Conférence Femise 2003

4, 5 et 6 décembre 2003, Marseille

Forum Euro-Mediterranéen des Instituts Economiques
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Cette conférence a été réalisée avec le soutien financier de la Commission des Communautés Européennes. Les opinions exprimées dans les contributions n'engagent que les auteurs et ne reflètent pas l'opinion officielle de la Commission.

This Conference was produced with financial support from the Commission of European Communities. The opinions expressed in the contributions are those of the authors only and do not necessarily reflect the opinions of the Commission of European Communities.

Institut de la Méditerranée

Conference on "Euro-Med. Association Agreements and the EU's New Neighbourhood Policy Vision"
December 6, 2003; Marseilles.

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Abstract: After completing the major requirements for membership, the negotiation process between EU and candidates requires heavy work to anticipate the impact of membership on the candidate country and EU. The principal aim of this study is to contribute to the potential impacts of EU membership on the agricultural sector in Turkey.

A regional agricultural sector model (TASM-EU) has been used to quantify the effects of membership. TASM-EU is a non-linear optimization model with endogenous prices. The missing part of the cost functions are estimated using the positive mathematical programming calibration technique.

After calibration the model is projected to 2005 using two scenarios: out-EU and in-EU. Two simulations are conducted for in-EU: with and without the area compensation payments. The preliminary results indicate that EU membership will have positive impact on consumers' welfare, but producers will suffer, especially without compensatory area payments. Livestock sector will shrink significantly. Despite the increase in the net exports of crops, the net imports of livestock products will show a significant increase. The increase in the consumption of basic food products will be achieved at a much lesser cost.

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1. INTRODUCTION

Further liberalization of trade in agriculture is expected to become top priority in Turkey. Apart from bilateral concessional trade agreements and ongoing WTO negotiations, Turkey is also a candidate to join the EU. The membership will imply full liberalization of agricultural trade with one of the top traders in the world, and also with her major trading partner. The benefits of liberalization are bound to depend on the path of agricultural policies in Turkey and EU, and also on the process of accession negotiations. This study aims to assess the recent policy developments within the framework of future EU membership of Turkey.

Liberalization of trade in Turkey dates back to early 1980's, and it gained further momentum with the Customs Union Agreement (CUA) with European Union (EU) in 1995. CUA initially covered all industrial products and processed agricultural products, which corresponded to 93 % in value of the trade between EU and Turkey in 1995. Adjustment to CAP was stated as a precondition for the CU in primary agricultural products. A system parallel to the one applied by EU was introduced in imports of processed agricultural products. Accordingly, the agricultural and industrial components of tariffs are treated separately. The industrial share enjoys duty-free treatment in imports from EU or EFTA countries, and reductions in imports from third countries. As a result of preferential trade negotiations in primary agricultural products, a bilateral agreement to improve the level of liberalization of agricultural trade had been concluded and entered into force in 1998. Turkey became an EU candidate in 1999.

The membership negotiations with EU may start after satisfactory developments in the general preconditions of membership. Agriculture is expected to be one of the toughest areas of negotiation. The difficulty will not only arise from the state of agriculture in Turkey, but more from the policy framework of EU in agriculture. The trade in agriculture with EU will be fully liberalized with the adjustment of domestic and trade policies to the rest of the world.

The major purpose of this study is to evaluate the impact of EU membership of Turkey on agriculture using a regional agricultural sector model for Turkey. To be able to achieve this objective, the study is organized as follows: The agricultural sector model used to the evaluate the effects is described in the next section. The third section presents the implementation of different scenarios, followed by the discussion of the model's results. The last section is reserved for the concluding remarks.

2. REGIONAL AGRICULTURAL SECTOR MODEL FOR TURKEY (TASM-EU)

The purpose of the Turkish Agricultural Sector Model (TASM-EU) is to provide a consistent and integrated framework to ponder about the potential developments in the Turkish agricultural sector in case of EU membership.[1] The structure of the model permits a thorough analysis of the crop and livestock production. Partial analyses such as looking only the demand or supply side is helpful in determining possible bottlenecks, but the results of such research might be quite different when the interrelations among the variables is allowed. The model is a non-linear programming model. It maximizes the consumers' and producers' surplus.

[1] The pioneering study on the same topic is Kasnakoglu, Buckwell, Akder et al. (1990).

Agricultural production in Turkey is highly diversified due to variety of soils and agro-climatic conditions. The structure of production presents a challenging diversity with the regions having both common products and regional specialties. The techniques of production for the common products are quite different among regions because of the differences in climate and resource endowments. The diversity in production points out an unusually interdependent production structure on the supply side. Inter-subsectoral dependencies are as important as the intra-subsectoral dependencies. In addition, on the demand side, the regions compete with each other for access to the same national and foreign markets, and demand for feed is in fierce competition with the demand for food.

Given this complex set of linkages, interactions among products, regions, and techniques of production will determine the impact of various changes in agricultural policies when Turkey becomes a member of EU. Evaluating policy interventions and growth possibilities in a partial context, rather than tracing their effects through the sector, can give misleading results. The direct effect of a new policy may be desirable but may be lessened or nullified by its indirect effects, which are more difficult to evaluate and predict. To take into account the interactions involved in the sector for the evaluation of policy effects and growth possibilities, a regional, partial equilibrium, static optimization model has been designed. The model maximizes Marshallian surpluses and incorporates a technique known as Positive Mathematical Programming (PMP) to overcome the overspecialization problem in production by using the information provided by the actual actions taken by the farmers. It provides an internally consistent quantitative framework of analysis to study the impact of changes in resource prices, resource availabilities, policies, techniques of production, and economic growth on the location, production, consumption and price of agricultural commodities.

It should be made explicit that the modeling approach, used in this study, is intended to supplement, not to substitute, the discussion of EU related agricultural policy issues. The model is capable of showing possible responses of the variables to specific scenarios in a more expeditious and systematic way than otherwise possible. Given the analytical boundaries of the model, it allows the policy analyst to evaluate the direct as well as the indirect effects of policy measures and to trace out the impact throughout the agricultural sector. The modeling approach used in this study is not normative. It can not make policy prescriptions.

2.1. Overview of the Model

TASM is a sector-wide model in the sense that it describes total national supply (production and imports) and use (domestic demand for food, feed, and exports). It is a single period model. The base period of the model is the average from 1997 to 1999. The production side of the model is decomposable into sub-models for each of four geographical areas. The flow of inputs and outputs is presented in Figure 1. On the demand side, consumer behavior is regarded as price dependent, and thus market clearing commodity prices are endogenous to the model. Demand, supply and policy interactions at the national level are sketched in Figure 2.

The objective function is quadratic in revenue and cost because it maximizes the area between linear demand and supply curves. The maximand 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.

The supply side of the model incorporates the PMP 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 the 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. Hence, 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 implementation of the methodology is described in the calibration section.

2.2. Structure of Crop and Livestock Production

The model contains more than 200 activities to describe the production of about 50 commodities with approximately 250 equations and 350 variables.

Each production activity defines a yield per hectare for crop production, yield per head for livestock and poultry production. Crop production activities use fixed proportion of labor, tractor power, fertilizers, seeds or seedlings. The livestock and poultry activities are defined in terms of dry energy requirements. The relation between inputs and outputs are those observed on farms in each region, and not necessarily biological or economic optima.

The commodities produced are distributed between different production selling activities at the national level. First, there are domestic demand activities which are generated by linear demand curves. Domestic demand includes the domestic 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 for export of commodities at exogenous prices both in raw and raw equivalent form for processed commodities. It is possible to augment the supply of commodities through import activities at exogenously determined prices.

Provincial data was used to select regional cropping activities. The area and production of provinces were aggregated according the regional definitions.

