0.55	0.00	0.18	0.02	0.05	0.00	0.00
ONION	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VEGETABLES	0.68	5.18	4.17	0.00	1.19	0.19	1.31	0.00	0.00
TOMATO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EGGPLANT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MELON	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAULIFLOWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WATER MELON	0.35	0.44	0.97	0.00	0.60	0.05	1.03	0.00	0.00
CARROT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CABBAGE	0.06	1.44	0.55	0.00	0.18	0.02	0.05	0.00	0.00
CUCUMBER	0.02	1.86	0.16	0.00	0.23	0.01	0.01	0.00	0.00
OKRA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PEPPER	0.26	1.44	2.50	0.00	0.18	0.11	0.22	0.00	0.00
LETTUCE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SPINACH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SQUASH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LEEK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FRUITS & NUTS	22.39	18.54	12.72	45.13	40.96	24.87	27.44	50.00	48.73
OLIVE	13.25	9.20	9.40	45.13	39.58	15.80	21.48	50.00	48.73
GRAPE	0.00	7.25	0.00	0.00	1.12	0.00	0.00	0.00	0.00
FIG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APPLE	9.15	0.00	3.32	0.00	0.00	9.07	5.96	0.00	0.00
PEAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PEACH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APRICOT	0.00	2.10	0.00	0.00	0.26	0.00	0.00	0.00	0.00
CHERRY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WILDCHERRY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
POMEGRANADE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PISTACHIO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FEED CROPS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CORN-SILAGE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 5.4.26. Crop Pattern for the Districts of Adiyaman - 2010 (hectares)

	MERKEZ	BESNI	CELIKHAN	GERGER	GOLBASI	KAHTA	SAMSAT	SINCIK	TUT
CEREALS	22500.1	19165.6	1196.3	831.1	3632.2	14479.6	4379.6	303.6	347.3
WHEAT	10723.5	11106.8	770.9	443.0	1704.2	3847.2	2545.0	0.0	51.9
CORN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BARLEY	10861.0	7781.2	302.8	0.0	109.4	9708.6	1257.5	0.0	0.0
RICE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RYE	915.6	277.6	121.6	388.1	1818.5	923.8	577.1	303.6	295.4
PULSES	10420.1	9830.9	374.1	443.0	1413.0	9188.9	1847.5	0.0	51.9
CHICK PEA	7602.2	7016.3	212.0	0.0	298.3	6795.6	880.2	0.0	0.0
DRY BEAN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LENTIL	2817.8	2814.6	162.2	443.0	1114.7	2393.3	967.3	0.0	51.9
INDUSTRIAL CROPS	10741.0	3311.1	1225.2	0.0	717.7	2432.8	2326.2	0.0	0.0
COTTON	6553.5	1741.1	1176.0	0.0	56.8	1312.3	1228.1	0.0	0.0
SUGAR BEET	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOBACCO	4187.5	1570.0	49.2	0.0	660.9	1120.5	1098.0	0.0	0.0
OIL SEEDS	1538.3	5945.4	537.8	388.1	2003.5	1088.3	693.6	303.6	295.4
SUNFLOWER	915.6	277.6	121.6	388.1	1818.5	923.8	577.1	303.6	295.4
SOYABEAN	622.7	5667.8	416.2	0.0	184.9	164.6	116.5	0.0	0.0
GROUNDNUT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SESAME	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TUBER CROPS	33.0	764.9	22.1	0.0	24.6	8.7	6.2	0.0	0.0
POTATO	33.0	764.9	22.1	0.0	24.6	8.7	6.2	0.0	0.0
ONION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VEGETABLES	398.1	2648.2	168.4	0.0	160.0	69.3	170.2	0.0	0.0
TOMATO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EGGPLANT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MELON	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CAULIFLOWER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WATER MELON	204.7	225.3	39.1	0.0	80.9	18.2	134.1	0.0	0.0
CARROT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CABBAGE	33.0	736.6	22.1	0.0	24.0	8.7	6.2	0.0	0.0
CUCUMBER	9.4	949.7	6.3	0.0	31.0	2.5	1.8	0.0	0.0
OKRA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PEPPER	151.0	736.6	100.9	0.0	24.0	39.9	28.2	0.0	0.0
LETTUCE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SPINACH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SQUASH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LEEK	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FRUITS & NUTS	13167.7	9481.3	513.5	1366.9	5516.5	9026.6	3563.9	607.2	660.0
OLIVE	7789.7	4704.5	379.5	1366.9	5331.0	5733.3	2789.3	607.2	660.0
GRAPE	0.0	3705.3	0.0	0.0	150.5	0.0	0.0	0.0	0.0
FIG	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
APPLE	5378.0	0.0	134.0	0.0	0.0	3293.3	774.7	0.0	0.0
PEAR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PEACH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
APRICOT	0.0	1071.5	0.0	0.0	35.0	0.0	0.0	0.0	0.0
CHERRY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WILDCHERRY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
POMEGRANADE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PISTACHIO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FEED CROPS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CORN-SILAGE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	58798.2	51137.3	4036.4	3029.0	13467.4	36294.2	12987.3	1214.3	1364.6

Table 5.4.27. Crop Pattern for the Districts of Batman - 2010 (% of cultivated land)

	MERKEZ	BESIRI	GERCUS	HASANKEYF	KOZLUK	SASON
CEREALS	34.87	38.56	20.23	22.63	37.70	19.47
WHEAT	22.65	13.14	16.37	16.29	6.72	7.01
CORN	0.00	0.00	0.00	0.00	0.00	0.00
BARLEY	7.18	23.60	0.00	0.00	27.95	0.00
RICE	0.00	0.00	0.00	0.00	0.00	0.00
RYE	5.04	1.82	3.87	6.33	3.03	12.46
PULSES	16.49	23.34	15.47	16.14	22.19	6.31
CHICK PEA	9.31	18.59	0.00	0.00	20.88	0.00
DRY BEAN	0.00	0.00	0.00	0.00	0.00	0.00
LENTIL	7.18	4.75	15.47	16.14	1.31	6.31
IND.CROPS	12.67	10.92	20.25	12.60	12.66	17.85
COTTON	9.27	4.78	0.00	0.00	4.63	0.00
SUGAR BEET	0.00	1.40	0.00	0.00	2.31	0.00
TOBACCO	3.40	4.74	20.25	12.60	5.71	17.85
OIL SEEDS	12.89	5.78	3.87	6.33	5.48	12.46
SUNFLOWER	5.04	1.82	3.87	6.33	3.03	12.46
SOYABEAN	7.84	1.71	0.00	0.00	0.07	0.00
GROUNDNUT	0.00	2.25	0.00	0.00	2.38	0.00
SESAME	0.00	0.00	0.00	0.00	0.00	0.00
TUBER CROPS	0.00	0.00	0.00	0.00	0.00	0.00
POTATO	0.00	0.00	0.00	0.00	0.00	0.00
ONION	0.00	0.00	0.00	0.00	0.00	0.00
VEGETABLES	1.51	0.75	0.89	0.15	0.46	0.70
TOMATO	0.00	0.00	0.00	0.00	0.00	0.00
EGGPLANT	0.00	0.00	0.00	0.00	0.00	0.00
MELON	0.00	0.00	0.00	0.00	0.00	0.00
CAULIFLOWER	0.00	0.00	0.00	0.00	0.00	0.00
WATER MELON	1.51	0.48	0.89	0.15	0.03	0.70
CARROT	0.00	0.00	0.00	0.00	0.00	0.00
CABBAGE	0.00	0.00	0.00	0.00	0.00	0.00
CUCUMBER	0.00	0.00	0.00	0.00	0.00	0.00
OKRA	0.00	0.00	0.00	0.00	0.00	0.00
PEPPER	0.00	0.00	0.00	0.00	0.00	0.00
LETTUCE	0.00	0.26	0.00	0.00	0.43	0.00
SPINACH	0.00	0.00	0.00	0.00	0.00	0.00
SQUASH	0.00	0.00	0.00	0.00	0.00	0.00
LEEK	0.00	0.00	0.00	0.00	0.00	0.00
FRUITS & NUTS	21.57	20.66	39.29	42.14	21.50	43.22
OLIVE	17.58	11.73	39.29	42.14	11.54	43.22
GRAPE	0.00	0.00	0.00	0.00	0.00	0.00
FIG	0.00	0.00	0.00	0.00	0.00	0.00
APPLE	2.16	8.49	0.00	0.00	9.96	0.00
PEAR	0.00	0.00	0.00	0.00	0.00	0.00
PEACH	0.00	0.00	0.00	0.00	0.00	0.00
APRICOT	1.83	0.44	0.00	0.00	0.00	0.00
CHERRY	0.00	0.00	0.00	0.00	0.00	0.00
WILDCHERRY	0.00	0.00	0.00	0.00	0.00	0.00
POMEGRANADE	0.00	0.00	0.00	0.00	0.00	0.00
PISTACHIO	0.00	0.00	0.00	0.00	0.00	0.00
FEED CROPS	0.00	0.00	0.00	0.00	0.00	0.00
CORN-SILAGE	0.00	0.00	0.00	0.00	0.00	0.00

Table 5.4.28. Crop Pattern for the Districts of Batman - 2010 (hectares)

	MERKEZ	BESIRI	GERCUS	HASANKEYF	KOZLUK	SASON
CEREALS	8372.3	8042.7	2844.5	750.5	6596.4	193.3
WHEAT	5438.3	2740.3	2300.9	540.5	1175.6	69.6
CORN	0.0	0.0	0.0	0.0	0.0	0.0
BARLEY	1723.1	4922.9	0.0	0.0	4890.6	0.0
RICE	0.0	0.0	0.0	0.0	0.0	0.0
RYE	1210.9	379.5	543.6	210.0	530.2	123.7
PULSES	3960.2	4867.9	2175.3	535.4	3882.3	62.7
CHICK PEA	2235.2	3877.5	0.0	0.0	3653.0	0.0
DRY BEAN	0.0	0.0	0.0	0.0	0.0	0.0
LENTIL	1725.0	990.5	2175.3	535.4	229.3	62.7
INDUSTRIAL CROPS	3042.2	2278.0	2847.0	418.1	2214.4	177.3
COTTON	2225.1	997.2	0.0	0.0	810.6	0.0
SUGAR BEET	0.0	292.2	0.0	0.0	404.1	0.0
TOBACCO	817.1	988.7	2847.0	418.1	999.7	177.3
OIL SEEDS	3093.7	1205.3	543.6	210.0	959.6	123.7
SUNFLOWER	1210.9	379.5	543.6	210.0	530.2	123.7
SOYABEAN	1882.8	356.5	0.0	0.0	13.0	0.0
GROUNDNUT	0.0	469.3	0.0	0.0	416.4	0.0
SESAME	0.0	0.0	0.0	0.0	0.0	0.0
TUBER CROPS	0.0	0.0	0.0	0.0	0.0	0.0
POTATO	0.0	0.0	0.0	0.0	0.0	0.0
ONION	0.0	0.0	0.0	0.0	0.0	0.0
VEGETABLES	362.7	155.9	125.6	5.1	80.8	6.9
TOMATO	0.0	0.0	0.0	0.0	0.0	0.0
EGGPLANT	0.0	0.0	0.0	0.0	0.0	0.0
MELON	0.0	0.0	0.0	0.0	0.0	0.0
CAULIFLOWER	0.0	0.0	0.0	0.0	0.0	0.0
WATER MELON	362.7	100.9	125.6	5.1	4.8	6.9
CARROT	0.0	0.0	0.0	0.0	0.0	0.0
CABBAGE	0.0	0.0	0.0	0.0	0.0	0.0
CUCUMBER	0.0	0.0	0.0	0.0	0.0	0.0
OKRA	0.0	0.0	0.0	0.0	0.0	0.0
PEPPER	0.0	0.0	0.0	0.0	0.0	0.0
LETTUCE	0.0	55.0	0.0	0.0	76.0	0.0
SPINACH	0.0	0.0	0.0	0.0	0.0	0.0
SQUASH	0.0	0.0	0.0	0.0	0.0	0.0
LEEK	0.0	0.0	0.0	0.0	0.0	0.0
FRUITS & NUTS	5179.0	4309.7	5523.3	1398.0	3761.8	429.2
OLIVE	4220.1	2447.7	5523.3	1398.0	2018.9	429.2
GRAPE	0.0	0.0	0.0	0.0	0.0	0.0
FIG	0.0	0.0	0.0	0.0	0.0	0.0
APPLE	518.5	1770.2	0.0	0.0	1742.8	0.0
PEAR	0.0	0.0	0.0	0.0	0.0	0.0
PEACH	0.0	0.0	0.0	0.0	0.0	0.0
APRICOT	440.4	91.8	0.0	0.0	0.0	0.0
CHERRY	0.0	0.0	0.0	0.0	0.0	0.0
WILDCHERRY	0.0	0.0	0.0	0.0	0.0	0.0
POMEGRANADE	0.0	0.0	0.0	0.0	0.0	0.0
PISTACHIO	0.0	0.0	0.0	0.0	0.0	0.0
FEED CROPS	0.0	0.0	0.0	0.0	0.0	0.0
CORN-SILAGE	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	24010.1	20859.5	14059.2	3317.1	17495.3	993.2

Table 5.4.29. Crop Pattern for the Districts of Diyarbakir - 2010 (%of cultivated land)

	BISMIL	CERMIK	CINAR	CUNGUS	DICLE	MERKEZ	EGIL	ERGANI	HANI	HAZRO	KOCAKOY	KULP	LICE	SILVAN
CEREALS	42.15	28.79	35.36	28.71	29.09	34.91	22.31	25.17	24.90	26.10	45.99	18.15	23.32	46.68
WHEAT	19.08	15.08	30.21	22.77	16.36	22.64	11.84	21.93	11.20	15.98	9.02	6.51	11.64	11.63
CORN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BARLEY	22.93	4.03	4.72	0.54	0.00	11.93	0.00	0.62	0.00	0.62	36.37	0.00	0.00	34.71
RICE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RYE	0.13	9.68	0.42	5.40	12.73	0.34	10.46	2.61	13.69	9.51	0.60	11.64	11.68	0.34
PULSES	23.39	17.25	15.15	22.19	13.26	18.51	11.12	12.94	10.97	16.41	30.16	6.28	11.25	29.41
CHICK PEA	17.69	2.82	3.30	0.38	0.00	9.16	0.00	0.43	0.00	0.43	26.67	0.00	0.09	25.89
DRY BEAN	1.85	0.03	1.10	0.11	0.00	2.54	0.00	0.10	0.00	0.00	3.14	0.00	0.23	2.81
LENTIL	3.85	14.41	10.75	21.71	13.26	6.82	11.12	12.41	10.97	15.98	0.35	6.28	10.93	0.72
IND.CROPS	8.65	3.05	7.37	1.70	4.57	19.02	13.03	25.95	5.32	4.48	6.18	19.62	9.77	4.77
COTTON	7.43	0.00	7.37	0.00	0.00	14.54	0.00	14.46	0.00	0.00	3.75	0.00	0.71	3.88
SUGAR BEET	1.22	0.00	0.00	0.00	0.00	3.26	0.00	0.00	0.00	0.00	1.74	0.00	0.33	0.36
TOBACCO	0.00	3.05	0.00	1.70	4.57	1.22	13.03	11.49	5.32	4.48	0.69	19.62	8.74	0.53
OIL SEEDS	8.50	9.83	14.03	6.04	12.73	8.78	10.46	9.32	13.69	9.51	2.30	11.64	11.83	4.36
SUNFLOWER	1.40	9.68	4.52	5.40	12.73	1.51	10.46	2.61	13.69	9.51	0.60	11.64	11.68	0.34
SOYABEAN	3.51	0.00	3.13	0.00	0.00	3.72	0.00	6.14	0.00	0.00	0.19	0.00	0.04	2.66
GROUNDNUT	3.60	0.15	6.38	0.64	0.00	3.54	0.00	0.57	0.00	0.00	1.51	0.00	0.11	1.35
SESAME	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TUBER CROPS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
POTATO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ONION	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VEGETABLES	0.48	0.43	2.22	0.00	3.10	1.74	0.72	3.75	0.24	0.00	0.10	0.23	0.07	0.04
TOMATO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EGGPLANT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MELON	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAULIFLOWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WATER MELON	0.34	0.43	1.56	0.00	3.10	1.10	0.72	2.44	0.24	0.00	0.10	0.23	0.07	0.04
CARROT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CABBAGE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CUCUMBER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OKRA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PEPPER	0.15	0.00	0.67	0.00	0.00	0.65	0.00	1.31	0.00	0.00	0.00	0.00	0.00	0.00
LETTUCE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SPINACH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SQUASH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LEEK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FRUITS & NUTS	16.82	40.65	25.87	41.35	37.25	17.05	42.36	22.88	44.88	43.49	15.25	44.08	43.76	14.75
OLIVE	0.00	39.37	0.00	40.87	37.25	2.24	42.36	22.41	44.88	43.31	1.83	44.08	43.58	1.88
GRAPE	4.09	0.00	9.71	0.00	0.00	4.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FIG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APPLE	9.44	1.28	4.62	0.48	0.00	6.53	0.00	0.47	0.00	0.19	13.42	0.00	0.18	12.66
PEAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PEACH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APRICOT	0.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22
CHERRY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WILDCHERRY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
POMEGRANADE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PISTACHIO	2.81	0.00	11.54	0.00	0.00	3.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FEED CROPS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CORN-SILAGE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 5.4.30. Crop Pattern for the Districts of Diyarbakir - 2010 (hectares)

	BISMIL	CERMIK	CINAR	CUNGUS	DICLE	MERKEZ	EGIL	ERGANI	HANI	HAZRO	KOCAKOY	KULP	LICE	SILVAN
CEREALS	57519.7	5481.9	29833.4	591.8	6349.1	59431.5	1967.6	16628.4	1747.5	1096.2	7198.3	1078.3	2006.3	27608.4
WHEAT	26045.9	2872.0	25495.1	469.4	3571.0	38551.1	1044.6	14491.7	786.5	670.9	1411.4	387.0	1001.1	6877.6
CORN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BARLEY	31295.0	766.5	3981.3	11.2	0.0	20309.8	0.0	409.0	0.0	26.1	5692.9	0.0	0.0	20529.9
RICE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RYE	178.8	1843.3	357.0	111.2	2778.1	570.6	923.0	1727.6	961.0	399.2	94.0	691.3	1005.2	200.8
PULSES	31924.0	3284.3	12784.6	457.4	2894.5	31510.2	980.8	8552.9	769.9	689.1	4720.8	373.3	967.4	17395.9
CHICK PEA	24148.0	536.4	2786.1	7.8	0.0	15589.1	0.0	286.2	0.0	18.3	4173.9	0.0	7.5	15311.5
DRY BEAN	2524.7	4.8	925.5	2.3	0.0	4316.5	0.0	64.2	0.0	0.0	491.9	0.0	19.5	1660.3
LENTIL	5251.3	2743.1	9073.0	447.4	2894.5	11604.7	980.8	8202.5	769.9	670.9	55.0	373.3	940.5	424.1
INDUSTRIAL CROPS	11808.1	581.0	6216.5	35.1	998.4	32382.8	1149.6	17143.4	373.6	188.3	967.9	1165.6	840.6	2820.2
COTTON	10137.3	0.0	6216.5	0.0	0.0	24756.5	0.0	9554.7	0.0	0.0	586.8	0.0	60.7	2294.2
SUGAR BEET	1670.8	0.0	0.0	0.0	0.0	5544.2	0.0	0.0	0.0	0.0	273.1	0.0	28.3	213.6
TOBACCO	0.0	581.0	0.0	35.1	998.4	2082.0	1149.6	7588.7	373.6	188.3	108.0	1165.6	751.5	312.4
OIL SEEDS	11606.2	1871.4	11839.1	124.4	2778.1	14941.7	923.0	6155.5	961.0	399.2	360.2	691.3	1017.6	2576.0
SUNFLOWER	1910.7	1843.3	3814.5	111.2	2778.1	2573.7	923.0	1727.6	961.0	399.2	94.0	691.3	1005.2	200.8
SOYABEAN	4786.5	0.0	2637.8	0.0	0.0	6333.4	0.0	4054.3	0.0	0.0	29.3	0.0	3.0	1575.7
GROUNDNUT	4909.0	28.1	5386.8	13.1	0.0	6034.6	0.0	373.5	0.0	0.0	236.8	0.0	9.4	799.5
SESAME	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TUBER CROPS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
POTATO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ONION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VEGETABLES	659.8	81.9	1877.3	0.0	676.5	2968.0	63.8	2476.5	16.5	0.0	16.3	13.7	5.7	22.8
TOMATO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EGGPLANT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MELON	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CAULIFLOWER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WATER MELON	459.3	81.9	1313.5	0.0	676.5	1865.2	63.8	1610.0	16.5	0.0	16.3	13.7	5.7	22.8
CARROT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CABBAGE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CUCUMBER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OKRA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PEPPER	200.5	0.0	563.8	0.0	0.0	1102.7	0.0	866.5	0.0	0.0	0.0	0.0	0.0	0.0
LETTUCE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SPINACH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SQUASH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LEEK	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FRUITS & NUTS	22958.6	7739.6	21830.3	852.4	8129.4	29027.6	3736.4	15115.1	3150.3	1826.4	2387.4	2618.3	3764.7	8726.5
OLIVE	0.0	7495.4	0.0	842.4	8129.4	3819.9	3736.4	14804.7	3150.3	1818.5	286.4	2618.3	3749.2	1109.8
GRAPE	5585.7	0.0	8191.1	0.0	0.0	8269.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FIG	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
APPLE	12877.8	244.2	3900.0	10.0	0.0	11117.4	0.0	310.3	0.0	7.8	2101.0	0.0	15.6	7487.5
PEAR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PEACH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
APRICOT	658.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	129.2
CHERRY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WILDCHERRY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
POMEGRANADE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PISTACHIO	3836.5	0.0	9739.2	0.0	0.0	5820.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FEED CROPS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CORN-SILAGE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	136476.3	19040.1	84381.2	2061.1	21825.9	170261.8	8821.0	66071.6	7018.9	4199.2	15650.9	5940.4	8602.3	59149.7

Table 5.4.31. Crop Pattern for the Districts of Gaziantep - 2010 (% of cultivated land)

	ARABAN	ISLAHIYE	KARGAMIS	KILIS	NIZIP	NUR	OGUZELI	SAHINBEY	SEHITKAMIL	YAVUZELI
CEREALS	39.37	38.91	47.77	31.62	39.12	39.11	44.02	28.23	44.33	41.60
WHEAT	21.20	29.05	22.14	24.73	28.08	29.82	33.92	26.53	10.49	14.08
CORN	0.00	0.00	4.04	0.13	2.42	0.00	3.08	0.51	0.00	0.00
BARLEY	17.51	8.81	19.92	6.12	7.61	9.06	5.74	0.40	33.83	27.52
RICE	0.00	0.00	1.67	0.06	1.00	0.00	1.28	0.21	0.00	0.00
RYE	0.67	1.05	0.00	0.60	0.00	0.24	0.00	0.58	0.00	0.00
PULSES	15.66	13.47	27.56	21.90	26.09	13.37	25.56	19.81	32.89	24.62
CHICK PEA	15.66	13.47	0.00	0.00	0.00	13.37	0.00	0.00	26.59	24.62
DRY BEAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LENTIL	0.00	0.00	27.56	21.90	26.09	0.00	25.56	19.81	6.31	0.00
IND.CROPS	5.88	0.99	0.76	0.08	0.48	1.06	0.95	0.02	0.00	1.98
COTTON	4.87	0.99	0.76	0.08	0.48	1.06	0.95	0.02	0.00	1.98
SUGAR BEET	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOBACCO	1.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OIL SEEDS	16.53	18.54	8.59	6.65	7.18	18.81	9.92	7.28	0.00	6.43
SUNFLOWER	0.67	1.05	0.00	6.38	1.34	0.24	0.71	6.20	0.00	0.00
SOYABEAN	15.86	17.49	8.59	0.27	5.15	18.57	6.55	1.08	0.00	6.43
GROUNDNUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SESAME	0.00	0.00	0.00	0.00	0.69	0.00	2.67	0.00	0.00	0.00
TUBER CROPS	2.11	6.61	0.00	0.00	0.00	7.03	0.00	0.00	0.00	0.86
POTATO	2.11	6.61	0.00	0.00	0.00	7.03	0.00	0.00	0.00	0.86
ONION	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VEGETABLES	6.78	8.00	4.55	0.98	2.81	8.50	4.62	1.18	0.37	2.75
TOMATO	0.00	0.00	2.14	0.07	1.28	0.00	1.63	0.27	0.00	0.00
EGGPLANT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MELON	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAULIFLOWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WATER MELON	0.00	0.00	2.40	0.91	1.52	0.00	2.99	0.91	0.37	0.00
CARROT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CABBAGE	2.06	2.32	0.00	0.00	0.00	2.47	0.00	0.00	0.00	0.84
CUCUMBER	2.66	3.35	0.00	0.00	0.00	3.56	0.00	0.00	0.00	1.08
OKRA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PEPPER	2.06	2.32	0.00	0.00	0.00	2.47	0.00	0.00	0.00	0.84
LETTUCE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SPINACH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SQUASH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LEEK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FRUITS & NUTS	13.67	13.47	10.77	38.77	24.33	12.13	14.94	43.49	22.41	21.77
OLIVE	2.00	2.11	0.00	0.00	0.00	0.47	0.00	0.00	0.00	0.00
GRAPE	8.67	7.10	9.26	21.88	19.88	7.14	11.83	22.25	18.61	11.34
FIG	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APPLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PEAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PEACH	0.00	0.00	0.73	0.02	0.44	0.00	0.55	0.09	0.00	0.00
APRICOT	3.00	4.26	0.00	0.00	0.00	4.52	0.00	0.00	0.00	1.22
CHERRY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WILDCHERRY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
POMEGRANADE	0.00	0.00	0.78	0.24	0.30	0.00	0.23	0.02	0.00	0.00
PISTACHIO	0.00	0.00	0.00	16.62	3.71	0.00	2.32	21.14	3.80	9.22
FEED CROPS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CORN-SILAGE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 5.4.32. Crop Pattern for the Districts of Gaziantep - 2010 (hectares)

	ARABAN	ISLAHIYE	KARGAMIS	KILIS	NIZIP	NURDAGI	OGUZELI	SAHINBEY	SEHITKAMIL	YAVUZELI
CEREALS	67467.6	14905.7	16210.3	11823.9	11108.9	17734.2	28056.3	8495.9	9438.0	4786.7
WHEAT	36318.9	11128.0	7614.0	9244.9	7976.1	13522.0	21619.6	7984.0	2234.4	1619.7
CORN	0.0	0.0	1369.8	47.7	687.5	0.0	1961.6	153.4	0.0	0.0
BARLEY	29998.3	3374.4	6768.5	2288.3	2161.3	4105.6	3661.5	120.4	7203.6	3166.0
RICE	0.0	0.0	568.0	19.8	285.1	0.0	813.5	63.6	0.0	0.0
RYE	1140.4	403.3	0.0	223.2	0.0	106.7	0.0	174.5	0.0	0.0
PULSES	26822.8	5159.0	9350.9	8188.5	7408.9	6061.0	16286.9	5960.4	7003.6	2832.3
CHICK PEA	26822.8	5159.0	0.0	0.0	0.0	6061.0	0.0	0.0	5660.8	2832.3
DRY BEAN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LENTIL	0.0	0.0	9350.9	8188.5	7408.9	0.0	16286.9	5960.4	1342.8	0.0
INDUSTRIAL CROPS	10074.3	380.9	259.5	31.7	137.6	479.1	605.5	5.6	0.0	227.2
COTTON	8348.5	380.9	259.5	31.7	137.6	479.1	605.5	5.6	0.0	227.2
SUGAR BEET	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOBACCO	1725.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OIL SEEDS	28316.8	7100.9	2914.8	2486.0	2038.0	8529.1	6323.4	2190.9	0.0	739.7
SUNFLOWER	1140.4	403.3	0.0	2384.5	379.7	106.7	450.3	1864.4	0.0	0.0
SOYABEAN	27176.4	6697.6	2914.8	101.5	1462.9	8422.4	4174.3	326.5	0.0	739.7
GROUNDNUT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SESAME	0.0	0.0	0.0	0.0	195.3	0.0	1698.8	0.0	0.0	0.0
TUBER CROPS	3619.6	2533.7	0.0	0.0	0.0	3186.3	0.0	0.0	0.0	98.5
POTATO	3619.6	2533.7	0.0	0.0	0.0	3186.3	0.0	0.0	0.0	98.5
ONION	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VEGETABLES	11617.8	3065.3	1543.1	365.2	797.7	3854.7	2945.0	353.8	78.8	316.2
TOMATO	0.0	0.0	727.1	25.3	364.9	0.0	1041.2	81.4	0.0	0.0
EGGPLANT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MELON	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CAULIFLOWER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WATER MELON	0.0	0.0	816.0	339.9	432.8	0.0	1903.8	272.4	78.8	0.0
CARROT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CABBAGE	3532.1	890.4	0.0	0.0	0.0	1119.6	0.0	0.0	0.0	96.1
CUCUMBER	4553.7	1284.6	0.0	0.0	0.0	1615.4	0.0	0.0	0.0	123.9
OKRA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PEPPER	3532.1	890.4	0.0	0.0	0.0	1119.6	0.0	0.0	0.0	96.1
LETTUCE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SPINACH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SQUASH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LEEK	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FRUITS & NUTS	23415.1	5158.0	3655.6	14494.4	6908.4	5502.2	9521.2	13088.4	4771.4	2504.5
OLIVE	3431.8	806.8	0.0	0.0	0.0	213.3	0.0	0.0	0.0	0.0
GRAPE	14846.7	2721.1	3142.9	8181.8	5646.3	3238.9	7542.4	6696.3	3962.0	1304.5
FIG	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
APPLE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PEAR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PEACH	0.0	0.0	246.7	8.6	123.8	0.0	353.3	27.6	0.0	0.0
APRICOT	5137.5	1630.1	0.0	0.0	0.0	2049.9	0.0	0.0	0.0	139.8
CHERRY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WILDCHERRY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
POMEGRANADE	0.0	0.0	266.0	90.1	85.1	0.0	144.1	4.7	0.0	0.0
PISTACHIO	0.0	0.0	0.0	6213.9	1054.2	0.0	1481.5	6360.7	809.5	1060.1
FEED CROPS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CORN-SILAGE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	171324.0	38303.6	33934.3	37389.7	28399.5	45346.5	63738.3	30095.1	21291.8	11604.1

Table 5.4.33. Crop Pattern for the Districts of Mardin - 2010 (% of cultivated land)

	DARGECIT	DERIK	KIZILTEPE	MERKEZ	MAZIDAGI	MIDYAT	NUSAYBIN	OMERLI	SAVUR	YESILLI
CEREALS	18.03	28.71	35.28	18.78	29.05	25.68	43.22	19.90	27.77	32.52
WHEAT	7.03	19.88	35.16	17.46	28.02	23.57	30.06	18.49	26.98	29.67
CORN	0.00	0.00	0.00	0.00	0.00	0.00	3.89	0.00	0.00	0.00
BARLEY	0.00	8.84	0.12	0.70	0.00	0.00	8.87	0.00	0.00	0.00
RICE	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.00	0.00
RYE	11.00	0.00	0.00	0.62	1.03	2.11	0.00	1.41	0.79	2.85
PULSES	7.03	14.47	23.66	8.83	15.64	20.83	22.81	18.12	14.52	24.91
CHICK PE	0.00	2.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DRY BEAN	0.00	0.37	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00
LENTIL	7.03	11.21	23.66	8.83	15.57	20.83	22.81	18.12	14.52	24.91
IND.CROP	19.53	18.26	6.93	29.77	1.94	14.41	4.35	20.58	7.86	5.85
COTTON	0.00	11.05	4.19	14.06	1.94	0.00	2.63	0.00	7.86	0.00
SUGAR BE	0.00	7.21	2.74	9.18	0.00	0.00	1.72	0.00	0.00	0.00
TOBACCO	19.53	0.00	0.00	6.53	0.00	14.41	0.00	20.58	0.00	5.85
OIL SEED	11.00	13.15	12.90	15.61	12.29	2.11	4.48	1.41	11.76	2.85
SUNFLOWE	11.00	2.10	0.24	1.18	11.01	2.11	1.39	1.41	8.43	2.85
SOYABEAN	0.00	9.88	3.75	12.58	0.82	0.00	2.35	0.00	3.34	0.00
GROUNDNU	0.00	0.27	0.00	0.00	0.45	0.00	0.00	0.00	0.00	0.00
SESAME	0.00	0.91	8.91	1.86	0.00	0.00	0.73	0.00	0.00	0.00
TUBER CR	0.00	2.38	0.90	3.03	0.00	0.00	0.96	0.00	0.00	0.00
POTATO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ONION	0.00	2.38	0.90	3.03	0.00	0.00	0.96	0.00	0.00	0.00
VEGETABL	0.00	5.60	1.73	5.03	1.07	2.60	6.72	0.37	2.20	4.75
TOMATO	0.00	2.51	0.95	3.19	0.00	0.00	0.60	0.00	0.00	0.00
EGGPLANT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MELON	0.00	1.78	0.55	1.47	0.00	0.00	0.28	0.00	0.00	0.00
CAULIFLO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WATER ME	0.00	1.31	0.23	0.37	0.90	2.60	5.54	0.37	1.49	4.75
CARROT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CABBAGE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CUCUMBER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OKRA	0.00	0.00	0.00	0.00	0.00	0.00	0.31	0.00	0.00	0.00
PEPPER	0.00	0.00	0.00	0.00	0.18	0.00	0.00	0.00	0.71	0.00
LETTUCE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SPINACH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SQUASH	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LEEK	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FRUITS &	44.40	16.14	18.11	17.30	40.00	34.37	17.02	39.62	35.88	29.11
OLIVE	44.40	0.00	0.00	8.58	0.00	34.11	0.00	39.62	0.00	29.11
GRAPE	0.00	7.33	16.69	4.10	17.86	0.26	10.00	0.00	14.82	0.00
FIG	0.00	0.40	0.01	0.06	0.00	0.00	0.10	0.00	0.00	0.00
APPLE	0.00	1.37	0.00	0.00	0.23	0.00	0.00	0.00	0.00	0.00
PEAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PEACH	0.00	0.02	0.01	0.02	0.00	0.00	0.31	0.00	0.00	0.00
APRICOT	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CHERRY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WILDCHER	0.00	2.75	1.05	3.51	0.00	0.00	0.66	0.00	0.00	0.00
POMEGRAN	0.00	0.00	0.00	0.00	0.00	0.00	2.31	0.00	0.00	0.00
PISTACHI	0.00	4.12	0.36	1.03	21.92	0.00	3.66	0.00	21.06	0.00
FEED CRO	0.00	1.29	0.49	1.65	0.00	0.00	0.43	0.00	0.00	0.00
CORN-SIL	0.00	1.29	0.49	1.65	0.00	0.00	0.43	0.00	0.00	0.00

Table 5.4.34. Crop Pattern for the Districts of Mardin - 2010 (hectares)