Figure 1. Input Output Structure in Production

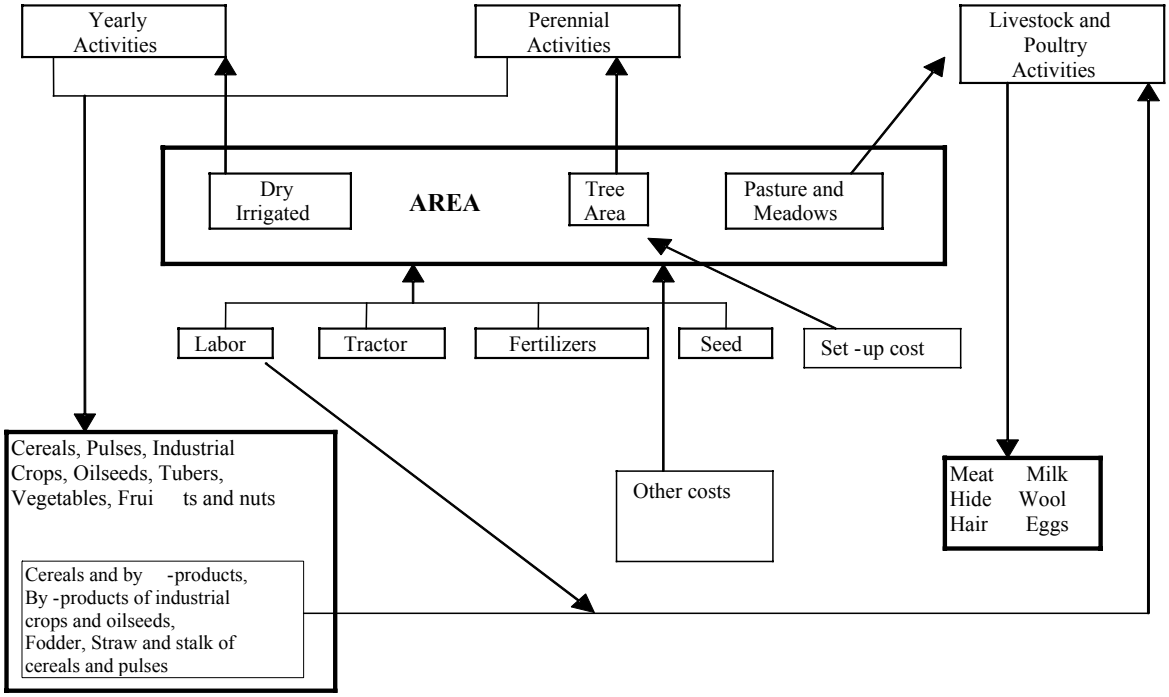
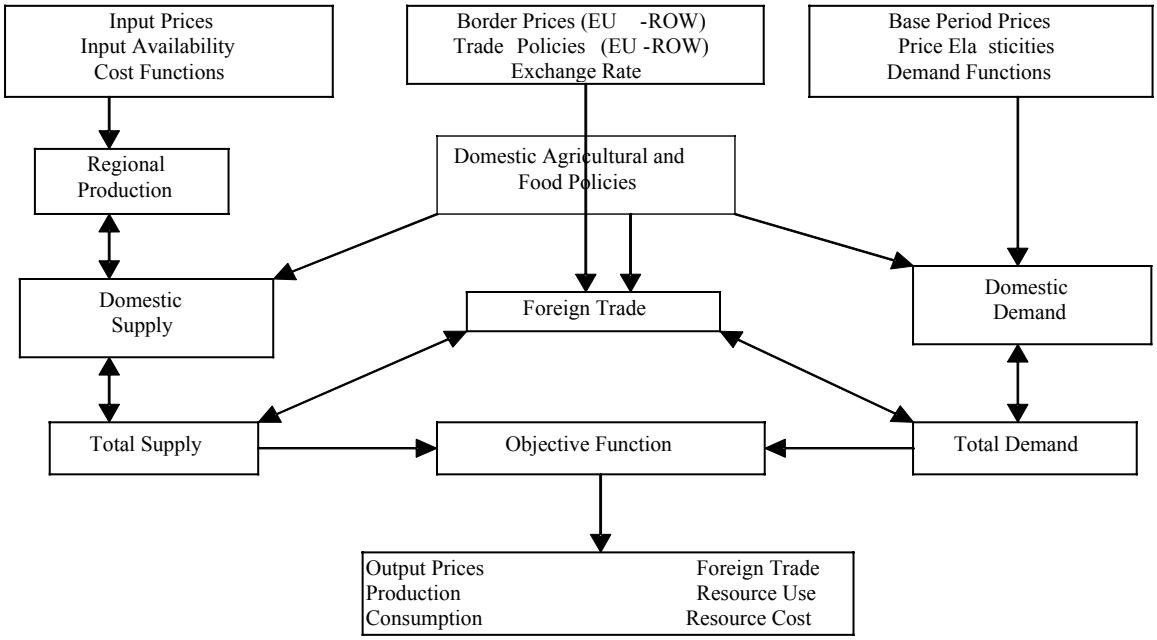


Figure 2. Demand and Supply Interacti on



2.2.1. Crop Production Activities

The input and output coefficients for crop production are specified for each unit of land. Output from crop production activities is divided into three categories: crop yield for human consumption, crop yield for animal consumption and crop by-product yield (forage, straw, milling by-products and oil seed by-products) for feed.

The commodity production activities in the model also constitute factor demand activities. Some factor supply functions are perfectly elastic (such as fertilizers), some are perfectly inelastic (e.g., categories of land). In the former category, factor prices are exogenous; in the latter they are endogenous.

Five groups of inputs i.e. land, labor, tractor power, fertilizer and seed, for the crop production are incorporated. Land is classified in four classes: Dry and irrigated land for short cycle activities, tree land for long cycle activities, and pasture land which includes range-land and meadow. Labor and tractor power requirements are specified on a quarterly basis. The labor input is measured in man-hour equivalents and shows actual time required on the field or per livestock unit. The tractor hours correspond to the usage of tractors in actual production and transportation related activities. Two types 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. Annualized investment costs are assigned for perennial crops.

2.2.2. Livestock Production Activities

Livestock production is an integrated part of the model. It is difficult to incorporate livestock production in a static sector model because of its dynamic character. Static models, however, can throw light on a 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. The feed supply is provided from the crop production sector, and it is disaggregated into six categories: Direct or raw equivalent commercial feed consumption of cereals i.e. wheat, barley, corn, rye, oats, millet and spelt; Two categories of processing by-products: milling by-products, i.e. wheat, rice, sugar beet, and oil seed by-products, i.e. cotton, sunflower, groundnut, and soybean; Straw or stalk by-products from the crop production: wheat, barley, corn, rye, oats, millet, spelt, rice, chickpea, dry bean, lentil; Fodder crops: alfalfa, cow vetch, wild vetch, and sainfoin; Range land and meadows.

The model makes sure that the minimum feed composition requirements are fulfilled. The explicit production cost for animal husbandry is labor. The outputs of the livestock and poultry production activities are expressed in terms of kg/head for livestock production.

2.3. Data Sources

The data can be grouped in two main clusters: (a) micro level production coefficients which form the core of the model, and (b) regional and national data such as the regional area, production, national consumption, factor prices and international trade statistics.

The data was put together from various sources such as the State Institute of Statistics (SIS), State Planning Organization (SPO), and The Directorate of Village Services (previously known as TOPRAKSU). FAO and World Bank sources were also used to complement and cross check the data from Turkish sources. The input and output coefficients are basically obtained from Koral and Artun (2000).

2.4. Calibration Method

It has been mentioned that the modeling approach uses the PMP approach to calibrate the model rather than flexibility constraints. For this purpose, the part of the cost function which can not be accounted by fixed proportions input-output coefficients has been estimated by the first step run of the model assuming that regional production figures in the base year reflects the optimal production pattern. First, the model was run with regional production constraints with a small perturbation to prevent degeneracy. The shadow prices of the regional production constraints obtained from the first-step run reflect the unaccounted portion of the cost function. Then, the shadow prices of the regional constraints are normalized with the actual production figures and are integrated into the objective function as a quadratic penalty term. The calibration constraints are then removed and the model has been adjusted for the validation exercise in the second-step run.