	DARGECIT	DERIK	KIZILTEPE	MERKEZ	MAZIDAGI	MIDYAT	NUSAYBIN	OMERLI	SAVUR	YESILLI
CEREALS	174.1	2264.4	1566.5	654.1	592.7	473.1	1596.4	152.9	468.8	183.2
WHEAT	67.9	1567.6	1561.1	608.0	571.7	434.2	1110.6	142.0	455.5	167.2
CORN	0.0	0.0	0.0	0.0	0.0	0.0	143.6	0.0	0.0	0.0
BARLEY	0.0	696.8	5.4	24.5	0.0	0.0	327.5	0.0	0.0	0.0
RICE	0.0	0.0	0.0	0.0	0.0	0.0	14.7	0.0	0.0	0.0
RYE	106.2	0.0	0.0	21.6	21.0	39.0	0.0	10.8	13.3	16.1
PULSES	67.9	1140.9	1050.8	307.4	319.2	383.7	842.8	139.2	245.1	140.4
CHICK PE	0.0	227.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DRY BEAN	0.0	29.6	0.0	0.0	1.6	0.0	0.0	0.0	0.0	0.0
LENTIL	67.9	884.2	1050.8	307.4	317.6	383.7	842.8	139.2	245.1	140.4
IND.CROP	188.5	1440.1	307.7	1036.7	39.6	265.4	160.8	158.0	132.7	33.0
COTTON	0.0	871.3	186.2	489.7	39.6	0.0	97.3	0.0	132.7	0.0
SUGAR BE	0.0	568.7	121.5	319.6	0.0	0.0	63.5	0.0	0.0	0.0
TOBACCO	188.5	0.0	0.0	227.3	0.0	265.4	0.0	158.0	0.0	33.0
OIL SEED	106.2	1037.4	572.7	543.6	250.6	39.0	165.6	10.8	198.6	16.1
SUNFLOWE	106.2	165.7	10.7	41.0	224.7	39.0	51.5	10.8	142.2	16.1
SOYABEAN	0.0	779.2	166.5	437.9	16.8	0.0	87.0	0.0	56.3	0.0
GROUNDNU	0.0	20.9	0.0	0.0	9.2	0.0	0.0	0.0	0.0	0.0
SESAME	0.0	71.6	395.6	64.7	0.0	0.0	27.1	0.0	0.0	0.0
TUBER CR	0.0	187.7	40.1	105.5	0.0	0.0	35.3	0.0	0.0	0.0
POTATO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ONION	0.0	187.7	40.1	105.5	0.0	0.0	35.3	0.0	0.0	0.0
VEGETABL	0.0	441.6	76.8	175.1	21.9	47.9	248.3	2.9	37.2	26.8
TOMATO	0.0	197.6	42.2	111.1	0.0	0.0	22.1	0.0	0.0	0.0
EGGPLANT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MELON	0.0	140.6	24.4	51.3	0.0	0.0	10.2	0.0	0.0	0.0
CAULIFLO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WATER ME	0.0	103.4	10.2	12.8	18.3	47.9	204.6	2.9	25.2	26.8
CARROT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CABBAGE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CUCUMBER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OKRA	0.0	0.0	0.0	0.0	0.0	0.0	11.4	0.0	0.0	0.0
PEPPER	0.0	0.0	0.0	0.0	3.6	0.0	0.0	0.0	12.0	0.0
LETTUCE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SPINACH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SQUASH	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LEEK	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FRUITS &	428.7	1272.8	804.3	602.5	816.1	633.1	628.9	304.3	605.7	164.0
OLIVE	428.7	0.0	0.0	298.9	0.0	628.3	0.0	304.3	0.0	164.0
GRAPE	0.0	578.2	741.3	142.8	364.3	4.8	369.3	0.0	250.2	0.0
FIG	0.0	31.8	0.5	2.1	0.0	0.0	3.7	0.0	0.0	0.0
APPLE	0.0	107.9	0.0	0.0	4.6	0.0	0.0	0.0	0.0	0.0
PEAR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PEACH	0.0	1.4	0.3	0.8	0.0	0.0	11.3	0.0	0.0	0.0
APRICOT	0.0	11.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CHERRY	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WILDCHER	0.0	217.2	46.4	122.1	0.0	0.0	24.2	0.0	0.0	0.0
POMEGRAN	0.0	0.0	0.0	0.0	0.0	0.0	85.2	0.0	0.0	0.0
PISTACHI	0.0	325.2	15.8	35.8	447.1	0.0	135.1	0.0	355.5	0.0
FEED CRO	0.0	102.1	21.8	57.4	0.0	0.0	16.0	0.0	0.0	0.0
CORN-SIL	0.0	102.1	21.8	57.4	0.0	0.0	16.0	0.0	0.0	0.0
TOPLAM	965.4	7886.9	4440.7	3482.3	2040.1	1842.1	3694.0	768.1	1688.1	563.5

Table 5.4.35. Crop Pattern for the Districts of Siirt - 2010 (% of cultivated land)

	AYDINLAR	BAYKAN	ERUH	KURTALAN	PERVARI	SIRVAN	MERKEZ
CEREALS	28.51	22.69	29.46	36.41	24.33	25.26	24.53
WHEAT	21.05	11.25	5.68	20.55	11.57	17.22	14.90
CORN	0.00	0.00	0.00	0.00	0.00	0.00	0.00
BARLEY	0.00	0.00	8.57	14.27	2.25	2.11	0.00
RICE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RYE	7.46	11.43	15.21	1.59	10.52	5.93	9.63
PULSES	21.05	10.78	8.46	19.19	13.14	11.72	13.41
CHICK PEA	0.00	0.00	6.00	10.66	1.57	1.48	0.00
DRY BEAN	0.00	0.00	0.00	0.00	0.00	0.18	0.00
LENTIL	21.05	10.78	2.46	8.54	11.57	10.07	13.41
INDUSTRIAL CROPS	0.00	11.26	7.28	12.10	8.93	18.95	10.52
COTTON	0.00	0.00	6.94	6.44	0.00	12.84	0.86
SUGAR BEET	0.00	0.00	0.00	3.20	0.00	0.00	0.00
TOBACCO	0.00	11.26	0.34	2.45	8.93	6.11	9.67
OIL SEEDS	7.46	11.43	18.16	8.91	10.52	12.40	9.99
SUNFLOWER	7.46	11.43	15.21	1.59	10.52	5.93	9.63
SOYABEAN	0.00	0.00	2.94	0.10	0.00	5.45	0.36
GROUNDNUT	0.00	0.00	0.00	7.22	0.00	1.02	0.00
SESAME	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TUBER CROPS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
POTATO	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ONION	0.00	0.00	0.00	0.00	0.00	0.00	0.00
VEGETABLES	0.00	0.47	0.90	1.17	0.00	1.16	1.20
TOMATO	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EGGPLANT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MELON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAULIFLOWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WATER MELON	0.00	0.47	0.27	0.57	0.00	0.00	1.13
CARROT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CABBAGE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CUCUMBER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OKRA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PEPPER	0.00	0.00	0.63	0.00	0.00	1.16	0.08
LETTUCE	0.00	0.00	0.00	0.60	0.00	0.00	0.00
SPINACH	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SQUASH	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LEEK	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FRUITS & NUTS	42.98	43.37	35.74	22.22	43.08	30.50	40.34
OLIVE	42.98	43.37	33.17	14.55	42.41	29.35	40.34
GRAPE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FIG	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APPLE	0.00	0.00	2.57	7.67	0.67	1.15	0.00
PEAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PEACH	0.00	0.00	0.00	0.00	0.00	0.00	0.00
APRICOT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CHERRY	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WILDCHERRY	0.00	0.00	0.00	0.00	0.00	0.00	0.00
POMEGRANADE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PISTACHIO	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FEED CROPS	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CORN-SILAGE	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 5.4.36. Crop Pattern for the Districts of Siirt - 2010 (hectares)

	AYDINLAR	BAYKAN	ERUH	KURTALAN	PERVARI	SIRVAN	MERKEZ
CEREALS	407.8	575.1	2887.1	13241.1	1805.2	680.3	2262.3
WHEAT	301.2	285.3	556.2	7474.8	858.2	463.8	1374.3
CORN	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BARLEY	0.0	0.0	839.8	5188.2	166.8	56.8	0.0
RICE	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RYE	106.7	289.8	1491.0	578.1	780.2	159.7	888.0
PULSES	301.2	273.2	829.1	6979.8	974.9	315.5	1236.8
CHICK PEA	0.0	0.0	587.7	3875.3	116.7	39.8	0.0
DRY BEAN	0.0	0.0	0.0	0.0	0.0	4.7	0.0
LENTIL	301.2	273.2	241.4	3104.5	858.2	271.0	1236.8
INDUSTRIAL CROPS	0.0	285.3	713.2	4398.9	662.6	510.4	970.5
COTTON	0.0	0.0	679.8	2342.4	0.0	345.8	79.2
SUGAR BEET	0.0	0.0	0.0	1163.7	0.0	0.0	0.0
TOBACCO	0.0	285.3	33.4	892.7	662.6	164.6	891.3
OIL SEEDS	106.7	289.8	1779.5	3239.9	780.2	333.9	921.6
SUNFLOWER	106.7	289.8	1491.0	578.1	780.2	159.7	888.0
SOYABEAN	0.0	0.0	288.5	37.5	0.0	146.7	33.6
GROUNDNUT	0.0	0.0	0.0	2624.3	0.0	27.5	0.0
SESAME	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TUBER CROPS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
POTATO	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ONION	0.0	0.0	0.0	0.0	0.0	0.0	0.0
VEGETABLES	0.0	12.0	88.0	426.6	0.0	31.4	111.0
TOMATO	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EGGPLANT	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MELON	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CAULIFLOWER	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WATER MELON	0.0	12.0	26.3	207.6	0.0	0.0	103.9
CARROT	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CABBAGE	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CUCUMBER	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OKRA	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PEPPER	0.0	0.0	61.6	0.0	0.0	31.4	7.2
LETTUCE	0.0	0.0	0.0	219.0	0.0	0.0	0.0
SPINACH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SQUASH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LEEK	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FRUITS & NUTS	614.9	1099.4	3502.9	8079.2	3196.7	821.3	3719.9
OLIVE	614.9	1099.4	3250.8	5291.3	3146.7	790.4	3719.9
GRAPE	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FIG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
APPLE	0.0	0.0	252.1	2787.8	50.1	30.9	0.0
PEAR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PEACH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
APRICOT	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CHERRY	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WILDCHERRY	0.0	0.0	0.0	0.0	0.0	0.0	0.0
POMEGRANADE	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PISTACHIO	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FEED CROPS	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CORN-SILAGE	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOTAL	1430.5	2534.8	9799.8	36365.4	7419.7	2692.8	9222.2

Table 5.4.37. Crop Pattern for the Districts of Sirnak - 2010 (% of cultivated land)

	BEYTUSSEBAP	CIZRE	IDIL	SILOPI	MERKEZ	ULUDERE	GUCLUKONAK
CEREALS	29.34	44.01	49.97	33.78	25.74	29.65	28.17
WHEAT	27.74	31.49	28.08	19.92	24.82	28.09	19.71
CORN	0.00	0.82	4.88	10.81	0.00	0.00	0.00
BARLEY	0.00	11.62	16.51	3.04	0.00	0.00	0.00
RICE	0.00	0.08	0.50	0.00	0.00	0.00	0.00
RYE	1.60	0.00	0.00	0.00	0.92	1.56	8.46
PULSES	12.24	27.65	27.28	11.44	15.50	12.94	19.71
CHICK PEA	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DRY BEAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LENTIL	12.24	27.65	27.28	11.44	15.50	12.94	19.71
INDUSTRIAL CROPS	0.00	0.00	0.00	28.24	0.00	0.00	0.28
COTTON	0.00	0.00	0.00	28.24	0.00	0.00	0.00
SUGAR BEET	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOBACCO	0.00	0.00	0.00	0.00	0.00	0.00	0.28
OIL SEEDS	17.10	1.39	0.79	0.38	9.86	16.71	8.46
SUNFLOWER	17.10	1.37	0.72	0.38	9.86	16.71	8.46
SOYABEAN	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GROUNDNUT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SESAME	0.00	0.02	0.07	0.00	0.00	0.00	0.00
TUBER CROPS	0.00	0.08	0.49	8.08	0.00	0.00	0.00
POTATO	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ONION	0.00	0.08	0.49	8.08	0.00	0.00	0.00
VEGETABLES	0.00	6.48	6.62	8.63	0.38	0.00	0.00
TOMATO	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EGGPLANT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
MELON	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CAULIFLOWER	0.00	0.00	0.00	1.44	0.00	0.00	0.00
WATER MELON	0.00	6.41	6.23	4.15	0.38	0.00	0.00
CARROT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CABBAGE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CUCUMBER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OKRA	0.00	0.07	0.39	0.36	0.00	0.00	0.00
PEPPER	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LETTUCE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SPINACH	0.00	0.00	0.00	2.68	0.00	0.00	0.00
SQUASH	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LEEK	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FRUITS & NUTS	41.33	20.37	14.70	6.92	48.51	40.70	43.39
OLIVE	0.00	0.00	0.00	0.00	0.00	0.00	43.39
GRAPE	16.02	14.62	8.03	5.29	19.21	16.94	0.00
FIG	0.00	0.00	0.00	0.91	0.00	0.00	0.00
APPLE	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PEAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PEACH	0.00	0.06	0.38	0.00	0.00	0.00	0.00
APRICOT	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CHERRY	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WILDCHERRY	0.00	0.00	0.00	0.00	0.00	0.00	0.00
POMEGRANADE	0.00	3.49	4.95	0.00	0.00	0.00	0.00
PISTACHIO	25.31	2.19	1.34	0.71	29.30	23.76	0.00
FEED CROPS	0.00	0.03	0.16	2.54	0.00	0.00	0.00
CORN-SILAGE	0.00	0.03	0.16	2.54	0.00	0.00	0.00

Table 5.4.38. Crop Pattern for the Districts of Sirnak - 2010 (hectares)

	BEYTUSSEBAP	CIZRE	IDIL	SILOPI	MERKEZ	ULUDERE	GUCLUKONAK
CEREALS	1488.4	8814.7	28552.0	12211.9	968.4	569.1	682.8
WHEAT	1407.2	6306.5	16042.0	7201.9	933.7	539.1	477.7
CORN	0.0	163.3	2791.1	3910.0	0.0	0.0	0.0
BARLEY	0.0	2328.1	9432.8	1100.0	0.0	0.0	0.0
RICE	0.0	16.7	286.1	0.0	0.0	0.0	0.0
RYE	81.2	0.0	0.0	0.0	34.7	30.0	205.1
PULSES	620.8	5537.3	15586.8	4134.8	583.0	248.3	477.7
CHICK PEA	0.0	0.0	0.0	0.0	0.0	0.0	0.0
DRY BEAN	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LENTIL	620.8	5537.3	15586.8	4134.8	583.0	248.3	477.7
INDUSTRIAL CROPS	0.0	0.0	0.0	10210.0	0.0	0.0	6.7
COTTON	0.0	0.0	0.0	10210.0	0.0	0.0	0.0
SUGAR BEET	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TOBACCO	0.0	0.0	0.0	0.0	0.0	0.0	6.7
OIL SEEDS	867.7	279.2	451.5	137.1	371.0	320.8	205.1
SUNFLOWER	867.7	274.3	409.1	137.1	371.0	320.8	205.1
SOYABEAN	0.0	0.0	0.0	0.0	0.0	0.0	0.0
GROUNDNUT	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SESAME	0.0	4.9	42.3	0.0	0.0	0.0	0.0
TUBER CROPS	0.0	16.4	279.7	2920.0	0.0	0.0	0.0
POTATO	0.0	0.0	0.0	0.0	0.0	0.0	0.0
ONION	0.0	16.4	279.7	2920.0	0.0	0.0	0.0
VEGETABLES	0.0	1297.1	3780.2	3120.0	14.4	0.0	0.0
TOMATO	0.0	0.0	0.0	0.0	0.0	0.0	0.0
EGGPLANT	0.0	0.0	0.0	0.0	0.0	0.0	0.0
MELON	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CAULIFLOWER	0.0	0.0	0.0	520.0	0.0	0.0	0.0
WATER MELON	0.0	1284.1	3557.6	1500.0	14.4	0.0	0.0
CARROT	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CABBAGE	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CUCUMBER	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OKRA	0.0	13.0	222.5	130.0	0.0	0.0	0.0
PEPPER	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LETTUCE	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SPINACH	0.0	0.0	0.0	970.0	0.0	0.0	0.0
SQUASH	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LEEK	0.0	0.0	0.0	0.0	0.0	0.0	0.0
FRUITS & NUTS	2096.6	4079.2	8398.5	2500.8	1825.1	781.2	1051.6
OLIVE	0.0	0.0	0.0	0.0	0.0	0.0	1051.6
GRAPE	812.7	2929.1	4589.5	1913.1	722.8	325.1	0.0
FIG	0.0	0.0	0.0	330.0	0.0	0.0	0.0
APPLE	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PEAR	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PEACH	0.0	12.6	216.2	0.0	0.0	0.0	0.0
APRICOT	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CHERRY	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WILDCHERRY	0.0	0.0	0.0	0.0	0.0	0.0	0.0
POMEGRANADE	0.0	698.4	2829.8	0.0	0.0	0.0	0.0
PISTACHIO	1283.9	439.0	763.0	257.7	1102.4	456.1	0.0
FEED CROPS	0.0	5.2	89.0	920.0	0.0	0.0	0.0
CORN-SILAGE	0.0	5.2	89.0	920.0	0.0	0.0	0.0
TOTAL	5073.5	20029.1	57137.7	36154.6	3762.0	1919.4	2423.9

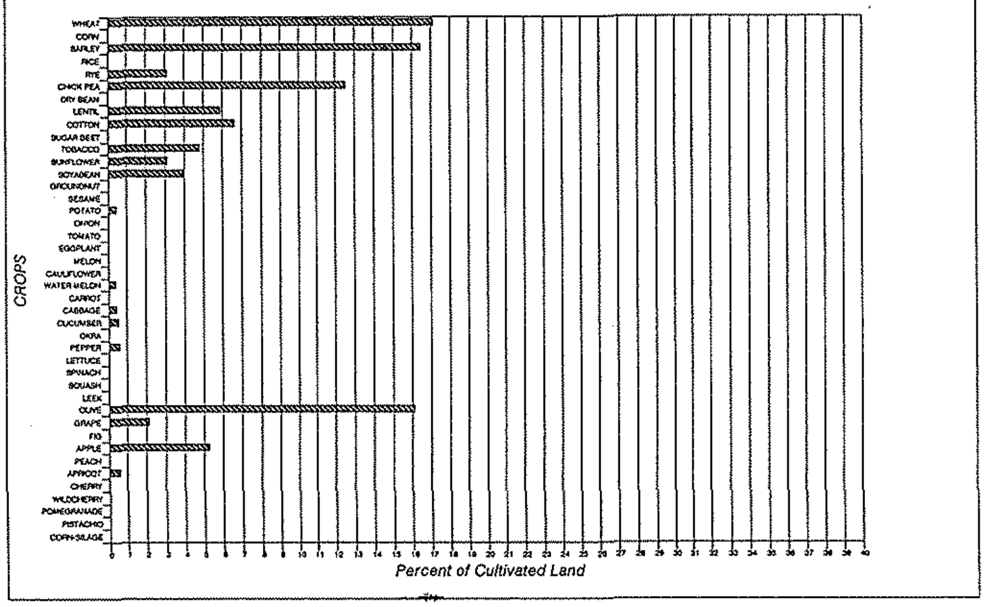
Table 5.4.39. Crop Pattern for the Districts of Sanliurfa - 2010 (%of cultivated land)

	AKCAKALE	BIRECIK	BOZOVA	CEYLANPINAR	HALFETI	HARRAN	HILVAN	SIVEREK	SURUC	MERKEZ	VIRANSEHIR
CEREALS	59.94	28.55	32.24	23.01	39.32	62.06	35.50	36.42	22.64	45.60	38.04
WHEAT	22.57	15.90	15.25	15.23	26.05	24.17	27.35	26.99	18.85	21.81	30.88
CORN	26.85	0.91	1.52	0.00	0.09	29.42	0.00	0.00	2.20	15.59	0.00
BARLEY	10.53	11.73	15.46	7.78	13.17	8.47	8.15	6.77	1.60	8.20	7.16
RICE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
RYE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.65	0.00	0.00	0.00
PULSES	9.30	14.90	13.34	11.94	22.36	8.47	18.40	18.86	5.42	11.70	22.23
CHICK PEA	0.00	0.00	0.00	0.00	0.00	0.00	2.58	4.74	0.00	0.12	1.31
DRY BEAN	0.00	0.00	0.00	0.00	0.00	0.00	3.95	3.65	0.00	0.17	2.37
LENTIL	9.30	14.90	13.34	11.94	22.36	8.47	11.87	10.47	5.42	11.41	18.55
INDUSTRIAL CROPS	3.71	13.55	22.63	26.33	1.33	0.87	17.39	5.70	32.67	10.77	5.67
COTTON	1.49	5.43	9.06	15.93	0.53	0.53	14.86	4.51	13.08	6.22	3.90
SUGAR BEET	2.23	8.13	13.56	10.40	0.80	0.35	2.53	0.00	19.59	4.54	1.77
TOBACCO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.18	0.00	0.00	0.00
OIL SEEDS	1.13	4.46	8.31	14.72	6.49	0.47	10.83	10.91	10.06	3.27	6.70
SUNFLOWER	0.01	0.38	1.50	0.05	5.41	0.00	0.12	6.00	0.24	0.71	1.61
SOYABEAN	1.12	4.08	6.81	14.25	0.40	0.47	5.99	2.33	9.83	2.19	3.04
GROUNDNUT	0.00	0.00	0.00	0.00	0.00	0.00	2.80	2.59	0.00	0.12	1.67
SESAME	0.00	0.00	0.00	0.42	0.68	0.00	1.93	0.00	0.00	0.26	0.38
TUBER CROPS	13.63	0.00	0.00	3.43	0.00	15.19	0.00	0.00	0.00	8.52	0.58
POTATO	13.63	0.00	0.00	0.00	0.00	15.07	0.00	0.00	0.00	7.99	0.00
ONION	0.00	0.00	0.00	3.43	0.00	0.11	0.00	0.00	0.00	0.53	0.58
VEGETABLES	1.49	5.45	6.80	5.96	4.43	0.98	1.39	0.93	8.56	3.61	4.97
TOMATO	0.36	1.31	2.19	3.61	0.13	0.12	0.48	0.00	3.16	1.11	0.61
EGGPLANT	0.26	0.95	1.58	0.00	0.09	0.00	0.00	0.00	2.28	0.00	0.00
MELON	0.34	2.57	2.17	1.89	3.85	0.17	0.55	0.00	1.98	1.68	1.60
CAULIFLOWER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
WATER MELON	0.00	0.20	0.17	0.46	0.32	0.23	0.00	0.93	0.14	0.14	2.76
CARROT	0.07	0.26	0.43	0.00	0.03	0.00	0.00	0.00	0.62	0.00	0.00
CABBAGE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CUCUMBER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
OKRA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PEPPER	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LETTUCE	0.03	0.11	0.18	0.00	0.01	0.00	0.00	0.00	0.26	0.00	0.00
SPINACH	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.12	0.00
SQUASH	0.42	0.00	0.00	0.00	0.00	0.46	0.00	0.00	0.00	0.25	0.00
LEEK	0.01	0.05	0.08	0.00	0.00	0.00	0.27	0.00	0.12	0.31	0.00
FRUITS & NUTS	10.80	33.09	16.69	12.73	26.06	11.89	16.31	28.18	20.65	16.05	21.50
OLIVE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.92	0.00	0.00	0.00
GRAPE	7.38	2.15	1.74	5.39	13.34	8.02	8.21	9.39	1.50	7.11	14.71
FIG	0.94	3.51	4.63	0.66	3.95	0.38	0.04	0.00	0.48	0.24	0.45
APPLE	0.00	0.00	0.00	0.00	0.00	0.00	2.52	3.34	0.00	0.11	1.41
PEAR	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PEACH	0.51	1.87	3.12	0.03	0.18	0.00	1.15	0.00	4.51	1.36	0.00
APRICOT	0.00	0.00	0.00	0.00	0.00	0.00	1.48	1.37	0.00	0.06	0.88
CHERRY	0.50	1.82	3.04	0.00	0.18	0.00	0.00	0.00	4.40	0.00	0.00
WILDCHERRY	0.00	0.00	0.00	3.97	0.00	0.13	0.00	0.00	0.00	0.61	0.67
POMEGRANADE	0.00	0.00	0.00	0.00	0.00	0.00	1.29	0.00	0.00	1.43	0.00
PISTACHIO	1.47	23.73	4.15	2.68	8.41	3.36	1.61	9.16	9.76	5.14	3.37
FEED CROPS	0.00	0.00	0.00	1.87	0.00	0.06	0.18	0.00	0.00	0.50	0.32
CORN-SILAGE	0.00	0.00	0.00	1.87	0.00	0.06	0.18	0.00	0.00	0.50	0.32

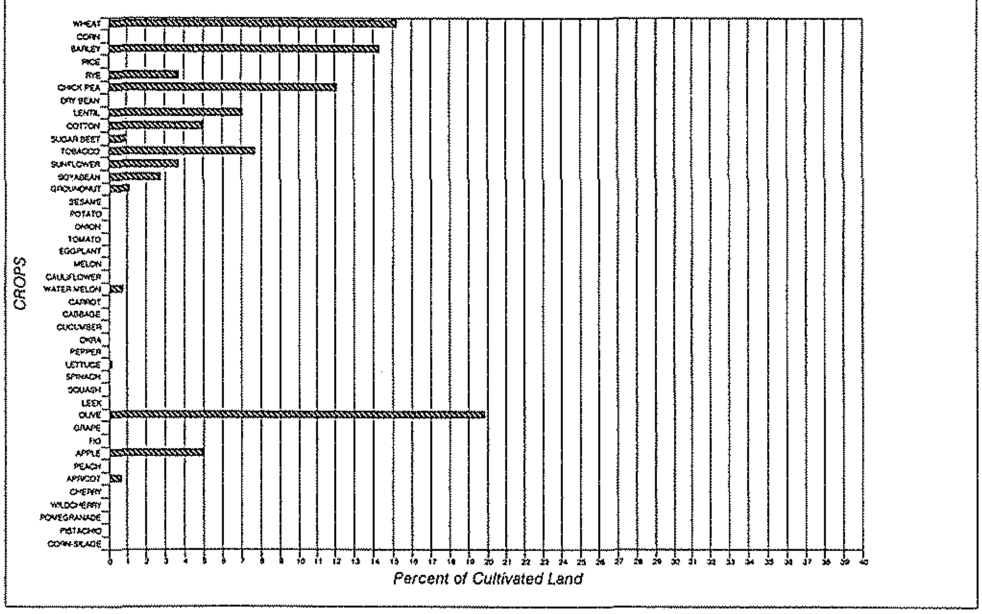
Table 5.4.40. Crop Pattern for the Districts of Sanliurfa - 2010 (hectares)

	AKCAKALE	BIRECIK	BOZOVA	CEYLANPINAR	HALFETI	HARRAN	HILVAN	SIVEREK	SURUC	MERKEZ	VIRANSEHIR
CEREALS	6142.8	862.9	1865.3	4208.6	607.9	4679.6	2802.6	7100.2	1312.2	8705.2	5087.1
WHEAT	2312.5	480.6	882.4	2785.4	402.9	1822.8	2159.4	5411.7	1092.4	4164.4	4129.2
CORN	2751.4	27.6	88.1	0.0	1.4	2218.1	0.0	0.0	127.4	2976.1	0.0
BARLEY	1078.8	354.7	894.8	1423.2	203.7	639.0	643.2	1367.2	92.5	1564.8	957.9
RICE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RYE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	331.3	0.0	0.0	0.0
PULSES	953.1	450.4	771.8	2183.8	345.8	638.8	1452.8	3781.7	313.9	2233.3	2972.2
CHICK PEA	0.0	0.0	0.0	0.0	0.0	0.0	203.8	950.2	0.0	22.1	174.9
DRY BEAN	0.0	0.0	0.0	0.0	0.0	0.0	312.0	732.6	0.0	32.5	316.3
LENTIL	953.1	450.4	771.8	2183.8	345.8	638.8	937.0	2098.9	313.9	2178.7	2481.1
INDUSTRIAL CROPS	380.3	409.7	1309.1	4816.3	20.6	66.0	1372.7	1141.9	1893.2	2055.3	757.9
COTTON	152.3	164.1	524.2	2914.2	8.3	39.9	1173.1	904.9	758.1	1187.8	521.7
SUGAR BEET	228.0	245.6	784.9	1902.2	12.4	26.1	199.7	0.0	1135.1	867.5	236.2
TOBACCO	0.0	0.0	0.0	0.0	0.0	0.0	0.0	237.0	0.0	0.0	0.0
OIL SEEDS	115.4	134.7	480.7	2692.7	100.3	35.8	855.3	2187.6	583.3	624.0	895.3
SUNFLOWER	1.0	11.5	86.9	9.8	83.6	0.1	9.7	1203.1	13.8	135.9	215.3
SOYABEAN	114.4	123.2	393.7	2606.0	6.2	35.7	472.6	466.1	569.4	418.1	405.9
GROUNDNUT	0.0	0.0	0.0	0.0	0.0	0.0	220.8	518.4	0.0	23.0	223.8
SESAME	0.0	0.0	0.0	76.9	10.5	0.0	152.3	0.0	0.0	47.1	50.2
TUBER CROPS	1396.7	0.0	0.0	627.6	0.0	1145.1	0.0	0.0	0.0	1625.6	77.9
POTATO	1396.7	0.0	0.0	0.0	0.0	1136.5	0.0	0.0	0.0	1524.9	0.0
ONION	0.0	0.0	0.0	627.6	0.0	8.6	0.0	0.0	0.0	100.7	77.9
VEGETABLES	152.8	164.7	393.4	1090.7	68.6	74.1	110.0	187.3	496.3	688.3	664.0
TOMATO	36.8	39.6	126.6	660.9	2.0	9.1	37.7	0.0	183.0	212.3	82.1
EGGPLANT	26.5	28.6	91.3	0.0	1.4	0.0	0.0	0.0	132.1	0.0	0.0
MELON	34.8	77.8	125.8	345.6	59.6	12.5	43.2	0.0	114.8	320.0	213.4
CAULIFLOWER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
WATER MELON	0.0	6.2	9.6	84.2	4.9	17.5	0.0	187.3	8.3	27.2	368.5
CARROT	7.2	7.8	24.8	0.0	0.4	0.0	0.0	0.0	35.9	0.0	0.0
CABBAGE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CUCUMBER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
OKRA	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PEPPER	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LETTUCE	3.0	3.3	10.4	0.0	0.2	0.0	0.0	0.0	15.1	0.0	0.0
SPINACH	0.0	0.0	0.0	0.0	0.0	0.0	7.9	0.0	0.0	22.1	0.0
SQUASH	43.0	0.0	0.0	0.0	0.0	35.0	0.0	0.0	0.0	47.0	0.0
LEEK	1.4	1.5	4.9	0.0	0.1	0.0	21.2	0.0	7.1	59.8	0.0
FRUITS & NUTS	1106.4	1000.4	965.8	2328.2	403.0	896.4	1287.3	5649.6	1196.7	3063.3	2875.5
OLIVE	0.0	0.0	0.0	0.0	0.0	0.0	0.0	986.0	0.0	0.0	0.0
GRAPE	765.8	65.1	100.8	985.2	206.3	604.5	648.4	1883.0	87.2	1357.7	1967.6
FIG	96.0	106.2	268.0	121.4	61.0	28.5	3.5	0.0	27.7	46.2	60.4
APPLE	0.0	0.0	0.0	0.0	0.0	0.0	199.1	669.6	0.0	21.1	188.3
PEAR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
PEACH	52.5	56.6	180.7	4.8	2.8	0.1	90.9	0.0	261.4	256.9	0.6
APRICOT	0.0	0.0	0.0	0.0	0.0	0.0	116.6	273.9	0.0	12.1	118.3
CHERRY	51.2	55.1	176.2	0.0	2.8	0.0	0.0	0.0	264.8	0.0	0.0
WILDCHERRY	0.0	0.0	0.0	726.4	0.0	10.0	0.0	0.0	0.0	116.5	90.2
POMEGRANADE	0.0	0.0	0.0	0.0	0.0	0.0	101.9	0.0	0.0	272.1	0.0
PISTACHIO	150.9	717.3	240.1	490.4	130.0	253.4	126.7	1837.1	565.7	980.7	460.2
FEED CROPS	0.0	0.0	0.0	341.5	0.0	4.7	14.4	0.0	0.0	95.4	42.4
CORN-SILAGE	0.0	0.0	0.0	341.5	0.0	4.7	14.4	0.0	0.0	95.4	42.4
TOTAL	10247.4	3022.8	5786.1	18289.5	1646.2	7640.4	7895.2	20048.5	5795.6	19090.4	13372.4

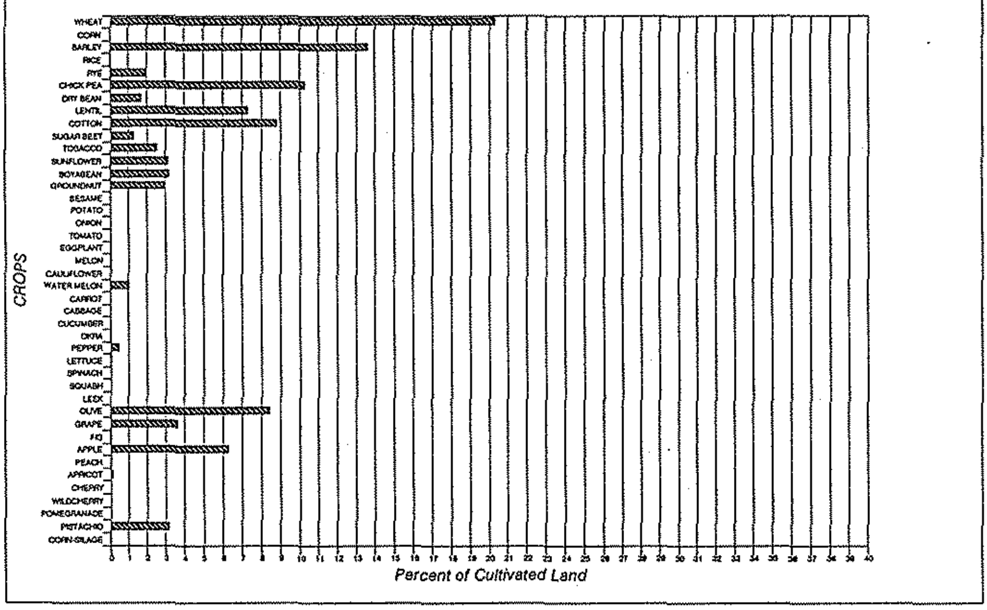
F. 5.4.51 Projected Crop Pattern 2010
ADIYAMAN (% of cultivated land)