The implementation of calibration methodology[2] can also provide information about the general structure of the model. The first step of the model can be written in simple matrix notation as follows:

$$\text{Max } Z = f(D) \qquad (1)$$

$$Ax \leq b \qquad (2)$$

$$Ix = \tilde{x} + \varepsilon \qquad (3)$$

$$x \geq 0 \qquad (4)$$

where, Z is the objective function. Domestic and foreign demand, import costs of the products, and the variable costs of all production activities are included in the objective function. The vector x and the matrix A denote the activities and input-output coefficients. Vector b shows the RHS of the equations.

Equation (3) is called calibration constraint. $\tilde{x}$ is formed by the base period levels of the activities, and ε is the perturbation factor (equals 0.001) to prevent degenerate solution. The dual values of the calibration constraints provide the missing information about the marginal costs of the activities. The intercept and slope terms of the activity specific marginal cost functions are estimated by using the prevailing product pattern in the base period. The slope terms are dependent on the gross revenue and the level of activities.

$$\gamma_{r,a,t} = -1/SE_a \cdot \sum_o \left(P_o \cdot Y_{r,a,t,o}\right) / BPA_{r,a,t} \qquad (5)$$

where, $\ddot{e}$ is the slope term, SE and P represent supply elasticity and price, respectively; Y is the yield, and BPA denotes base period activity level. The indices are defined as follows: r, region; a, production activity; t, technology; and o, output.

[2] For alternative calibration methods see Paris and Howitt (2000 and 1998), Hecklei and Britz (2000a), CAPRI Team (2000), and Witzke and Britz (1998).

The intercept terms are found by using the dual values of the calibration constraints and the slope terms:

$$\alpha_{r,a,t} = -DVC_{r,a,t} - \gamma_{r,a,t} \cdot BPA_{r,a,t} \qquad (6)$$

where $\acute{a}$ is the intercept term of the cost function, and DVC denotes the dual value of the calibration constraint in (3).

Hence, the cost functions are obtained from the production decisions of the farmers in the base period. In the second step the cost functions are incorporated in the model shown in equations from (1) to (4), and calibration constraints (3) are removed. The model used for policy experiments is shown below:

$$\text{Max } Z = f(D) + \sum_{r,a,t} x_{r,a,t} \left(\alpha_{r,a,t} + 0.5\gamma_{r,a,t} \cdot x_{r,a,t} \right) \qquad (7)$$

$$Ax \leq b \qquad (8)$$

$$x \geq 0 \qquad (9)$$

The model is consistent with the microeconomic theory[3], and it replicates the base year production and prices without the calibration constraints.

3. MODEL SCENARIOS AND RESULTS

TASM-EU is a mathematical programming model to evaluate the impact of EU membership on agriculture in Turkey. The base period of the model is the average of the years 1997, 1998 and 1999. All policies and input-output relations pertaining in the base period are incorporated in the model. The model response to the changes in the policy environment, i.e. world prices, subsidies, trade measures etc., are through changes in the returns and costs of products due to the calibration method used in the model.

The model is solved for the year 2005. Following the Agenda 2002 reforms, CAP is expected to have a well defined set of parameters, for at least the major products, by the year 2005. The basic question to be answered is "What would happen to agriculture if Turkey would have been a member of EU in 2005?" To be able to evaluate the impact it is necessary to have the picture without membership.

The first scenario describes no membership situation (Out-EU). The possible domestic and trade policies in 2005, population and income growth from the base period to 2005, and world price estimates are included in the model. Turkey is the member of EU in the second scenario (In-EU). The recent enlargement process of EU indicated that the conditions of integration may change as the access time approaches. For this reason, three different simulations are conducted under the In-EU scenario. The first two is related to the uncertainties of accession, and the third is dependent on the domestic production environment in Turkey.

[3] See Hecklei (1997), Hecklei and Britz (1999, 2000a and 2000b), Howitt (1995a and 1995b), Cakmak (1992) for a detailed discussion about the consistency with micro theory and about the cost terms.

It is necessary to indicate few important points about the coverage of the model before getting in the details of the simulations and the results. It is obvious that the accession negotiations on the rural and agricultural structure will be tougher that the agricultural policy negotiations. The model does not include structural and rural policies. The model assumes that Turkey will comply with all quality, food safety, and health standards of EU. Lastly, the model does not incorporate possible changes in the income of the consumers due to the EU membership.

3.1. Simulations with TASM-EU

After the Agenda 2000 reforms, EU decided to extend the transition period to 10 years due to the additional budgetary burden of the new members. The new members are not allowed to receive full compensatory payments. It may be realistic to assume that the transition period for Turkey would be at least 10 years due to the lack of institutional and statistical infrastructure, and she should get prepared for no compensatory payment option.

For this reason, three simulations are conducted under the In-EU scenario. All major EU policies, but compensatory payments are incorporated in the first simulation (In-EU1). The second simulation (In-EU2) includes the compensatory payments. The third simulation (In-EU3) is aimed to measure the impact of a domestic policy measure that is not discussed under the ongoing agricultural policy reform program in Turkey. The only difference of In-EU3 from In-EU1 is the increase of productivity in livestock production by 5 percent.

All policies and changes in policies and exogenous parameters are described in Table 1. The structure of simulations and the rationale for the changes are described below:

Base Period (BP): All parameters and variables are the averages of the years 1997, 1998, and 1999. Fertilizer price subsidies, deficiency payments for some selected crops, tariffs, and export subsidies reflect period averages.

Turkey is not a member of EU (Out-EU): It is assumed that Turkey will not be a member of EU in 2005. The changes from the BP run reflect the potential changes in the domestic policies and external market conditions. The population and real income per capita are expected to increase 1.5 and 2.0 percent per annum, respectively. The population growth is the estimate of State Institute of Statistics. The income growth is highly affected by the contraction in 2001, and it is expected that the GNP growth rates will return to late 1990's rates after 2003. Trade prices in 2005 are obtained from the estimates of FAPRI (2000) with the necessary FOB and CIF adjustments. The volume of trade both for exports and imports are basically determined by the estimated prices, WTO commitments, and the trade volume in the base period. Technological improvement in the production will only be achieved by the increase in the irrigated land. This assumption stems from the fact that productivity growth in Turkish agriculture is stagnant in the last decade (Akder et al., 2000). The funds for irrigation investment have been quite limited in the recent past. Taking into account priority of the GAP and gestation periods, it is assumed that irrigated area in the GAP Region will increase by 150,000 ha and by 60,000 ha in the rest of Turkey by 2005. The level and the coverage of deficiency payments in 2005 will be the same as 2000. Nominally fixed fertilizer price subsidy will disappear in 2005. Area restrictions on tea, tobacco and hazelnut are set at the base period, since no area targets are announced. Similar assumption is made for the quantity restriction on

sugar beet production. Direct income subsidy will not have a direct impact on the cropping pattern, but will certainly increase the income of the farmers.