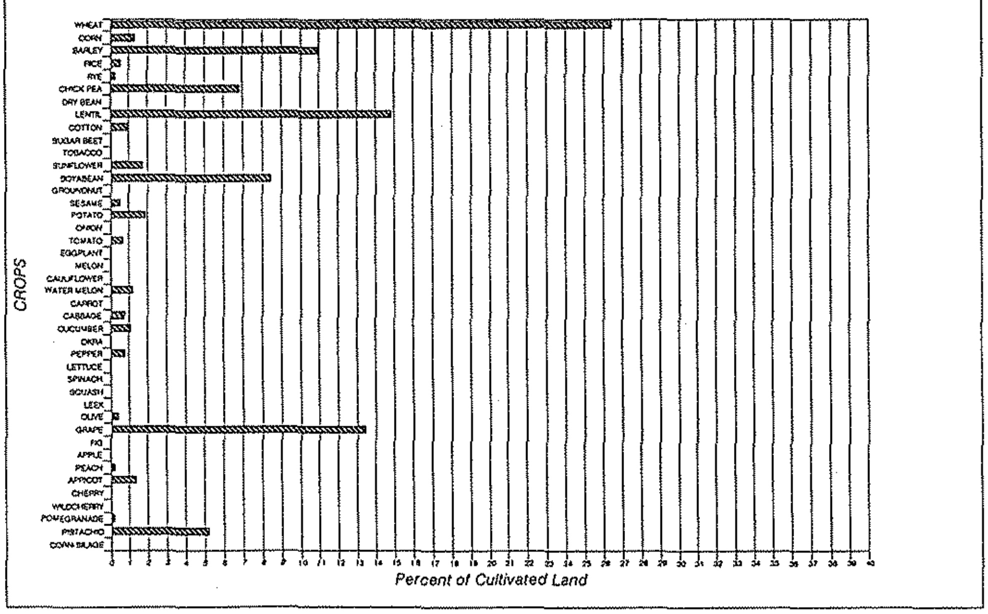
F. 5.4.52 Projected Crop Pattern 2010
BATMAN (% of cultivated land)

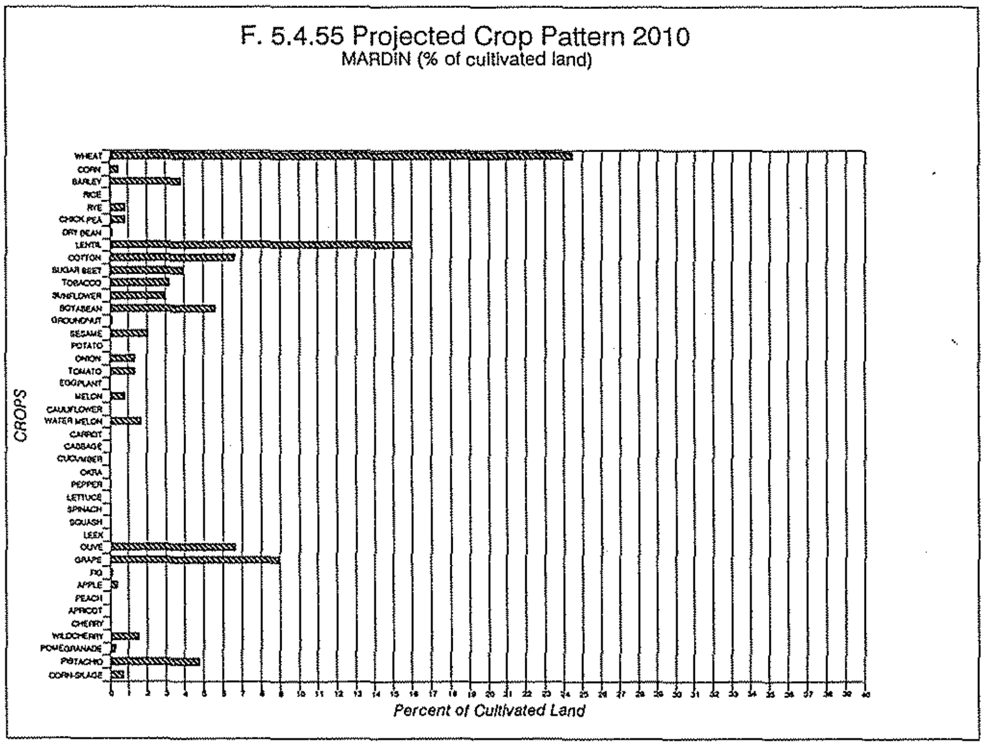


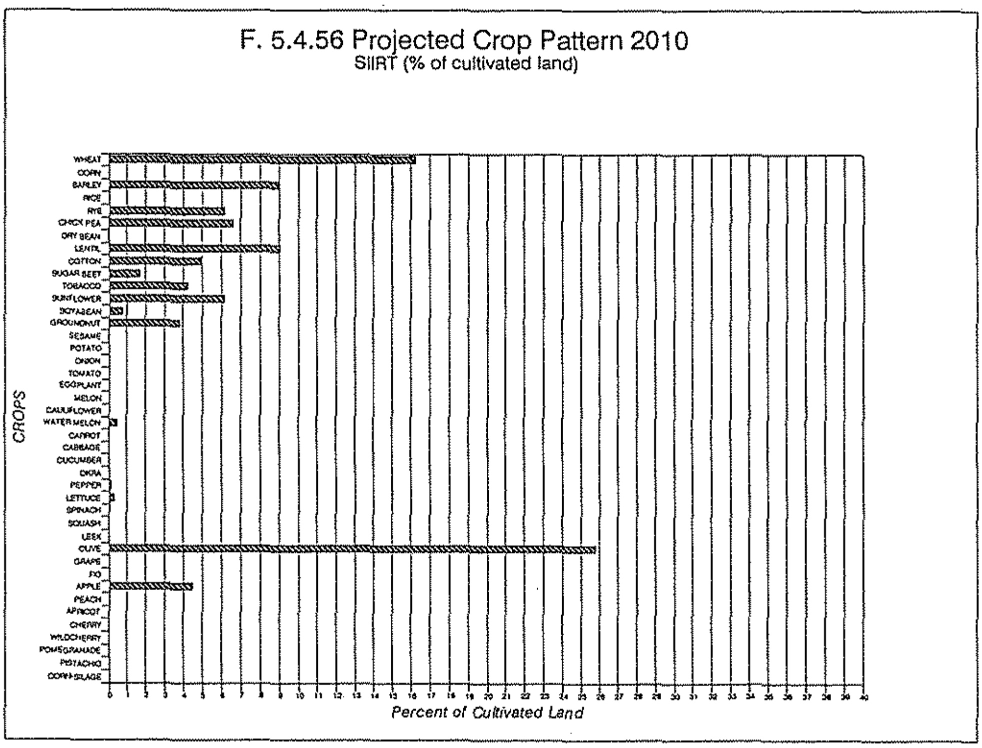
F. 5.4.53 Projected Crop Pattern 2010
DIYARBAKIR (% of cultivated land)



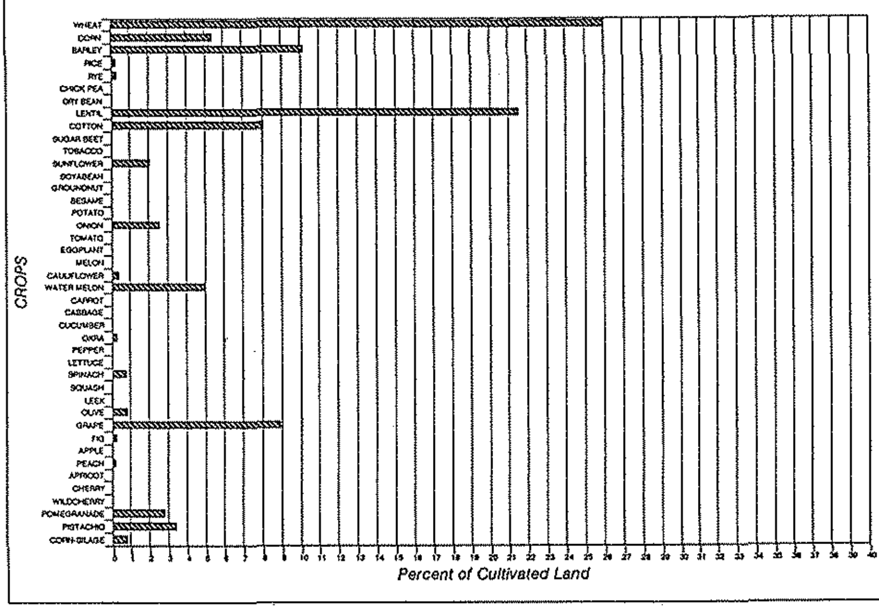
F. 5.4.54 Projected Crop Pattern 2010
GAZIANTEP (% of cultivated land)



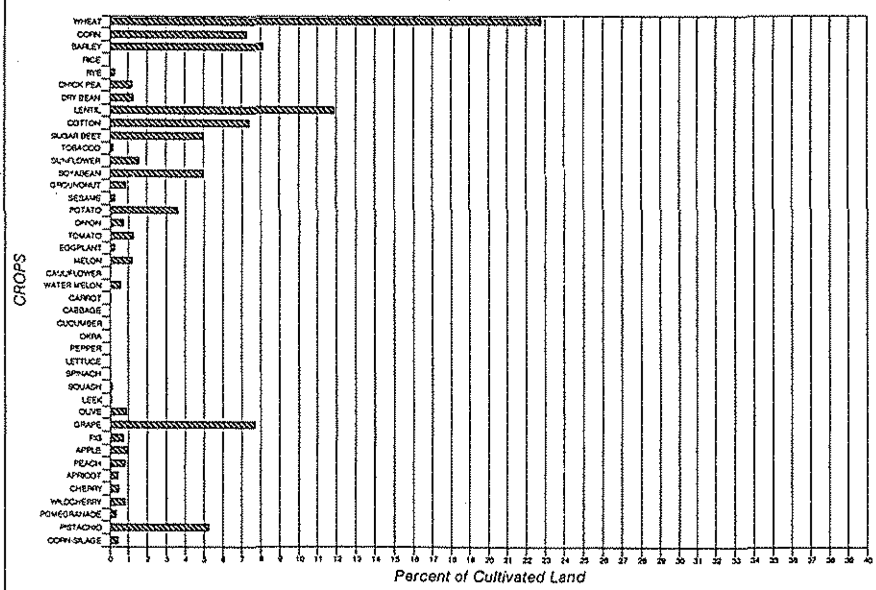

F. 5.4.55 Projected Crop Pattern 2010
MARDIN (% of cultivated land)
CROPS
Percent of Cultivated Land


F. 5.4.56 Projected Crop Pattern 2010
SIIRT (% of cultivated land)
CROPS
Percent of Cultivated Land

F. 5.4.57 Projected Crop Pattern 2010
SIRNAK (% of cultivated land)



F. 5.4.58 Projected Crop Pattern 2010
SANLIURFA (% of cultivated land)



5.4.4 Technical Evaluation of the Projects With Respect to Irrigation

Apart from the general analysis of the Projects in terms of the crop pattern and land intensity, it is necessary to evaluate them with respect to irrigation. The following discussion intends to fulfill this purpose and refers to the Tables presented in the Appendix 5B. First, the results of the base run to the year 2010 will be analyzed. Then the simulations with low project efficiency and low availability of the irrigated land will be used in formulating recommendations with respect to irrigation.

5.4.4.1 Base Projection to 2010

The results of the base projection to 2010 show (Appendix 5B) that the annual water use (ANWAT-USE) ranges from 47.2% to 100%, and the monthly peak water use (PKWAT-USE) from 33.5% to 100%. This situation implies that 9 irrigation projects are facing irrigation water deficit (mainly with respect to annual water supply) despite the fact that unrealistic high project irrigation efficiencies (Ep) of the Master Plan (see section 5A.6 and Table A4) have been applied. The average land use (PRLND-USE which is calculated as the weighted average of all three land classes over all months of a year) of the projects in the North is 68.9% and that of the projects in the South is 67.0%. In this part of the study the cropping intensity is defined as the sum of the weighted average land use of June to August (SUMMER-AVG) and of December to February (appendix 5B, Table DNS). This definition seems to be more applicable than just taking the weighted average of annual land use multiplied by 2, as in this case the perennials are not so much dominating the value. So the maximum cropping intensity is 200%, assuming that in general a summer and a winter crop can be grown. In the base projection the average cropping intensity of the projects in the North is 133% (range: 128% to 141%) and that of the Southern projects is 127% (range: 118% to 137%). The cropping patterns are rather diversified, consisting in the North of 7 to 11 and in the South of 8 to 18 different crops, mainly field crops but also vegetables and perennials. The weighted gross revenue for all irrigation projects is 3082 $/ha. It ranges from 1932 to 2783 $/ha with an average of 2267 $/ha for the projects in the North. The range for the projects in the South is 2276-4643 $/ha with an average of 3519 $/ha. These rather high differences between North and South are mainly caused by the distribution of the land classes and to a minor extent by the different water requirements (Table A3) and partly by the different water supply situation (See Appendix 5A). Comparing the gross revenues per hectare of the irrigation projects with those of the respective rainfed areas it is obvious that, especially in the North, some irrigation projects may not be economically viable, particularly not if the higher production cost under irrigated conditions are taken into account. So it is of outstanding importance to improve the water supply situation and/or to reduce the irrigable area.

5.4.4.2 Base Projection to 2010 With Reduced Ep Values

Another projection to 2010 has been conducted using all of the input data submitted by DSI but reducing the Ep values to a realistic level. The Ep values have been decreased by 15 percentage points (reasons are explained in Appendix 5A.5), all other conditions are identical to base projection. These reduction in the Ep-values of 35% mean that the irrigation water available for the crops is reduced by approximately 30%. The results of the reduced Ep show (Appendix 5B) that all irrigation projects face a water deficit as the annual water use (ANWAT-USE) is 100% and the shadow price for annual water supply (SHDPRI-TOW) ranges from 58 to 95 $/1000m3. In addition, the monthly peak water use (PKWAT-USE) is also 100% for two projects, but as the shadow price for this peak water (SHDPRI-PKW) is only 7 and 22 $/1000m3, this deficit is not as severe as that of the annual supply. As a consequence of the irrigation water deficit, the average land use (LAND-USE) has decreased for seven projects, resulting in a lower average land use for the projects in the North of 62.8% (6.1% points lower) and for the projects in the South of 65.0% (2.0% point lower), compared to the base projection.

The average cropping intensity of the North and South projects decreases to 117% and 122% respectively (an overall decrease of 11%-points).

The cropping patterns of the irrigation projects are nearly as diversified as those of the base projection. Altogether there are 36 different crops: 14 field crops, 14 vegetables and 8 perennials; again the projects in the North have less crops than those in the South.

The weighted gross revenue for all irrigation projects decreased by 10.0%, whereas it increased for all rainfed regions (Appendix 5B), as more land is cropped because of the water deficits in all irrigation projects. Three project areas in the North have lower per hectare gross revenue than the medium rain zone in the North, whereas in the South the lowest revenue per hectare is better than the medium rain zone in the South.

5.4.4.3 Base Projection to 2010 With Reduced Irrigated Area

Another simulation has been conducted to find out more about the impact of water availability. The available water has been increased by 30%. As it seems unrealistic to assume that this additional water can be made available, instead of this, the irrigable areas of all projects have been reduced by 30%, which has the same effect concerning water supply per hectare. So for this simulation, all other conditions are identical to the base projection. It has to be mentioned that, to find out more about the irrigation projects, the decline in the irrigated area has not been added to the respective rainfall zones.

The results (Appendix 5B) indicate that the annual monthly peak water use for none of the projects reached 100%. As the annual water use fluctuates between 56% and 96% and monthly peak water use between 47% and 92%, it has to be concluded that the water supply degree per ha is quite different for each project in GAP. Moreover, as for most projects the monthly peak water use is considerably lower than the annual water use (up to 26.8%-points for Batman-Silvan), the monthly peak water supply can be relatively reduced until monthly peak water use is identical to the annual water use. Only for three projects (Dicle, Suruc-Baziki and Silopi) the monthly peak water supply should be relatively increased. After these suggested modifications of the monthly peak supply data, the maximum net irrigable areas by DSI should be modified in accordance with the annual water use. This would mean that the irrigable areas of nine projects have to be reduced (all projects with annual water use of less than 70%), whereas the irrigable areas of two projects can be increased, if more irrigable land is available. But it is strongly recommended to take into account additionally, the reduced Ep simulation, unless more reliable information become available on project efficiencies which can be realistically expected for the GAP projects (e.g. from ongoing studies).

Since more water per hectare is available, the average land use for the Northern projects increased to 74.6% (up by 5.8%-points compared to base projection). For the Southern projects an improvement of 3.7%-points can be observed, bringing the average land use for the South to 70.6%. The average of all irrigation projects increased from 67.9% to 72.6% compared to the base projection.

Similarly like the increase of the average land use, an improvement of the average cropping intensity can be realized: The average of the projects in the North goes up to 145%. The overall average of all irrigation projects improved from 130% to 141%, which is the influence of additional water supply situation.

The cropping patterns of the irrigation projects are as diversified as those of the base projection: Altogether, there are 36 different crops, i.e. 14 field crops, 14 vegetables and 8 perennials.

The weighted gross revenue of all irrigation projects increases by 27.3% compared to the base projection, although the cropping intensity increased by only 8.4%. This clearly shows the influence of the improved water supply situation. For the Northern irrigation projects the weighted gross revenues range from 2366 to 3612 $/ha with an average of 2874 $/ha, and for the Southern projects the range is 3693-5463 $/ha. Hence , the irrigation projects in the South are more profitable than those in the North. It is still questionable whether all projects in the North are economically feasible.

5.4.4.4 Evaluation of the Model Results for the 1995, 2000, and 2005

To find the influence of the stepwise implementation of the irrigation projects additional model projection for the years 1995, 2000, and 2005 have been conducted. As it was the intention to use all the input data as submitted by DSI without any modification (no reduction of maximum net irrigable areas, no modification of monthly peak water supplies, and no reduction of the Ep-values), all technical conditions and restrictions are identical to the base projection.

The results of these in-between period projections show that the cropping patterns in 1995 are less diversified than 2010. Altogether there are 24 different crops in the projects, 7 field crops, 13 vegetables and 4 perennials (Table 5A.1.7). The low number of field crops may be caused by the large rainfed areas still available (e.g. all wheat is grown in rainfed zones). Wheat first appears under irrigated conditions in 2005.

The average land use of the irrigation projects in 1995 is lower than 2010, especially for the Northern projects, where it decreases by 10.4%-points to only 58.4% (Table 5A.1.15). But, in 2000, it reaches 67.7% (North) and in 2005, 67.5% (North), and 64.8% (South) with an overall average of 66.2% compared to 67.9% in 2010.

The annual water use in 1995 and 2000 for all irrigation projects is 100% (Tables 5A.1.15 and 5A.2.15) which means that all projects have to face water deficit. The Importance of this water deficit is indicated by the shadow price for the annual water supply (SHDPRI-TOW), so it is most severe in 1995, slightly decreasing in 2000. It is just at the margin for six projects in 2005. This means that it is advisable to develop the irrigable areas up to 2000 not to their full extent (but already full water supply) to avoid water shortages and to extend the irrigable areas of the projects in 2005 when the average water use per hectare becomes lower because of a somewhat different crop pattern (the water saving winter crop wheat appears for the first time in the cropping pattern). The water deficits are not consistent for several projects, but it seems to be lowest for 6 projects (Adiyaman-Kahta, Garzan, Suruc-Baziki, Gaziantep, Nusaybin-Cizre-Idil, Silopi), especially after the year 2000, whereas it seems to be highest for Adiyaman, Goksu-Araban, Batman, Batman-Silvan, Urfa-Harran, Mardin-Ceylanpinar and Bozova Projects.

The monthly peak water use is 100% for seven projects in 1995, for four projects in 2000, for still three projects in 2005 and 2010, showing water shortages during the peak months in summer. With respect to this aspect the projects Garzan, Batman, Garzan-Silvan, Urfa-Harran, Mardin-Ceylanpinar, Gaziantep, Nusaybin-Cizre-Idil Projects never have to face problems.

The gross revenues per hectare of all irrigation projects are higher than those of the respective rainfed zones, since their years of implementation and later on, with the exception of project Batman-Silvan in 2010 (Table 17 of the series 5A.1 to 5A.4). Other problematic projects with only slightly higher gross revenues per hectare are Adiyaman-Kahta, Adiyaman-Goksu-Araban and Garzan Projects. The situation for the Southern projects is much more promising, with respect to absolute gross revenues per hectare and especially in comparison to their rainfed zones.

5.4.4.5 Recommendations with Respect to Irrigation

The results of the crop pattern model indicate valuable relationships with respect to the irrigation projects planned and/or already in construction in the GAP Region.

Since the Hancagiz project as a sub-project of the Gaziantep project is already in operation, and the Urfa-Harran and Batman projects will become operational in 1993, and Dicle project in 1994, these projects can hardly be changed basically. As all these projects will face a water shortage during the first decade, even if the optimistic irrigation efficiencies are reached, all technically possible steps should be taken to increase the irrigation efficiency. For these projects lined field canals should be provided, gate pipes should be introduced, and a perfect land grading and levelling has to be conducted. In favorable areas sprinkler and drip irrigation should be supported. But, the efficiency which can be reached should not be overestimated. Only under the most promising conditions: light soils, application depth of 25mm, a flow rate of 40 l/s per hectare an application efficiency (Ea) of 80% can be reached (on heavy soils, but other factors at the optimum Ea is only 70%). For a farm size of 5 ha. the field canal efficiency (Eb) is 90%. If the irrigable area is 5000 ha. the conveyance efficiency (Ec) is 80%. The application efficiency for drip systems ranges from 60 to 90%. Eb and Ec are similar to those of the sprinkler systems.

The possibilities of groundwater use should be explored in addition to the surface water.

In addition to the technical measures, an efficient extension service has to be developed, intensive training of the farmers is essential.

The irrigable area of the Dicle project should not be developed to the planned extent (but design supply should be provided from the very beginning). An extension of the irrigable area after 10 years should be based on the experience during these years. The projects implemented first should be used to evaluate their performance intensively so that the results can be used for the future next projects (the different irrigation efficiencies should be really measured).

The plans of the other projects should be modified based on modern and realistic planning methods: Penman-Monteith for the estimation of crop water requirements in combination with the crop coefficients published by FAO.

On the other hand, if all these costly investment costs have been spent, there should be a certain pressure on the farmers within the developed areas to really use the irrigation water provided. The water charges could be modified in such a way that all farmers have to pay a flat rate whether they irrigate or not. On top of this a rate which depends on the crops irrigated could be charged. But the precondition is that the water needed by the farmers can be really provided by DSI.

The initial irrigation projects in the GAP Region will form the yardstick which will be used by the farmers in the region to find out what they can expect during the next decades.

5.4.5 TURGAP Scenarios

5.4.5.1 Introduction

Following scenarios are conducted with TURGAP for year 2010:

1. *Scenario B2010* : Base run for 2010
2. *Scenario G2010* : Assumes that GATT negotiation lead to full liberalization of trade and removal of subsidies in agriculture. The world trade prices to emerge from full liberalization and trade potentials for Turkey estimated by the WTM are employed to reposition export demand and import supply functions employed by TURGAP.
3. *Scenario D2010* : Assumes that the income growth rate between 1988 and 2010 is 3.5 percent per year instead of the assumed 3 percent in the base scenario and the population growth rate per year is 2.1 percent per year as is the case at present instead of the more optimistic assumption of 1.9 percent per year assumed in the base runs.
4. *Scenario I2010* : Assumes that the irrigable area in each of the project regions is 30 percent less than the irrigable area specified in the base runs which were based on the DSI calculations.
5. *Scenario E2010* : Assumes that the project efficiencies in all projects are 15 percentage points less than the base, to simulate the likely effects of less water availability.
6. *Scenario T2010* : Assumes no additional transport costs for the GAP Region relative to the rest of Turkey. Thus the region is assumed not to be in an advantageous or disadvantageous position due to the geographical location of production. This therefore is the base run with no transportation costs. The results of the scenarios are presented in Tables 5.4.41 - 5.4.48.

Table 5.4.41: Macro Implications of TURGAP Scenarios (2010)

Indicators	BASE	GATT FULL LIBER.	HIGHER DOMESTIC DEMAND	LOWER PROJECT EFFICIENCY	LOWER IRRIGABLE LAND	NO TRANSPORT COST
Consumer Surplus(Bil.$)	72.38	76.05	79.18	71.95	72.28	73.02
Producer Surplus(Bil.$)	48.00	51.39	65.54	48.33	47.95	48.00
TOTAL SURPLUS	120.38	127.44	144.72	120.28	120.23	121.02
GAP Crop Value(Bil.$)	6.49	5.36	7.88	6.42	6.01	9.31
ROT Crop Value(Bil.$)	33.82	25.20	41.23	34.29	34.31	31.29
TURKEY CROP VALUE	40.31	30.56	49.11	40.71	40.32	40.60
SHARE OF GAP IN TURKEY	0.16	0.18	0.16	0.16	0.15	0.23
Turkey Livestock Value(Bil.$)	35.53	41.84	47.04	35.53	35.53	35.53
TURKEY TOTAL VALUE	75.84	72.4	96.15	76.24	75.85	76.13
GAP Crop Volume(Bil.$)	4.03	3.89	4.20	3.88	3.62	5.56
ROT Crop Volume(Bil.$)	18.65	17.31	19.90	18.72	18.94	17.74
TURKEY CROP VOLUME	22.68	21.20	24.10	22.60	22.56	23.30
SHARE OF GAP IN TURKEY	0.18	0.18	0.17	0.17	0.16	0.24
Turkey Livestock Volume(Bil.$)	11.12	10.75	11.14	11.12	11.12	11.13
TURKEY TOTAL VOLUME	33.80	31.95	35.24	33.72	33.68	34.43
Total Trade Value(Bil.$)	3.06	5.36	2.39	3.03	2.93	3.54
GAP Labour Use(Bil.Hours)	1.14	1.09	1.20	1.20	1.07	1.24
ROT Labour Use(Bil.Hours)	10.51	10.43	10.90	10.51	10.60	10.40
TURKEY LABOUR USE	11.65	11.52	12.10	11.71	11.67	11.64
GAP Machine Use(Mil.Hours)	45.76	43.70	47.66	41.98	39.22	42.66
ROT Machine Use(Mil.Hours)	252.27	248.12	264.97	258.64	260.14	261.63
TURKEY MACHINE USE	298.03	291.82	312.63	300.62	299.36	304.29
Nitrogen Use(Mil.Tons)	1.14	1.40	1.42	1.37	1.34	1.42
Phosphate Use(Mil.Tons)	0.42	0.88	0.87	0.88	0.82	0.89

Table 5.4.42: Indices of Macro Implications of TURGAP Scenarios (2010)

Indicators	BASE	GATT FULL LIBER.	HIGHER DOMESTIC DEMAND	LOWER PROJECT EFFICIENCY	LOWER IRRIGABLE LAND	NO TRANSPORT COST
Consumer Surplus	100.00	105.07	109.39	99.41	99.86	100.88
Producer Surplus	100.00	107.06	136.54	100.69	99.90	100.00
TOTAL SURPLUS	100.00	105.86	120.22	99.92	99.88	100.53
GAP Crop Value	100.00	82.59	121.42	98.92	92.60	143.45
ROT Crop Value	100.00	74.51	121.91	101.39	101.45	92.52
TURKEY CROP VALUE	100.00	75.81	121.83	100.99	100.02	100.72
SHARE OF GAP IN TURKEY	100.00	108.94	99.66	97.95	92.58	142.43
Turkey Livestock Value	100.00	117.76	132.40	100.00	100.00	100.00
TURKEY TOTAL VALUE	100.00	95.46	126.78	100.53	100.01	100.38
GAP Crop Volume	100.00	96.53	104.22	96.28	89.83	137.97
ROT Crop Volume	100.00	92.82	106.70	100.38	101.55	95.12
TURKEY CROP VOLUME	100.00	93.47	106.26	99.65	99.47	102.73
SHARE OF GAP IN TURKEY	100.00	103.26	98.08	96.62	90.30	134.29
Turkey Livestock Volume	100.00	96.67	100.18	100.00	100.00	100.09
TURKEY TOTAL VOLUME	100.00	94.53	104.26	99.76	99.64	101.86
Total Trade Value	100.00	175.16	78.10	99.02	95.75	115.69
GAP Labour Use	100.00	95.61	105.09	105.26	93.86	108.93
ROT Labour Use	100.00	99.24	103.71	100.00	100.86	98.95
TURKEY LABOUR USE	100.00	98.89	103.85	100.52	100.17	99.93
GAP Machine Use	100.00	95.50	104.15	91.74	85.71	93.23
ROT Machine Use	100.00	98.35	105.03	102.53	103.12	103.71
TURKEY MACHINE USE	100.00	97.92	104.90	100.87	100.45	102.10
Nitrogen Use	100.00	122.81	124.56	120.18	117.54	124.56
Phosphate Use	100.00	209.52	207.14	209.52	195.24	211.90

Table 5.4.43: Simulated Market Balances for 2010 (.000 tons) GATT FULL REALIZATION SCENARIO

	PRODUCTION SIMULATED BASE-TRK 2010	PRODUCTION SIMULATED ROT 2010	PRODUCTION SIMULATED GAP 2010	PRODUCTION SIMULATED TRK 2010	NET-TRADE SIMULATED TRK 2010	CONSUMPTION SIMULATED ANIMAL 2010	CONSUMPTION SIMULATED HUMAN 2010
WHEAT	27558.23	25529.05	2123.58	27652.64	600.13	4740.86	22311.66
CORN	4248.75	2849.03	2202.77	5051.80	1700.00	1458.73	1893.07
RYE	597.11	467.17	130.31	597.48	47.86	477.40	72.21
BARLEY	13218.62	10653.59	4344.97	14998.56	2464.92	7429.98	5103.67
RICE	120.48	111.54		111.54	-443.44		554.99
CHICK-PEA	1116.69	331.33	583.83	915.16	300.00		615.16
DRY-BEAN	425.60	425.28		425.28			425.28
LENTIL	1374.23	386.29	1035.26	1421.55	315.48		1106.08
DRY-PEA	10.01	10.01		10.01			10.01
POTATOE	9412.87	5240.22	924.74	6164.95	-4300.00		10464.95
ONION	2669.66	1338.31	236.17	1574.49	-1300.00		2874.49
TOMATOE	10130.88	5512.46	972.79	6485.24	-4500.00		10985.24
AUBERGINE	1569.78	1335.15	235.61	1570.76			1570.76
MELON	4243.36	3248.54	573.27	3821.82	-516.65		4338.47
CAULIFLOWR	145.03	75.33	13.29	88.62	-75.00		163.62
WAT-MELON	7183.96	6102.78	1076.96	7179.75			7179.75
CARROT	320.00	180.11	31.78	211.90	-150.00		361.90
CABBAGE	1075.32	787.96	139.05	927.02	-208.32		1135.34
CUCUMBER	1674.94	1423.08	251.13	1674.21			1674.21
OKRA	44.83	28.57	5.04	33.61	-14.44		48.05
PEPPER	1538.99	1266.62	315.59	1582.22	92.07		1490.15
LETTUCE	282.08	161.05	28.42	189.47	-131.96		321.42
SPINACH	294.90	192.03	33.89	225.92	-97.79		323.71
SQUASH	466.26	329.57	58.16	387.73	-150.00		537.73
LEEK	630.14	451.63	79.70	531.33	-141.18		672.51
GROUNDNUT	155.41	103.74	93.31	197.05	75.00		122.05
SESAME	101.76	59.87	10.57	70.44	-50.00		120.44
SUNFLOWER	3241.21	2953.54	286.98	3240.52			3240.52
SOYABEAN	770.84	720.89	477.22	1198.10	350.00		848.10
LINSEED	11.35	16.35		16.35	5.00		11.35
COLZA	3.49	1.53		1.53	-1.50		3.03
COTTON	3220.10	2579.04	1955.12	4534.16	1500.00		3034.16
TOBACCO	483.80	470.18	13.60	483.77	150.00		333.77
SUGARBEET	28814.59	25207.03	12672.46	37879.49	10000.00		27879.49
PISTACHIO	45.96		45.52	45.52	-3.32		48.84
HAZELNUT	301.87	420.00		420.00	250.00		170.00
OLIVE	1772.01	1242.09	168.70	1410.79	-950.00		2360.79
TEA	1309.14	1015.71		1015.71	-650.00		1665.71
GRAPES	7340.83	7475.31	382.81	7858.13	-502.67		8360.79
FIG	603.18	526.12	92.84	618.96	-25.00		643.96
ORANGE	1581.19	974.86		974.86	-800.00		1774.86
LEMON	604.71	362.87		362.87	-300.00		662.87
APPLE	4361.32	2753.59	40.04	2793.63	-2250.00		5043.63
PEARS	934.61	596.60		596.60	-500.00		1096.60
PEACH	775.35	412.35	72.77	485.11	-385.00		870.11
APRICOT	382.03	225.02	39.71	264.73	-146.66		411.39
CHERRY	311.01	327.31		327.31			327.31
WILDCHERRY	173.63	175.90	85.55	261.45	90.00		171.45
POMEGRAN	86.44	78.74	13.90	92.64			92.64
SHEEP-MEAT	1095.04			1095.04	550.00		545.04
SHEEP-MILK	3642.75			3642.75	1300.00		2342.75
SHEEP-WOOL	162.48			162.48	-80.00		242.48
SHEEP-HIDE	98.78			98.78	-50.00		148.78
GOAT-MEAT	214.66			209.37	97.84		111.54
GOAT-MILK	1185.05			1155.86	-228.43		1384.29
GOAT-WOOL	15.40			15.02	8.00		7.02
GOAT-HIDE	20.89			20.37	-10.00		30.37
ANGOR-MEAT	19.12			15.66	7.00		8.66
ANGOR-MILK	67.01			54.86	-25.00		79.86
ANGOR-WOOL	7.21			5.91	3.00		2.91
ANGOR-HIDE	1.47			1.20	-1.00		2.20
COW-MEAT	1057.46			1057.46			1057.46
COW-MILK	24267.49			24267.49	7353.96		16913.53
COW-HIDE	124.60			124.60	-60.00		184.60
BUFAL-MEAT	70.81			44.81	-13.56		58.37
BUFAL-MILK	881.92			558.16	-425.00		983.16
BUFAL-HIDE	10.83			6.86	-5.00		11.86
POLTR-MEAT	372.66			306.36	-175.00		481.36
EGGS	884.24			726.91	-353.53		1080.44

5.4.5.2 International Demand Scenario

The full liberalization of trade and removal of subsides in agriculture are projected to have significant impacts on Turkish agriculture.

Agricultural production suffers a slight loss, more in value terms than in quantity. The decline in production is higher in ROT than the GAP Region, and higher in crop production than in livestock. As a result, the share of the GAP Region in total agricultural value increases.

The losses in revenue, are partly compensated by declines in labor and machinery use, but more importantly by gains from trade.

On the overall, despite the decline in domestic production, Turkey is predicted to gain from GATT's outcome of full liberalization. Both the consumer and producer surpluses register increases.

Cereals and pulses whose exports show significant increases, register high growth rates also in domestic production. Most other products show either no change or slight declines in their domestic production. Turkey becomes a net importer in many products due to favorable input prices.

Due to competition from imports, the domestic prices received by farmers decline in most products, excluding cereals, oilseeds and some animal products.

5.4.5.3 Domestic Demand Scenario

Higher population and income growth rates result in shifts in the domestic as well as supply functions to the right. The agricultural sector responds to higher demand partly by increases in production and partly by decreases in exports. Furthermore, increases in domestic prices ranging from 5 - 10% in general also contribute to the balancing of supply and demand.