Table 1. Structure of Scenarios Conducted with TASM-EU

	1997-1999 **B**ase **P**eriod	Scenarios for 2005			
		Status quo	Member		
Abbreviation	BP	Out-EU	In-EU1	In-EU2	In-EU3
	All parameters and variables average of 1997-99.	Turkey out of EU in 2005.	Turkey in EU in 2005; CAP and EU prices are included, except compensatory area payments.	Turkey in EU in 2005; Compensatory area payments included.	Same as In-EU1; Techn. Improv. in Turkey's livestock production
Agricultural Policies	-Intervention purchases -Deficiency payments (period's average) -Fertilizer subsidy	-Intervention purchases -Deficiency payments (year 2000) -No fertilizer subsidy -Restrictions on tea, tobacco, hazelnut and sugar beet.	-EU-CMO applied -No deficiency payments -No fertilizer subsidy -Restrictions on tea, tobacco, hazelnut and sugar beet.	In-EU1 and compensatory area payments for cereals, oilseeds and set-aside included	Same as In-EU1
Growth of Population Income		Average/year 1.5 percent 2.0 percent	Same as Out-EU	Same as Out-EU	Same as Out-EU
Teknological development		210,000 ha increase in irrigated area: GAP 150,000 Rest 60,000	Same as Out-EU	Same as Out-EU	In-EU1 and 5 percent improvement in livestock yields
Foreign trade prices, market access and other border policies	-Trade prices, tariffs and exports subsidies are averages of 1997-99 -Observed foreign trade quantities	-Prices adjusted to the changes in world prices -Adjusted WTO commitments -Export subsidies same as BP -Improved market access	-EU prices adjusted to the changes in world prices -Impact on EU prices for some products -No border intervention to EU -Improved market access	Same as In-EU1	Same as In-EU1
Exchange Rates (TL 1,000)	97:USD1=TL153 98:USD1=TL262 99:USD1=TL422	USD1 =EUR1.06	USD1 =EUR1.06	USD1 =EUR1.06	USD1 =EUR1.06

Turkey is a member of EU, *highly possible case* (In-EU1): This simulation reflects the starting bargaining position of EU to the accession negotiations on agriculture. All policies of CAP, but area compensatory payments, are valid for Turkey. Tariffs and import subsidies are removed for EU-Turkey trade in agricultural products. All

intervention purchases and prices are implemented in Turkey at the levels determined by the Agenda 2000 for 2005. Protection and import subsidy levels of Turkey against the third countries are at the same levels as EU. The quota levels for products like sugar, milk are determined by the base period production. All policies related to fruits and vegetables are implemented in Turkey. The other exogenous parameters are the same as the Out-EU scenario.

Turkey is a member of EU, *depends on negotiations* (In-EU2): The only difference from the previous simulation is that area compensatory payments are included in the model. At least 10 percent of the land in the reference period should be put on set-aside for the farmer to be eligible to receive area compensatory payments. Small farmers with less than 92 tons per year output are exempt from the set-aside condition. Compensatory payments are determined at the same level (EUR63/reference cereals yield MT/ha) for cereals, oilseeds, protein crops, and set-aside for 2005. EU claims that the price distortionary impact of the area payments is minimal, since the payments are not crop specific.[4] The simulation assumes that the claim of EU is valid. 1997-99 averages are taken as the reference areas of related crops. Rain-fed regional yields are included as the reference yields. Furthermore it is assumed that none of the farmers will be exempt from the set-aside requirement, and 10 percent of the cultivated land will be set-aside. Under this simulation the compensatory payments reflect the minimum total amount.

Turkey is a member of EU, *depends on domestic policy* (In-EU3): All conditions of the In-EU1 simulations are valid. The only change is a net 5 percent productivity improvement in the livestock sector.

3.2. Results of the Simulations with TASM-EU

It is possible to analyze the results of the simulations at different aggregation level given the structure of the model above. Welfare impacts of various scenarios may be supplemented by the discussion of the direct and indirect effects of policy changes on the area, production and regional costs of production. The results will be discussed from aggregate towards more disaggregate levels by emphasizing the most important effects.

The agriculture policies in Turkey, as well as in EU, are continuously changing. Moreover, the accession conditions of the past enlargements displayed major differences. The results of the simulations are valid only under the assumptions of the policy environment and the expected values of exogenous parameters. Hence, they do not and can not reflect the potential impact of EU membership under all conditions.

3.2.1. General Effects of EU Membership

Total, producers' and consumers' surplus measures are the aggregate measures to evaluate the impact of membership. Producers' surplus roughly indicates the return from all production factors not included in the variable costs. Consumers' surplus is the additional benefit to non marginal consumers.[5]

[4] This claim of EU is open to discussion, and it is claimed these transfers are not fully decoupled and have an impact on the allocation of resources. For a review of the discussion see Roberts et al. (1999).

[5] For a thorough discussion see Kasnakoglu et al. (1990 and 1991).

The general results, including the welfare measures, are presented in Table 2. Total surplus is expected to increase in 2005 independent from the EU membership. Total surplus is expected to increase by 20 percent without the membership. More than half of the increase is due to the growth in income and upgraded agricultural resources. Membership of EU in 2005 will bring an additional 1 percent increase in total surplus. Set-aside requirement to be eligible for the area payments declines the total welfare, whereas productivity improvement in livestock production increases the welfare impact of the membership.

Similar results of simulations in total surpluses are significantly different for the producers and consumers. No membership scenario causes 15 percent increase in the producers' surplus. The basic cause of this increase is due to the fact that the increase in the demand is not matched by the increase in production, and furthermore the sector continues to operate at high protection levels. Especially with the expansion of imports in livestock products, the consumers' surplus goes up by 24 percent. The negative impact of the removal of fertilizer price subsidy on producers is matched by the positive impact of irrigated area expansion and changes in cropping pattern.

The welfare results are totally different in membership and no-membership scenarios. Producers' surplus decreases by 16 percent, whereas the consumers' surplus increases by 12 percent if Turkey becomes a member in 2005. High proportion of consumers' surplus in total causes a 2 percent improvement in total surplus. The simulation with area compensation payments (In-E2) results in slightly reduced welfare impact since the payments are not included in surplus calculation. The technological improvement in the livestock sector is effective in increasing the performance of the sector.

In fact, the overall results are similar to the welfare impacts. Assuming that the EU and Turkish agricultural policies remain intact, the membership will be beneficial to the consumers and will hurt the producers. EU policies are continuously in evolution since 1992, and a new phase of change has been started with Agenda 2000 decisions. The results of the scenarios are reflecting these policy changes. The prices of important products, such as cereals and oilseeds in policy formulation in both EU and Turkey, are expected to be close to the world prices in EU and hence in Turkey too. In addition, the prices of livestock products seems to be more in line with world prices in EU than in Turkey, if Turkey stays out of the Union in 2005. The closeness of the internal prices is a sign of the reduction in protection. In the case of no drastic changes in the world market conditions, EU producers will be subsidized through almost decoupled payments depending on the reference area, yield and heads of animals rather than prices distorting policies.

The values of production and consumption in Table 2 are calculated in two different ways: First is with the 1997-99 prices, the other with the model's prices. Both values are in US dollars and the impact of inflation is limited with the depreciation of the US dollars. The volumes calculated with constant prices correspond to changes in the quantities. The values are found by multiplying the model's prices with the corresponding quantities, and reflect the changes in both quantities and prices.

Table 2. General Results of TASM-EU Scenarios (USD million)

	1997-99	2005			
	BP	Out-EU	In-EU1	In-EU2	In-EU3
Total Surplus (Index)	**100**	**120.5**	**123.1**	**122.8**	**123.9**
Producers' Surplus	100	115.0	96.7	96.6	98.2
Consumers' Surplus	100	123.6	137.7	137.2	138.0
Total Production					
Volume [a]	31,996	34,511	30,930	30,496	32,315
Value	31,996	39,231	30,600	30,467	31,613
Compensatory Area Payments	-	-	-	2,453	-
Crop Production					
Volume [a]	21,475	22,627	22,784	22,417	22,764
Value	21,475	25,387	24,435	24,347	24,498
Compensatory Area Payments	-	-	-	2,453	-
Livestock Production					
Volume [a]	10,521	11,885	8,146	8,080	9,551
Value	10,521	13,934	6,164	6,119	7,115
Total Consumption					
Volume [a]	27,578	32,142	34,623	34,564	34,683
Expenditure	27,578	35,727	31,366	31,543	31,241
Crop Consumption					
Volume [a]	16,875	19,325	19,667	19,613	19,658
Expenditure	16,875	20,859	20,046	20,215	20,077
Livestock Consumption					
Volume [a]	10,703	12,818	14,955	14,951	15,027
Expenditure	10,703	14,868	11,320	11,328	11,164
Net Exports	**1,980**	**899**	**-2,797**	**-3,064**	**-1,917**
Crop Products	2,150	1,530	2,256	2,038	2,127
Livestock Products	-170	-631	-5,053	-5,101	-4,045
Price Indices	**100**	**112.75**	**95.06**	**95.84**	**94.89**
Crop Products	100	110.29	104.35	105.49	104.70
Livestock Products	100	117.77	76.09	76.16	74.84

Notes: See text for the scenarios.

[a] Model results at the base period prices.

Source: Authors' calculations.

The volume of agricultural production declines in all cases, except in no-membership scenario and improvement in livestock technology. The volume expansion by 8 percent in member scenario turns out to be -3 percent in the non-member scenario. The change is more drastic if the changes in prices are taken into account. The value of agricultural production increases only in non-member scenario. Member scenario provides 22 percent decline in value. The area compensation payments compensate 7 percentage points of the significant decline in farmers' revenues. As it is explained in the scenario structures, the area compensation payments correspond to minimum values. For example, if the reference yields are calculated by incorporating irrigated cultivation, it may be possible to compensate almost

the entire decline in the revenue. Improvement of production technology stems as another policy to diminish the negative impact of membership on the producers.

The results on crop and livestock sub-sectors are strikingly different. The situation in the livestock sector mainly reflects the backward production conditions in the livestock despite high tariffs combined with non-tariff protection. The overall crop production seems to stay competitive even in the case of membership. The volume of crop production increases by about 5 percent in all simulations. Trade liberalization with the EU brings about 13 percent increase in the value of crop production through the changes in the price structure. The area compensation payments for cereals and oilseeds provide about 10 percent additional increase in the farmers' revenues. Another interesting result is obtained through the sub-sectoral interactions between the crop and livestock production. The improvement in the livestock production technology pushes up the value of crop production.

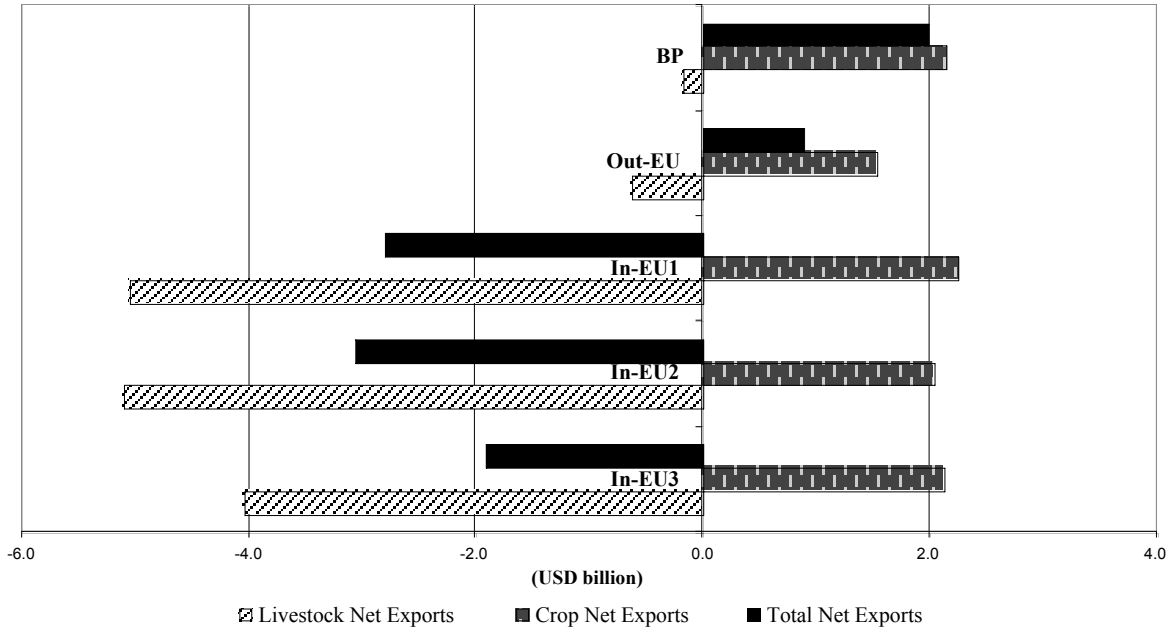
Both the volume and value of livestock record significant reduction in the membership scenario. The livestock production volume and value increase by 13 percent and 32 percent, respectively due to the expansion in demand coupled with high protection in the non-member scenario of 2005. Yet, the volume is reduced by 22 percent and the value by 40 percent compared to the base period if Turkey becomes a member in 2005. The protection on the livestock products in EU remains high, despite the declines brought by the policy changes. For instance, it is interesting to note that the price of beef in EU is expected to be twice the US cif price of Australian beef. Despite the high rates of protection, Turkey will not have a chance to compete with EU under the prevailing production structure. Yet, even slight improvement in the livestock yield improves the volume by 17 percent and the value by 15 percent.

Total, crop and livestock consumption increase in all scenarios, but more significantly in case of membership. No-membership brings about 16 percent increase in consumption. Membership causes a further increase of 10 percentage points. However the impact on consumption expenditures is quite different. The 30 percent increase in consumption expenditures in the case of no-membership is down to 14 percent increase when Turkey becomes a member in 2005. As expected the impact of membership is quite different at the sub-sectoral level. The volume of crop consumption increases by 15 percent in non-member scenario, with similar increase of 17 percent in the membership scenario. Increase in consumption expenditure is almost the same in member scenario, but no-membership results in 10 percentage point higher expenditures than the change in the volume.

Large discrepancies occur in volume and value of consumption of livestock products, as it is expected. In all membership simulations the volume of consumption increases by 40 percent relative to base period, and by 13 percent relative to no-membership scenario. However, the picture is quite different in livestock consumption expenditure. The consumption expenditure is up by 40 percent in no-member case, whereas the same rate of change is only 5 percent in case of membership. The membership the consumers save almost 25 percent if Turkey becomes a member, and hence a relatively high consumption level is achieved at a much lower cost. Higher proportion of consumption is provided from domestic production, with almost no impact on consumption level in the case of yield improvement in livestock sector.

It is obvious that net exports will be affected from the changing production and consumption conditions (Table 2). The total net exports of raw and processed products in raw equivalent form amounted to about USD 2 billion in the base period. The total of imports of livestock products in the same period was USD 0.2 million (Figure 3). Trade liberalization with EU combined with the expansion of demand brings about more favorable conditions for imports compared to exports, especially in the livestock products. Non-member scenario for 2005 gives the necessary signals for an unfavorable export conditions. Total net exports decline by slightly more than 50 percent. The exports of crop products are resisting by 28 percent reduction. The imports of livestock products increase by more than 4 folds, and reach USD 630 million. Membership to EU causes Turkey to become a significant net exporter in the agricultural products. Total net exports climbs up to USD 2.8 billion, despite the increase in the crop products net exports. Without any tariffs and non-tariff barriers with EU, The net imports in livestock products shoot up to USD 5 billion. The set-aside requirement to be eligible for the compensation payments causes further decline in the net exports. It is important to note that yield improvement in livestock causes USD 1 billion in the imports of livestock products.

Figure 3. Net Imports



Source: Table 2.

Laspayres price indices are calculated for all simulations using the base period production as weights. The overall price level is expected to increase by 13 percent when Turkey is out of Union, whereas the crop and livestock product prices go up by 11 percent and 18 percent, respectively. In the membership simulations, the increase in crop prices is coupled with significant decrease in livestock prices leading to 5 percent decline in the level of prices compared to base period, and 16 percent decline compared to non-member scenario.

3.2.2. Impact on Agricultural Products and Regions

Following the evaluation of the overall results of membership to EU, the impact on selected products, farmers' revenues and regions will be discussed in this section.

Impact on Production Volume: All model results are evaluated at the base period average prices. The levels and changes for product groups and for selected products are presented in Table 3.