On the overall, both the producers and the consumers gain from the higher demand. The consumers gain directly from the income growth, the producers gain indirectly through increases in the value of production.

The demand for resources also increase, compared to the base scenario. Demand for labor and machinery increases by 5 %, for nitrogen by 25% and for phosphate by 7% over the base scenario.

Table 5.4.44: Simulated Market Balances for 2010 (.000 tons) HIGHER DOMESTIC DEMAND SCENARIO

	PRODUCTION SIMULATED BASE-TRK 2010	PRODUCTION SIMULATED ROT 2010	PRODUCTION SIMULATED GAP 2010	PRODUCTION SIMULATED TRK 2010	NET-TRADE SIMULATED TRK 2010	CONSUMPTION SIMULATED ANIMAL 2010	CONSUMPTION SIMULATED HUMAN 2010
WHEAT	27558.23	24291.43	3868.85	28160.29		5165.28	22995.00
CORN	4248.75	3100.41	1197.13	4297.54	650.00	1589.32	2058.22
RYE	597.11	503.52	88.86	592.37		520.14	72.23
BARLEY	13218.62	11143.92	1966.57	13110.49		8095.15	5015.35
RICE	120.48	112.12		112.12	-505.59		617.71
CHICK-PEA	1116.69	591.32	486.05	1077.37	381.70		695.68
DRY-BEAN	425.60	406.40	71.72	478.12			478.12
LENTIL	1374.23	168.34	1098.54	1266.88			1266.88
DRY-PEA	10.01	11.27		11.27			11.27
POTATOE	9412.87	8912.78	1572.84	10485.62			10485.62
ONION	2669.66	2553.95	450.70	3004.64			3004.64
TOMATOE	10130.88	9669.95	1706.46	11376.41			11376.41
AUBERGINE	1569.78	1493.53	263.56	1757.10			1757.10
MELON	4243.36	4048.86	714.50	4763.36			4763.36
CAULIFLOWR	145.03	138.16	24.38	162.54			162.54
WAT-MELON	7183.96	6852.13	1209.20	8061.33			8061.33
CARROT	320.00	304.32	53.70	358.02			358.02
CABBAGE	1075.32	1022.12	180.37	1202.50			1202.50
CUCUMBER	1674.94	1591.87	280.92	1872.79			1872.79
OKRA	44.83	42.82	7.56	50.38			50.38
PEPPER	1538.99	1442.72	254.60	1697.32			1697.32
LETTUCE	282.08	267.91	47.28	315.19			315.19
SPINACH	294.90	280.14	49.44	329.58			329.58
SQUASH	466.26	439.31	77.53	516.84			516.84
LEEK	630.14	598.35	105.59	703.94			703.94
GROUNDNUT	155.41		171.59	171.59	30.00		141.59
SESAME	101.76	98.12	17.31	115.43	-10.00		125.43
SUNFLOWER	3241.21	3566.95	74.70	3641.64			3641.64
SOYABEAN	770.84	317.92	559.16	877.08			877.08
LINSEED	11.35	12.44		12.44	2.00		10.44
COLZA	3.49	3.97		3.97			3.97
COTTON	3220.10	2260.64	1206.21	3466.85	700.00		2766.85
TOBACCO	483.80	478.31	48.39	526.70	150.00		376.70
SUGARBEET	28814.59	27110.52	5384.21	32494.73	600.00		31894.73
PISTACHIO	45.96		46.66	46.66			46.66
HAZELNUT	301.87	301.87		301.87	121.99		179.88
OLIVE	1772.01	1536.07	179.85	1715.92			1715.92
TEA	1309.14	1372.59		1372.59			1372.59
GRAPES	7340.83	5521.97	1680.10	7202.07			7202.07
FIG	603.18	541.64	95.59	637.22			637.22
ORANGE	1581.19	1768.06		1768.06			1768.06
LEMON	604.71	680.40		680.40			680.40
APPLE	4361.32	4017.00	708.88	4725.88			4725.88
PEARS	934.61	1009.51		1009.51			1009.51
PEACH	775.35	345.92	502.25	848.17			848.17
APRICOT	382.03	213.00	213.25	426.25			426.25
CHERRY	311.01	289.13	51.02	340.15			340.15
WILDCHERRY	173.63	60.00	129.56	189.56			189.56
POMEGRAN	86.44		84.34	84.34			84.34
SHEEP-MEAT	1095.04			1095.04	381.69		713.35
SHEEP-MILK	3642.75			3642.75			3642.75
SHEEP-WOOL	162.48			162.48	-64.00		226.48
SHEEP-HIDE	98.78			98.78	-30.00		128.78
GOAT-MEAT	214.66			214.66	33.00		181.66
GOAT-MILK	1185.05			1185.05			1185.05
GOAT-WOOL	15.40			15.40	2.00		13.40
GOAT-HIDE	20.89			20.89	-3.00		23.89
ANGOR-MEAT	19.12			22.08	9.00		13.08
ANGOR-MILK	67.01			77.36			77.36
ANGOR-WOOL	7.21			8.33	1.75		6.58
ANGOR-HIDE	1.47			1.69	-1.00		2.69
COW-MEAT	1057.46			1057.46	-14.00		1071.46
COW-MILK	24267.49			24267.49	-7.00		24274.49
COW-HIDE	124.60			124.60			124.60
BUFAL-MEAT	70.81			71.31			71.31
BUFAL-MILK	881.92			888.20			888.20
BUFAL-HIDE	10.83			10.91			10.91
POLTR-MEAT	372.66			372.66			372.66
EGGS	884.24			884.24			884.24

5.4.3.4 Lower Project Efficiency and Irrigable Area Scenarios

The two most important resources generated by the GAP are water and Irrigable area. Lower project efficiency scenarios analyzes the impact of lower water supply. The Irrigable area scenario analysis the impact of lower land availability.

The implications of the two scenarios on irrigation project management are discussed in detail in section 5.4.4.

These two significant changes in resources endowments, surprisingly do not have significant macro effects on total welfare, production or trade.

5.4.3.5 No Transport Cost Scenario

The scenario is conducted to emphasize the agronomic comparative advantages of the GAP Region, by disregarding The spatial dimension. The results of the simulation should not be evaluated in absolute terms, but should rather be taken as indicating the directions of changes that could result from changes in regional demand and regional transport costs relative to the rest of Turkey.

The results presented in Table 5.4.47 suggest that, in the absence of local demands free of additional transport costs corn, chickpea, lentil, eggplant, cauliflower, carrot, cabbage, lettuce, spinach, leek, groundnut, sesame, pistachio, pomegranate will only be produces in the GAP Region. Rice, dry-beans, dry-pea, potatoes, onion, melons, olive, pepper, squash, sunflower, linseed, colza (rapeseed), sugarbeet, hazelnut, tea, citrus, pears, cherry on the otherhand will only be produced in the Rest of Turkey. The remaining crops will be produced in both regions.

Table 5.4.45: Simulated Market Balances for 2010 (.000 tons)
LOW PROJECT EFFICIENCY SCENARIO

	PRODUCTION SIMULATED BASE-TRK 2010	PRODUCTION SIMULATED ROT 2010	PRODUCTION SIMULATED GAP 2010	PRODUCTION SIMULATED TRK 2010	NET-TRADE SIMULATED TRK 2010	CONSUMPTION SIMULATED ANIMAL 2010	CONSUMPTION SIMULATED HUMAN 2010
WHEAT	27558.23	23425.59	4320.70	27746.29	186.77	5217.38	22342.14
CORN	4248.75	3047.24	1187.75	4234.99	650.00	1605.35	1979.64
RYE	597.11	508.25	91.79	600.04	2.10	525.39	72.55
BARLEY	13218.62	11175.52	2472.37	13647.89	500.22	8176.78	4970.89
RICE	120.48	109.47		109.47	-443.30		552.77
CHICK-PEA	1116.69	516.88	565.24	1082.12	474.03		608.09
DRY-BEAN	425.60	357.59	63.10	420.70			420.70
LENTIL	1374.23	415.96	948.47	1364.44	258.36		1106.08
DRY-PEA	10.01	9.93		9.93			9.93
POTATOE	9412.87	7970.41	1406.55	9376.96			9376.96
ONION	2669.66	2267.51	400.15	2667.66			2667.66
TOMATOE	10130.88	8598.62	1517.41	10116.03			10116.03
AUBERGINE	1569.78	1332.21	235.10	1567.30			1567.30
MELON	4243.36	3602.31	635.70	4238.01			4238.01
CAULIFLOWR	145.03	123.05	21.72	144.77			144.77
WAT-MELON	7183.96	6101.71	1076.77	7178.48			7178.48
CARROT	320.00	271.90	47.98	319.88			319.88
CABBAGE	1075.32	913.57	161.22	1074.79			1074.79
CUCUMBER	1674.94	1423.10	251.14	1674.24			1674.24
OKRA	44.83	38.07	6.72	44.78			44.78
PEPPER	1538.99	1281.90	256.22	1538.12	30.00		1508.12
LETTUCE	282.08	239.75	42.31	282.06			282.06
SPINACH	294.90	250.63	44.23	294.86			294.86
SQUASH	466.26	396.15	69.91	466.05			466.05
LEEK	630.14	535.49	94.50	629.99			629.99
GROUNDNUT	155.41	104.91	48.51	153.43	30.00		123.43
SESAME	101.76	86.34	15.24	101.58	-10.00		111.58
SUNFLOWER	3241.21	3115.60	121.66	3237.26			3237.26
SOYABEAN	770.84	647.54	114.27	761.81			761.81
LINSEED	11.35	11.35		11.35	2.00		9.35
COLZA	3.49	3.49		3.49			3.49
COTTON	3220.10	2464.41	709.21	3173.62	700.00		2473.62
TOBACCO	483.80	282.68	199.88	482.56	150.00		332.56
SUGARBEET	28814.59	23731.50	4187.91	27919.42			27919.42
PISTACHIO	45.96		46.14	46.14			46.14
HAZELNUT	301.87	301.87		301.87	146.00		155.87
OLIVE	1772.01	1568.96	179.85	1748.81			1748.81
TEA	1309.14	1303.20		1303.20			1303.20
GRAPES	7340.83	5520.25	1689.44	7209.68			7209.68
FIG	603.18	509.42	89.89	599.31			599.31
ORANGE	1581.19	1578.02		1578.02			1578.02
LEMON	604.71	603.82		603.82			603.82
APPLE	4361.32	3679.43	649.31	4328.74			4328.74
PEARS	934.61	929.48		929.48			929.48
PEACH	775.35	655.09	115.60	770.70			770.70
APRICOT	382.03	323.44	57.08	380.52			380.52
CHERRY	311.01	262.65	46.35	308.99			308.99
WILDCHERRY	173.63	145.45	25.67	171.12			171.12
POMEGRAN	86.44		82.36	82.36			82.36
SHEEP-MEAT	1095.04			1095.04	525.00		570.04
SHEEP-MILK	3642.75			3642.75			3642.75
SHEEP-WOOL	162.48			162.48	-64.00		226.48
SHEEP-HIDE	98.78			98.78	-30.00		128.78
GOAT-MEAT	214.66			214.66	33.00		181.66
GOAT-MILK	1185.05			1185.05			1185.05
GOAT-WOOL	15.40			15.40	2.00		13.40
GOAT-HIDE	20.89			20.89	-3.00		23.89
ANGOR-MEAT	19.12			19.10	9.00		10.10
ANGOR-MILK	67.01			66.94			66.94
ANGOR-WOOL	7.21			7.20	1.75		5.45
ANGOR-HIDE	1.47			1.47	-1.00		2.47
COW-MEAT	1057.46			1057.46			1057.46
COW-MILK	24267.49			24267.49	-7.00		24274.49
COW-HIDE	124.60			124.60			124.60
BUFAL-MEAT	70.81			70.77			70.77
BUFAL-MILK	881.92			881.54			881.54
BUFAL-HIDE	10.83			10.83			10.83
POLTR-MEAT	372.66			372.66			372.66
EGGS	884.24			884.24			884.24

Table 5.4.46: Simulated Market Balances for 2010 (.000 tons)
LOWER IRRIGABLE LAND AVAILABILITY SCENARIO

	PRODUCTION SIMULATED BASE-TRK 2010	PRODUCTION SIMULATED ROT 2010	PRODUCTION SIMULATED GAP 2010	PRODUCTION SIMULATED TRK 2010	NET-TRADE SIMULATED TRK 2010	CONSUMPTION SIMULATED ANIMAL 2010	CONSUMPTION SIMULATED HUMAN 2010
WHEAT	27558.23	25539.30	1900.85	27440.15		5212.65	22227.50
CORN	4248.75	3053.84	1188.91	4242.76	650.00	1603.89	1988.87
RYE	597.11	507.51	89.56	597.07		524.91	72.16
BARLEY	13218.62	11093.94	1957.75	13051.69		8169.37	4882.33
RICE	120.48	101.23	17.86	119.10	-433.67		552.77
CHICK-PEA	1116.69	518.96	441.06	960.01	349.48		610.54
DRY-BEAN	425.60	424.91		424.91			424.91
LENTIL	1374.23	341.07	929.24	1270.31	164.24		1106.08
DRY-PEA	10.01	10.00		10.00			10.00
POTATOE	9412.87	7997.69	1411.36	9409.04			9409.04
ONION	2669.66	2268.17	400.27	2668.44			2668.44
TOMATOE	10130.88	8608.56	1519.16	10127.72			10127.72
AUBERGINE	1569.78	1333.80	235.38	1569.18			1569.18
MELON	4243.36	3604.12	636.02	4240.14			4240.14
CAULIFLOWR	145.03	123.25	21.75	145.00			145.00
WAT-MELON	7183.96	6103.52	1077.09	7180.62			7180.62
CARROT	320.00	271.96	47.99	319.95			319.95
CABBAGE	1075.32	913.98	161.29	1075.27			1075.27
CUCUMBER	1674.94	1423.20	251.15	1674.35			1674.35
OKRA	44.83	38.10	6.72	44.82			44.82
PEPPER	1538.99	1282.09	256.25	1538.34	30.00		1508.34
LETTUCE	282.08	239.78	42.31	282.09			282.09
SPINACH	294.90	250.61	44.23	294.84			294.84
SQUASH	466.26	396.20	69.92	466.12			466.12
LEEK	630.14	535.56	94.51	630.08			630.08
GROUNDNUT	155.41	26.04	128.72	154.76	30.00		124.76
SESAME	101.76	86.36	15.24	101.60	-10.00		111.60
SUNFLOWER	3241.21	3192.23	39.64	3231.86			3231.86
SOYABEAN	770.84		772.74	772.74			772.74
LINSEED	11.35	11.32		11.32	2.00		9.32
COLZA	3.49	3.48		3.48			3.48
COTTON	3220.10	2136.50	1077.03	3213.53	700.00		2513.53
TOBACCO	483.80	418.81	64.44	483.25	150.00		333.25
SUGARBEET	28814.59	23910.32	4819.47	28729.79	600.00		28129.79
PISTACHIO	45.96		45.76	45.76			45.76
HAZELNUT	301.87	301.87		301.87	146.00		155.87
OLIVE	1772.01	1590.48	179.85	1770.32			1770.32
TEA	1309.14	1308.68		1308.68			1308.68
GRAPES	7340.83	5545.90	1742.83	7288.73	41.94		7246.79
FIG	603.18	512.03	90.36	602.39			602.39
ORANGE	1581.19	1580.82		1580.82			1580.82
LEMON	604.71	604.61		604.61			604.61
APPLE	4361.32	3704.34	653.71	4358.05			4358.05
PEARS	934.61	934.21		934.21			934.21
PEACH	775.35	658.58	116.22	774.79			774.79
APRICOT	382.03	244.84	137.03	381.87			381.87
CHERRY	311.01	264.33	46.65	310.98			310.98
WILDCHERRY	173.63	60.00	113.19	173.19			173.19
POMEGRAN	86.44		85.64	85.64			85.64
SHEEP-MEAT	1095.04			1095.04	525.00		570.04
SHEEP-MILK	3642.75			3642.75			3642.75
SHEEP-WOOL	162.48			162.48	-64.00		226.48
SHEEP-HIDE	98.78			98.78	-30.00		128.78
GOAT-MEAT	214.66			214.66	33.00		181.66
GOAT-MILK	1185.05			1185.05			1185.05
GOAT-WOOL	15.40			15.40	2.00		13.40
GOAT-HIDE	20.89			20.89	-3.00		23.89
ANGOR-MEAT	19.12			19.06	9.00		10.06
ANGOR-MILK	67.01			66.79			66.79
ANGOR-WOOL	7.21			7.19	1.75		5.44
ANGOR-HIDE	1.47			1.46	-1.00		2.46
COW-MEAT	1057.46			1057.46			1057.46
COW-MILK	24267.49			24267.49	-7.00		24274.49
COW-HIDE	124.60			124.60			124.60
BUFAL-MEAT	70.81			70.70			70.70
BUFAL-MILK	881.92			880.60			880.60
BUFAL-HIDE	10.83			10.82			10.82
POLTR-MEAT	372.66			372.66			372.66
EGGS	884.24			884.24			4.24

Table 5.4.47: Simulated Market Balances for 2010 (.000 tons) WITHOUT TRANSPORTATION COMPONENT