The sector, faced with a different relative price structure in the case of membership, shows different responses depending on the product. The results on product groups usually hide rather significant changes in specific products. The membership brings about 10 percent contraction in the overall production level.

The major source of contraction is the decrease in livestock production. The livestock production increases as a response to demand expansion in non-member scenario. Yet, in case of membership the livestock price level declines by about 40 percent that in turn causes 30 percent reduction in livestock production. It is interesting to note that EU livestock prices are generally about two times than the corresponding world prices. The decline in poultry products is relatively less than 35 percent reduction in other livestock products.

Crop production shows relatively better performance in the EU member scenario. The volume of crop production excluding the orchards products goes up by half of a percent, the total increases by almost 1 percent.

Individual products in the groups display differentiated responses to membership. The decline in wheat stems from the soft wheat production. In the member scenario, the production of soft wheat declines by 10 percent, whereas the durum wheat production expands by 4 percent. It is important to note that area compensatory payments are not included in the reference membership (In-EU1) simulation. Furthermore, special area payments in the CMO of durum wheat are not incorporated even in In-EU2 simulation. Barley and rice production expand by 9 percent and 6 percent, respectively, whereas corn production declines by 8.7 percent in the member scenario. Pulses seem to benefit the most from the membership. Chickpea and lentil production increase by more than 15 percent.

Industrial crops are the most possible candidates to remain competitive with the membership. The production levels of all crops increase. Cotton and sugar beet production increase by 5 percent and 4 percent, respectively. EU will become one of the major producers of cotton in the world when Turkey becomes a member. This situation may cause reduction in the target price of cotton and that might have dampening effect on the EU price of cotton. Stagnated tobacco production is due to area control. Both in Turkey and in EU, policy makers intend to continue to use strict supply control measures for tobacco. EU is trying to take effective quotas and quota management procedures to control the supply by taking into account the special conditions of tobacco farmers. Turkey is trying to enforce quotas with no specific control measures. Oil seeds appear as the crop product group that will have the highest decline with membership. In tuber crops, onion production is expected to decrease slightly and potato production increase by 1 percent.

Vegetable and fruit production will go up with membership. All crops in vegetables are expected to increase in production. Tomato for processing seems to have the highest

competitive position among the vegetables, followed by cucumber and melons. The orchard products register changes between 1 percent and 2 percent in the membership scenario, except for apple and for oil olives. It is necessary to note that the payments for maximum guarantied quantity payments for olives are not included in the model, since the EU intends to revise the payment program for olives due to its high budgetary burden. The production of citrus, table olive and pistachio increase between 1 percent and 2.5 percent. Tea production remains the same due to area limitation, and the production of the remaining orchard crops declines.

Table 3. Production Volumes (million USD at 1997-99 prices)

	97-99	2005				Percent change	
	BP	Out-EU	In-EU1	In-EU2	In-EU3	EU1/BP	EU1/Out
Crop Production	**21,475**	**22,627**	**22,784**	**22,417**	**22,764**	**6.1**	**0.7**
Cereals	**5,468**	**5,519**	**5,279**	**4,989**	**5,273**	**-3.5**	**-4.4**
Wheat	3,667	3,787	3,463	3,298	3,429	-5.6	-8.6
Barley	1,190	1,159	1,264	1,162	1,279	6.2	9.1
Corn	412	414	378	364	391	-8.2	-8.7
Rice	121	87	93	92	92	-23.3	6.7
Pulses	**756**	**774**	**876**	**841**	**871**	**15.9**	**13.1**
Chickpea	313	329	381	362	379	21.7	16.0
Industrial Crops	**3,490**	**3,494**	**3,603**	**3,585**	**3,599**	**3.3**	**3.1**
Tobacco	1,001	999	1,000	1,000	1,000	-0.1	0.2
Sugar beet	1,294	1,162	1,207	1,196	1,205	-6.7	3.9
Cotton	1,195	1,334	1,396	1,389	1,394	16.8	4.7
Oilseeds	**580**	**429**	**403**	**385**	**400**	**-30.6**	**-6.1**
Sunflower	471	330	306	289	304	-35.0	-7.2
Soybeans	19	16	14	13	14	-27.2	-13.7
Tubers	**1,899**	**2,128**	**2,098**	**2,096**	**2,098**	**10.5**	**-1.4**
Vegetables	**4,390**	**5,129**	**5,286**	**5,282**	**5,285**	**20.4**	**3.1**
Fruits and Nuts	**4,891**	**5,153**	**5,239**	**5,239**	**5,239**	**7.1**	**1.7**
Livestock Products	**10,251**	**11,885**	**8,145**	**8,080**	**9,551**	**-22.6**	**-31.5**
Beef	2,960	3,732	2,224	2,212	2,670	-24.9	-34.1
Milk	3,741	4,290	2,820	2,805	3,355	-24.6	-34.3
Poultry Products	1,891	1,913	1,622	1,588	1,875	-14.3	-15.3
TOTAL	**31,996**	**34,512**	**30,930**	**30,497**	**32,315**	**-3.3**	**-10.4**

Source: Authors' calculations.

The cultivated area is decreased by 10 percent in the compensation payment simulation of membership scenario. The impact of set aside on the production volume is limited only to 1.3 percent decline. As it will be seen in the following section area compensation payment is able to compensate the loss in production. The return of technological improvement in the livestock production is significant. Compared with the no technological improvement simulation, the livestock production increases by 17 percent. The production of feed crops increases too parallel to the increase in livestock production

Impact on Production Value, Costs and Gross Income: The production value includes changes both in the prices and in the quantities. The changes in prices are mainly affected by two factors. First is the expected change in the world prices by 2005. Second channel is the change in degree of transmission of the world prices through the intended reforms in CAP. CAP price policies of cereals and oilseeds are drastically revised, and unless the world prices decrease dramatically in the future, the EU internal prices are expected to be

formed close to the world prices. The loss of farmers' revenue will be compensated by area compensation payments. No significant changes are expected in the other field crops. Following the policy changes in 2000, the level of the compensation payments for withdrawals of fresh vegetables and fruits has been diminished. Despite the implementation of entry prices, it is anticipated that the prices of the products in this group will decrease. The support was shifted more to MGA and MGQ payments. The intervention in the beef market aims to push down the supply and intervention price. Reform in the milk and dairy product market was postponed to 2006.

The results on the value of production for product groups and selected products are presented in Table 4. The decline in the prices with the membership is accompanied with drastic decrease in domestic production, and hence the value of livestock production is halved. The decline in the crop production value is slightly less than 4 percent. Value declines in cereals and oilseeds are compensated by the increase in pulses, industrial crops, vegetables and fruits, and end up about at the same level as the non-member scenario. Least affected crops from the membership are barley and rice. With a relatively high EU price, both value and volume of rice production go up. The increase in chickpea value by 15 percent is more than compensate the decline in dry beans by 9 percent, and hence the pulses group registers a positive increase. Almost all values for industrial crops, notably cotton, increase. Turkey does not seem to have any competitive edge in oilseeds within EU or out of EU.

Table 4. Value of Production (USD million)

	97-99	2005				Percent Change	
	BP	Out-EU	In-EU1	In-EU2[a]	In-EU3	EU1/BP	EU1/Out
Crop Production	**21,475**	**25,387**	**24,435**	**26,800**	**24,498**	**13.8**	**-3.7**
Cereals	**5,468**	**6,127**	**4,295**	**6,350**	**4,366**	**-21.5**	**-29.9**
Wheat	3,667	4,272	2,736	4,035	2,717	-25.4	-35.9
Barley	1,190	1,286	1,135	1,710	1,194	-4.6	-11.7
Corn	412	433	290	429	316	-29.7	-33.1
Rice	121	64	69	68	68	-43.3	6.7
Pulses	**756**	**823**	**933**	**896**	**928**	**23.4**	**13.4**
Chickpea	313	355	411	390	408	31.3	16.0
Industrial Crops	**3,490**	**3,384**	**3,860**	**3,841**	**3,855**	**10.6**	**14.1**
Tobacco	1,001	1002	1,004	1,004	1,004	0.4	0.3
Sugar beet	1,294	1,017	1,056	1,046	1,055	-18.4	3.9
Cotton	1,195	1,366	1,800	1,790	1,796	50.6	31.8
Oilseeds	**580**	**261**	**205**	**335**	**204**	**-64.6**	**-21.3**
Sunflower	471	173	125	249	124	-73.6	-27.8
Soybean	19	11	9	13	9	-50.4	-13.7
Tubers	**1,899**	**2,128**	**2,098**	**2,096**	**2,098**	**18.7**	**-5.8**
Vegetables	**4,390**	**6,010**	**6,288**	**6,296**	**6,290**	**43.2**	**4.7**
Fruits and Nuts	**4,891**	**6,389**	**6,600**	**6,600**	**6,600**	**34.9**	**3.3**
Livestock Products	**10,251**	**13,934**	**6,164**	**6,119**	**7,114**	**-41.4**	**-55.8**
Beef	2,960	3,142	1,335	1,328	1,603	-54.9	-57.5
Milk	3,741	5,868	2,513	2,500	2.987	-32.8	-57.2
Poultry Products	1,891	2,071	1,280	1,254	1,480	-32.3	-38.2
Total	**31,996**	**39,321**	**30,600**	**32,920[b]**	**31,612**	**-4.4**	**-22.2**

Notes: [a] Compensatory area payments are added to the relevant crops.
[b] Including compensatory area and set-aside payments.
Source: Authors' calculations.

Vegetables and fruits are expected to be competitive under all conditions. The share of cereals in total agricultural production value is about 17 percent in the base period, whereas the share of vegetables and fruits are 14 percent and 15 percent, respectively. With the EU membership the share of fruits and vegetables in total reaches 32 percent.

Apart from the use of labor, the membership does not have significant effects on the factor use (Table 5). The decline of labor use by 11 percent is mainly due to the decrease in livestock production that naturally brings significant contraction in the herd size. The use of labor decreases by 2 percent in crop production, without a significant change in the use of machinery.

In all simulations the removal of fertilizer price subsidy has limited effects. The use of fertilizer increases by 2 percent in out of EU scenario, and declines by the same percentage in the case membership.

The variable cost items comprise of labor, machinery rental, fertilizer, seeds or seedlings, and annualized set-up costs for orchards. In non-member scenario total variable costs increase by 13 percent, but total value registers a higher increase that leads to 20 percent increase in gross income of the farmers. The difference between in EU and out of EU scenarios is reflected in the changes of total value of production

Table 5. Changes in Input Use, Costs and Gross Returns (1997-99=100)

	2005				Percent Change	
	Out-EU	In-EU1	In-EU2	In-EU3	EU1/BP	EU1/Out
Labor Use[a]						
Total	109.2	96.9	96.1	98.6	-3.1	-11.3
in Crop Production	107.6	105.5	104.8	105.7	5.5	-1.9
Machinery Use[a]	**103.8**	**103.1**	**100.1**	**103.1**	**3.1**	**-0.6**
Fertilizer Use						
N	102.6	100.4	97.2	100.4	0.4	-2.1
P	101.4	99.4	95.4	99.4	-0.6	-2.0
Cost of fertilizer	**154.9**	**151.7**	**146.2**	**151.7**	**51.7**	**-2.1**
Crop Production						
Cost of Variable Inputs	113.1	111.5	109.2	111.6	11.5	-1.4
Gross Return[b, c]	119.5	114.4	128.6	114.7	14.4	-4.3
Total Production						
Feed costs	120.5	65.9	68.1	76.7	-34.1	-45.3
Gross return[b, c]	124.6	94.7	113.1	98.0	-5.3	-24.0

Notes: [a] in 1997-99 prices, rates of change are the same for use and cost.
[b] Net of variable costs.
[c] Including compensatory area and set-aside payments for In-EU2.
Source: Authors' calculations.

It is necessary to subtract the value of feed from the total value of agricultural production to be able to identify total gross income. The use of feed is endogenously determined by the model. The scenario prices are multiplied by the use of feed to find the feed cost, and then this amount is subtracted from the value of production to find the total gross income (Table 5).

The increase in gross income is higher than the increase in costs, mainly due to the high protection rates in livestock feed crops in non-member scenario. With the EU membership the contraction in herd size coupled with 45 percent decline in feed costs causes almost 25 percent decline in gross income.

The contribution of area compensation payments to gross income is not negligible. The gross income increases by about 20 percent with compensation payments compared to no compensation payment simulation. As a result of improvement in livestock yields total income performance goes up by 4 percent compared to no improvement simulation, despite an increase in feed cost.

Regional Effects: The crop production is disaggregated into 4 regions in the model, whereas the livestock production is at the national level. The model may provide clues about the regional effects of membership at least fro the crop production.

The most affected region from the membership is East Anatolia, and the least affected one is the Coastal Region. Yet, the effects are in reverse direction. The volume of production in the East declines by 1 percent in the member scenario compared to non-member. The impact on the Coastal Region is positive by almost the same proportion (Table 6). The changes in production values reflect the difference in the crop patterns in these two regions. Coastal Region's value declines slightly as a result of membership, whereas in East Anatolia the decrease is about 12 percent. It is necessary to remind that the model results indicated huge contraction in herd sizes in the member scenario, and the livestock production is the most important agricultural activity in the East. After all, the region which will suffer the most after the membership is expected to be the East Anatolia. However, given the backward nature of agricultural production in this region, it will also be eligible to get the highest level of aid from the structural funds.

Table 5. Regional Effects (USD million)

	97-99	2005				Percent change	
	BP	Out-EU	In-EU1	In-EU2	In-EU3	EU1/BP	EU1/Out
Production Volume	**21,475**	**22,626**	**22,784**	**22,417**	**22,764**	**6.1**	**0.7**
Coastal	11,494	12,228	12,311	12,148	12,304	7.1	0.7
East Anatolia	6,715	6,896	6,956	6,818	6,944	3.6	0.9
Central Anatolia	1,007	1,020	1,008	987	1,007	0.2	-1.1
GAP	2,258	2,483	2,509	2,464	2,508	11.1	1.1
Production Value[a]	**21,475**	**25,387**	**24,435**	**26,800**	**24,498**	**13.8**	**-3.7**
Coastal	11,494	13,982	13,783	14,572	13,807	19.9	-1.4
East Anatolia	6,715	7,544	6,875	8,048	6,903	2.4	-8.9
Central Anatolia	1,007	1,092	962	1,120	966	-4.4	-11.8
GAP	2,258	2,770	2,815	3,060	2,821	24.6	1.6

Not: [a] Including compensatory area and set-aside payments for In-EU2.
Source: Authors' calculations.

GAP Region benefits the most from the membership with the contribution of a relatively high growth in irrigated land, and it is the only region which enjoys positive change in production value.

The regional distribution of area compensation payments reveals its importance for certain regions. Almost half of the payments is allocated to the Central Anatolia Region with 9 percent decline in revenues following the membership. Membership with compensation causes the level of revenues to be above the non-member scenario, and 17 percent increase relative to reference membership simulation. The same effect for Coastal and GAP regions are 6 percent and 9 percent, respectively.

3.2.3. Food Consumption and Expenditure

Calculations similar to production are done to obtain the value and volume of food consumption. The volumes are calculated with the simulated quantities and the prices in the base period to determine the changes in quantities. Food expenditure is calculated by multiplying simulated quantities with the simulated prices. Consumption volumes and expenditures are valued at the farm gate prices. Price increase may cause either an increase or a decrease in expenditures depending on the response of the consumers to changes in prices.

The results on food consumption are presented in Table 7. More emphasis will be given to the comparison of in and out of EU in the following discussion, since the comparison with the base period involves also changes whether Turkey becomes a member or not.