	PRODUCTION SIMULATED BASE-TRK 2010	PRODUCTION SIMULATED ROT 2010	PRODUCTION SIMULATED GAP 2010	PRODUCTION SIMULATED TRK 2010	NET-TRADE SIMULATED TRK 2010	CONSUMPTION SIMULATED ANIMAL 2010	CONSUMPTION SIMULATED HUMAN 2010
WHEAT	27558.23	29680.53	845.40	30525.93	2500.00	5212.66	22813.29
CORN	4248.75		4273.61	4273.61	650.00	1603.89	2019.72
RYE	597.11	402.66	196.94	599.60	2.10	524.91	72.59
BARLEY	13218.62	11436.20	3896.29	15332.49	2000.00	8169.38	5163.10
RICE	120.48	122.58		122.58	-430.19		552.77
CHICK-PEA	1116.69		1249.01	1249.01	624.95		624.06
DRY-BEAN	425.60	426.15		426.15			426.15
LENTIL	1374.23		1323.39	1323.39	184.03		1139.36
DRY-PEA	10.01	10.01		10.01			10.01
POTATOE	9412.87	9499.36		9499.36			9499.36
ONION	2669.66	2673.93		2673.93			2673.93
TOMATOE	10130.88	4703.70	5417.28	10120.98			10120.98
AUBERGINE	1569.78		1594.71	1594.71			1594.71
MELON	4243.36	4240.30		4240.30			4240.30
CAULIFLOWR	145.03		147.46	147.46			147.46
WAT-MELON	7183.96	7189.56		7189.56			7189.56
CARROT	320.00		322.27	322.27			322.27
CABBAGE	1075.32		1075.40	1075.40			1075.40
CUCUMBER	1674.94		1679.89	1679.89			1679.89
OKRA	44.83	44.82		44.82			44.82
PEPPER	1538.99	1539.00		1539.00	30.00		1509.00
LETTUCE	282.08		282.54	282.54			282.54
SPINACH	294.90		297.73	297.73			297.73
SQUASH	466.26	466.48		466.48			466.48
LEEK	630.14		630.34	630.34			630.34
GROUNDNUT	155.41		156.22	156.22	30.00		126.22
SESAME	101.76		101.70	101.70	-10.00		111.70
SUNFLOWER	3241.21	3253.99		3253.99			3253.99
SOYABEAN	770.84	183.05	580.50	763.55			763.55
LINSEED	11.35	11.32		11.32	2.00		9.32
COLZA	3.49	3.49		3.49			3.49
COTTON	3220.10	2271.94	937.98	3209.92	700.00		2509.92
TOBACCO	483.80	478.98	5.99	484.97	150.00		334.97
SUGARBEET	28814.59	29071.23		29071.23	600.00		28471.23
PISTACHIO	45.96		44.51	44.51			44.51
HAZELNUT	301.87	301.87		301.87	146.00		155.87
OLIVE	1772.01	1647.85	179.85	1827.70			1827.70
TEA	1309.14	1322.60		1322.60			1322.60
GRAPES	7340.83	6137.11	1256.20	7393.31			7393.31
FIG	603.18	363.31	245.06	608.38			608.386
ORANGE	1581.19	1588.10		1588.10			1588.10
LEMON	604.71	606.67		606.67			606.67
APPLE	4361.32	3401.25	990.92	4392.17			4392.17
PEARS	934.61	950.86		950.86			950.86
PEACH	775.35	246.00	540.67	786.67			786.67
APRICOT	382.03	213.00	175.38	388.38			388.38
CHERRY	311.01	313.97		313.97			313.97
WILDCHERRY	173.63	60.00	115.58	175.58			175.58
POMEGRAN	86.44		89.09	89.09			89.09
SHEEP-MEAT	1095.04			1095.04	525.00		570.04
SHEEP-MILK	3642.75			3642.75			3642.75
SHEEP-WOOL	162.48			162.48	-64.00		226.48
SHEEP-HIDE	98.78			98.78	-30.00		128.78
GOAT-MEAT	214.66			214.66	33.00		181.66
GOAT-MILK	1185.05			1185.05			1185.05
GOAT-WOOL	15.40			15.40	2.00		13.40
GOAT-HIDE	20.89			20.89	-3.00		23.89
ANGOR-MEAT	19.12			19.12	9.00		10.12
ANGOR-MILK	67.01			67.01			67.01
ANGOR-WOOL	7.21			7.21	1.75		5.46
ANGOR-HIDE	1.47			1.47	-1.00		2.47
COW-MEAT	1057.46			1057.46			1057.46
COW-MILK	24267.49			24267.49	-7.00		24274.49
COW-HIDE	124.60			124.60			124.60
BUFAL-MEAT	70.81			70.82			70.82
BUFAL-MILK	881.92			882.10			882.10
BUFAL-HIDE	10.83			10.84			10.84
POLTR-MEAT	372.66			372.66			372.66
EGGS	884.24			884.24			884.24

Table 5.4.48: Producer Prices

Table 5.4.48: Simulated Producer Prices For 2010 Under Different Simulations ($/ton)

	BASE	GATT	GATT/ BASE	DOM.DEMAND	DOM.DEMAND/ BASE	PROJ.EFF.	PROJ.EFF./ BASE	LOW-IRR	LOW-IRR./ BASE	noTRN	noTRN/ BASE
WHEAT	113.42	114.11	1.01	117.42	1.04	113.92	1.00	115.15	1.02	112.90	1.00
CORN	152.39	168.68	1.11	156.18	1.02	154.86	1.02	153.38	1.01	148.46	0.97
RYE	81.82	84.87	1.04	85.53	1.05	82.10	1.00	85.39	1.04	79.49	0.97
BARLEY	113.64	121.91	1.07	115.88	1.02	115.55	1.02	115.47	1.02	121.06	1.07
RICE	356.04	343.63	0.97	356.04	1.00	356.04	1.00	356.04	1.00	356.04	1.00
CHICK-PEA	293.75	275.30	0.94	298.64	1.02	291.56	0.99	285.94	0.97	254.62	0.87
DRY-BEAN	901.60	904.12	1.00	1001.72	1.11	940.20	1.04	907.06	1.01	897.34	1.00
LENTIL	302.30	302.30	1.00	306.34	1.01	302.30	1.00	302.30	1.00	255.55	0.85
DRY-PEA	419.42	420.09	1.00	465.81	1.11	438.83	1.05	421.88	1.01	418.89	1.00
POTATOE	181.73	132.86	0.73	207.53	1.14	183.45	1.01	181.95	1.00	177.83	0.98
ONION	205.90	141.32	0.69	227.65	1.11	206.53	1.00	206.29	1.00	204.55	0.99
TOMATOE	383.48	250.21	0.65	427.30	1.11	385.68	1.01	383.95	1.00	384.92	1.00
AUBERGINE	460.88	460.18	1.00	511.95	1.11	462.63	1.00	461.30	1.00	443.17	0.96
MELON	267.71	245.79	0.92	298.11	1.11	268.95	1.00	268.45	1.00	268.42	1.00
CAULIFLOWR	559.05	372.54	0.67	620.30	1.11	561.73	1.00	559.44	1.00	534.71	0.96
WAT-MELON	197.52	197.93	1.00	219.95	1.11	198.05	1.00	197.84	1.00	196.99	1.00
CARROT	376.89	259.17	0.69	418.95	1.11	377.21	1.00	377.02	1.00	370.50	0.98
CABBAGE	260.76	227.59	0.87	289.84	1.11	261.05	1.00	260.79	1.00	260.71	1.00
CUCUMBER	480.46	480.94	1.00	534.10	1.11	480.92	1.00	480.85	1.00	477.25	0.99
OKRA	1042.07	833.80	0.80	1149.70	1.10	1045.15	1.00	1042.88	1.00	1042.89	1.00
PEPPER	578.09	594.36	1.03	634.24	1.10	578.85	1.00	578.66	1.00	578.09	1.00
LETTUCE	278.04	191.94	0.69	309.38	1.11	278.09	1.00	278.02	1.00	277.03	1.00
SPINACH	378.44	295.57	0.78	421.02	1.11	378.55	1.00	378.61	1.00	370.31	0.98
SQUASH	630.16	529.13	0.84	697.04	1.11	630.46	1.00	630.37	1.00	629.86	1.00
LEEK	303.94	258.16	0.85	338.46	1.11	304.11	1.00	304.02	1.00	303.73	1.00
GROUNDNUT	486.85	543.58	1.12	531.76	1.09	520.36	1.07	497.76	1.02	473.16	0.97
SESAME	1222.83	962.99	0.79	1353.24	1.11	1228.25	1.00	1227.70	1.00	1224.66	1.00
SUNFLOWER	426.76	426.99	1.00	470.21	1.10	428.08	1.00	429.87	1.01	422.51	0.99
SOYABEAN	186.38	198.66	1.07	196.04	1.05	197.21	1.06	184.12	0.99	195.13	1.05
LINSEED	293.20	308.30	1.05	309.51	1.06	293.83	1.00	297.93	1.02	298.55	1.02
COLZA	244.00	232.50	0.95	257.13	1.05	243.10	1.00	247.32	1.01	243.97	1.00
COTTON	457.26	479.79	1.05	493.44	1.08	511.60	1.12	464.95	1.02	469.16	1.03
TOBACCO	2581.50	2582.16	1.00	2704.52	1.05	2617.15	1.01	2597.39	1.01	2547.59	0.99
SUGARBEET	34.72	40.26	1.16	37.67	1.08	35.84	1.03	35.07	1.01	33.69	0.97
PISTACHIO	4985.75	4256.36	0.85	6534.88	1.31	4940.82	0.99	5035.66	1.01	5351.42	1.07
HAZELNUT	1653.44	1301.34	0.79	1653.44	1.00	1653.44	1.00	1653.44	1.00	1653.44	1.00
OLIVE	2471.57	1420.32	0.57	3170.84	1.28	2512.65	1.02	2474.57	1.00	2373.20	0.96
TEA	1725.02	1202.02	0.70	1986.21	1.15	1733.72	1.01	1725.68	1.00	1705.26	0.99
GRAPE	133.43	554.69	4.16	426.33	3.20	339.39	2.54	328.34	2.46	132.44	0.99
FIG	682.87	608.37	0.89	818.78	1.20	689.95	1.01	684.32	1.00	673.39	0.99
ORANGE	583.28	344.27	0.59	696.84	1.19	587.19	1.01	583.74	1.00	574.75	0.99
LEMON	570.56	330.13	0.58	681.78	1.19	574.27	1.01	570.99	1.00	562.47	0.99
APPLE	608.88	342.49	0.56	774.33	1.27	621.60	1.02	610.16	1.00	596.84	0.98
PEARS	792.39	431.14	0.54	1006.45	1.27	803.81	1.01	793.27	1.00	756.13	0.95
PEACH	626.22	387.15	0.62	791.72	1.26	638.26	1.02	627.65	1.00	598.26	0.96
APRICOT	587.72	363.89	0.62	735.91	1.25	599.29	1.02	588.94	1.00	539.31	0.92
CHERRY	932.06	783.23	0.84	1172.08	1.26	950.43	1.02	932.32	1.00	905.01	0.97
WILDCHERRY	662.67	691.90	1.04	853.94	1.29	696.29	1.05	668.58	1.01	636.42	0.96
POMEGRAN	337.68	286.40	0.85	462.33	1.37	371.41	1.10	344.34	1.02	315.72	0.93

6. CONCLUSIONS, RECOMMENDATIONS AND OUTLOOK

The Objective of the Study

The objective of agricultural activities in GAP should be to maximization agricultural sector's contribution to the welfare in Turkey as a whole. The findings of this study are all conditional to this main objective. The conclusions, recommendations and outlook, which are derived from the results, are all suggestions for the allocation of resources in the economy, to achieve this overall objective, rather than the maximization of parts of the objective.

The models which are employed here, can technically produce results related to parts, as well, i.e. according to one of the partial objectives. Such results may be considered as useful intellectual exercises, too. Yet, all partial objectives cannot be maximized at the same time, as long as resources are limited and a balancing interdependency among the partial objectives prevail.

The Main Results

The TURGAP and WTM scenarios conducted for this study suggest that in year 2010 Turkey will continue to be one of the few countries which will succeed in preserving its self-sufficiency in agriculture and at the same time export some of its surplus to international markets.

The GAP Region, with the completion of the irrigation project in year 2010 will move from being dependent on the rest of Turkey for agricultural products to a region which is self-sufficient and exporter in many products to the rest of the country and the world. Contrary to optimistic expectations, however, the export expansion will not be dramatic.

Many serious studies have concluded in the past the opposite. Were they all wrong? Actually, the irrigation technology which is assumed in this study is not different from any other (serious) study completed in the past. The differences are not because of technological aspects or differing crop patterns or yields. There are, however, two extremely important variables which accompany any development in Turkish Economy which have been overlooked by many of these studies in the past: the development of income and population in Turkey.

The demand for agricultural products can be divided into two components, namely domestic demand and international demand. The domestic demand in Turkey will increase more rapidly under the influence of high population and income growth. This strong demand increase will absorb a large part of the additional supply of the GAP Region. As incomes will increase, food consumption in the GAP Region and ROT will increase. The population increase, which implies a longer number of domestic consumers will not be modest either.

Many studies have looked at GAP as an isolated region and independent of time. Many of them made in their analysis the (implicit) assumption, that all irrigation will take place at the same time and at once. The time component is still an important issue. If irrigation projects can be completed much rapidly than planned or if there will be long, unexpected delays, the output and export performances will differ respectively.

The Sensitivity of Results

Another major result of the study, which is relatively difficult to read from the numerical values, but which is reflected in the modelling experience of the experts, is the sensitivity of results to various changes. The results are highly sensitive to changes in their environment. This has two important implications. First, the findings of this study are estimates made on the basis of information available at present. They have to be updated and revised continuously as additional information becomes available. Success requires at the present time fast response to rapidly changing conditions, so flexibility appears to be a principle which no policy can escape. Second, this is an additional justification of the main objective above. It is not possible to isolate the developments in the GAP Region from the rest of Turkey, and the world.

The results are sensitive to major developments such as improvements in infrastructure, i.e., decrease or increase in transport costs; major events in the world economy, such as the completion of Uruguay Round or technological improvements.

The study does not suggest only caution because of the sensitivity of results. Rerunning the model for various scenarios is another tool for coping with the highly unstable environments. The concrete examples supplied in the study are: "GATT scenario", "Partial Liberalization", "Radical Changes in the Former Socialist Countries", "Different Population and Income Growth", "Project Efficiency and Irrigable Land". If the GATT negotiations, for example, are successful, it can be expected that the price ratios of world market prices will move slightly in favor of these commodities which have been highly supported by the developed countries during the last decades, as sugar, cereal products and milk products. In the long run these changes might have (if no other counterbalancing event occurs) a significant effect on the production structure and crop pattern in Turkey and the GAP Region.

The Adjustment Process or the Sequence of Irrigation Projects

The results are not only sensitive to important "events" but they are also sensitive to the sequence of events. This can be observed from the TURGAP results, which are supplied in five year intervals. The results at each 5 year do not necessarily imply a smooth development. Each new irrigation project interacts with the existing ones and with the rest of Turkey. Accordingly changes in the acreage of irrigation projects, their location and their timing will affect the results tremendously. Although all results are presented for each of the five years, some of the changes might be only because of the completion of a new irrigation project, just one year before. The crop pattern may change two years later once again, but from the available tables, it appears, as if it takes five years for the next change. The interpretation of the results in time require special care.

Crop Pattern, World Trade Model and Agricultural Policy

When the sources of growth in Turkish agriculture are analyzed over the past five decades, it is observed that through expansions of land in the 50's, increasing use of fertilizers in 60's, expansion in irrigation and mechanization in 70's and finally improvements in seeds, crop compositions and rotations in 80's, it has been possible to match the growing domestic demand and also to export the surplus to world markets.

During the next two decades, the GAP project is expected to increase Turkish agricultural production considerably, via large scale expansion of irrigated land. But it should be pointed out that the expansion in the valuable resource of irrigable land will not continue forever, and it will not be repeated until a project of the same or bigger size comes to existence.

The base results presented in this study may be interpreted as "policy-free", meaning that these results will be achieved without *additional* agricultural policies. However, this does not mean that no additional policies should be applied. This is especially relevant for marketing issues.

Marketing Policies

It is quite difficult, if not impossible to solve the marketing problems of the coming two decades at once. However, as the models of this study, WTM and TURGAP will be updated regularly, it may be worth to stress those results (output) of the models which will continue to be relevant for marketing issues at that time, too. The relevance of WTM for marketing, especially for export marketing is obvious, but TURGAP produces extremely important results on marketing, too.

There will be three important marketing flows of agricultural produce: from GAP to the rest of Turkey, within GAP and from rest of Turkey to GAP. All these flows will require different emphasis on marketing system, strategies and infrastructure. Yet, the intensities of these flows will not reach maturity until all projects are completed. Although the project locations will indicate prospective locations of physical marketing facilities, it is recommended not to rush to huge marketing-investments in the early stages of the projects, because temporary output advantages may be misleading. The crop pattern model results for different periods offer in this respect valuable guidance. Each Project location can also be evaluated according to the importance of model output results and each output in turn can be classified according to marketing features such as perishability, storability, suitability for industrial processing, which once again suggest specific marketing system, strategy and infrastructure.

This approach can be reversed, too. The model results yield outcomes which are free of policy changes. However, this does not mean, that other outcomes cannot be achieved. A different crop pattern, other than the one suggested in the model will have some extra cost or it will require a change in policy. Exactly this information which is supplied in the output of TURGAP is best guidance for alternative, new agricultural, marketing policies.

It is quite problematic to apply different governmental support policies for the same agricultural product in different locations. It is therefore unrealistic to expect that the marketing systems of basic agricultural produce will be differentiated. The most powerful tool for regional policy differentiation will become the investment in physical marketing facilities.

However, in the light of international developments it seems almost certain that new agricultural policies will be required. The trends towards regionalization and globalization in the world economy allow, on the other hand, no option for a single country, to organize an isolated agricultural support policy anymore. The adoption of new policies should be compatible with GATT negotiations and should not hinder Turkey's accession to the EC and should not harm Turkish farmers and the national economy.