In almost all member simulations food consumption goes up, and food expenditure decrease. Pulses and sugar consumption remains stagnant both in quantity and expenditure, but due to different reasons. The remaining surplus of pulse production from the domestic is exported at the new set of relative prices. Quota in sugar production is effective. Sugar quota is used at the quota prices, and the excess domestic demand is satisfied by imports.

As expected, the highest increase in consumption occurs in livestock products. Beef consumption goes up by 12 percent, and with the contribution of ovine meat, the total meat consumption grows by 16 percent. The percentage increase in cow milk consumption is smaller than sheep and goat milk consumption. In other livestock products the growth rates are limited by 1 percent. Chicken consumption increases by 10 percent.

Basic food consumption increases by 5 percent in the member scenario. Wheat and maize are the main contributors to this growth. The source of this contribution is the food-feed competition that is incorporated in the model structure. In non-member scenario, the herd sizes expand. Apart from the durum wheat, all other cereals are channeled to livestock production as intermediate inputs. In member scenario, cereals are spared more for direct human consumption and/or the quantities of trade change.

The membership scenario registers decreases in food consumption expenditures, despite the general tendency of increase in food consumption. The hike in domestic prices of basic foods, especially of cereals, in non-member scenario is eased by membership. The prices are 20 percent lower in the member scenario, since the EU prices are formed close to world prices. The comparison of membership consumption expenditure with the base period results reveals no change if the growth of population is accounted for.

Table 7. Food Consumption and Expenditure (USD million)

	97-99	2005				Percent change	
	BP	Out-EU	In-EU1	In-EU2	In-EU3	EU1/BP	EU1/Out
Consumption Volume	**27,578**	**32,143**	**34,624**	**34,564**	**34,684**	**25.5**	**7.7**
Total food	25,554	29,788	32,275	32,217	32,337	26.3	8.3
Crops	15,258	17,508	17,856	17,802	17,847	17.0	2.0
Livestock products	10,296	12,280	14,418	14,414	14,489	40.0	17.4
Meat [a]	5,642	6,927	8,039	8,035	8,110	42.5	16.0
Milk	3,780	4,290	5,077	5,077	5,077	34.3	18.3
Basic food [b]	**6,205**	**7,135**	**7,496**	**7,447**	**7,489**	**20.8**	**5.1**
Cereals	3,303	3,496	3,825	3,787	3,818	15.8	9.4
Flour	2,620	2,732	3,025	2,992	3,023	15.4	10.7
Pulses	594	689	690	690	690	16.1	0.0
Sugar	1,049	1,286	1,286	1,286	1,286	22.5	0.0
Oils	1,259	1,664	1,695	1,685	1,695	34.7	1.9
Consumption Expend.	**27,578**	**35,727**	**31,366**	**31,543**	**31,241**	**13.7**	**-12.2**
Total food	25,554	33,241	28,825	28,997	28,695	12.8	-13.3
Crops	15,258	18,895	18,030	18,192	18,055	18.2	-4.6
Livestock products	10,296	14,347	10,796	10,804	10,640	4.9	-24.8
Meat [a]	5,642	7,293	5,368	5,377	5,213	-4.8	-26.4
Milk	3,780	5,868	4,519	4,519	4,519	19.5	-23.0
Basic food [b]	**6,205**	**6,638**	**5,741**	**5,886**	**5,762**	**-7.5**	**-13.5**
Cereals	3,303	3,776	2,997	3,102	3,017	-9.3	-20.7
Flour	2,620	3,078	2,391	2,481	2,396	-8.8	-22.3
Pulses	594	731	730	730	730	22.9	-0.1
Sugar	1,049	1,125	1,125	1,125	1,125	7.2	0.0
Oils	1,259	1,006	889	930	890	-29.3	-11.6

Notes: The values of consumption in processed form are obtained from raw equivalents.

[a] Including chicken

[b] wheat flour, wheat, corn, rice, pulses, sugar, vegetable oils.

Source: Authors' calculations.

3.2.4. Trade

The membership to EU may have two different effects on trade. First, the quantity and value of trade may change as a result of membership. Second, the direction of trade may be affected. The results on net exports presented in Table 8 incorporate both effects. Apart from the base period, all net export results are disaggregated as to EU and rest of the world in the Table 8.

It is relatively easier to incorporate EU protection measures in the model, then the export subsidies. A bidding mechanism is effective in having the privilege of export subsidies. Hence, export prices reflect the member preference, yet it is also possible to export to the rest of the world.

Turkey's net export of the products included in the model in the base period reach USD 2 billion. With almost no trade in livestock products, almost all is coming from the crop production. The tariffs of non-member scenario are close to base period levels. The structure of trade in the model allows the expansion in both exports and imports.

Table 8. Net Exports (USD million)

	97-99	2005											
	BP	Out-EU			In-EU1			In-EU2			In-EU3		
	Total	EU	Others	Total	EU	Others	Total	EU	Others	Total	EU	Others	Total
Crop Products	**2,150**	**1,027**	**503**	**1,531**	**1,753**	**502**	**2,256**	**1,628**	**409**	**2,038**	**1,684**	**443**	**2,127**
Cereals	**-105**	**-308**	**-9**	**-317**	**-510**	**149**	**-360**	**-591**	**66**	**-524**	**-571**	**93**	**-478**
Wheat	13	-47		-47	-375		-375	-456		-456	-436		-436
Barley	97				156	155	312	156	72	229	156	99	255
Corn	-100	-126		-126	-156		-156	-156		-156	-156		-156
Rice	-108	-119	-9	-127	-119	-6	-124	-119	-6	-125	-119	-6	-125
Pulses	**156**	**112**	**-17**	**95**	**203**		**203**	**166**		**166**	**198**		**198**
Chickpea	114	112		112	169		169	147		147	166		166
Industrial Products	**763**	**80**	**253**	**333**	**533**	**-9**	**524**	**527**	**-16**	**511**	**531**	**-10**	**521**
Tobacco	401		291	291	293		293	293		293	293		293
Sugar beet	117	-133	-38	-171	-133	-9	-141	-133	-16	-149	-133	-10	-142
Cotton	246	213		213	373		373	367		367	371		371
Oilseeds	**-669**	**-686**	**-6**	**-691**	**-708**	**-6**	**-714**	**-709**	**-6**	**-715**	**-708**	**-6**	**-714**
Sunflower	-320	-317		-317	-336		-336	-337		-337	-337		-337
Soybean	-331	-336		-336	-337		-337	-337		-337	-337		-337
Tubers	**51**	**52**		**52**									
Vegetables	**242**	**312**	**101**	**414**	**589**	**233**	**821**	**589**	**231**	**819**	**589**	**231**	**820**
Fruits and Nuts	**1,712**	**1,465**	**181**	**1,645**	**1,646**	**135**	**1,781**	**1,646**	**135**	**1,781**	**1,646**	**135**	**1,781**
Livestock Products	**-170**	**-395**	**-236**	**-631**	**-5,030**	**-22**	**-5,053**	**-5,078**	**-23**	**-5,101**	**-4,030**	**-15**	**-4,045**
Beef	0		-87	-87	-1,106		-1,106	-1,114		-1,114	-839		-839
Milk	-28				-2,005		-2,005	-2,019		-2,019	-1,532		-1,532
Poultry products	49	-104	-149	-253	-792		-792	-818		-818	-592		-592
Total	**1,980**	**632**	**267**	**899**	**-3,277**	**480**	**-2,797**	**-3,450**	**387**	**-3,063**	**-2,345**	**428**	**-1,917**

Source: Authors' calculations.

When population and income growth are incorporated in this structure, the level of net exports for non-member scenario falls to less than USD 1 billion. The exports of crop products decline by 30 percent, whereas the imports of livestock products increase by four folds, despite almost 200 percent tariff. No reversal of trade is observed. Cereals, oilseeds, and livestock products are imported, and industrial crops, pulses, fruits and vegetables are exported.

The results of non-member scenario provide clues about the impact of membership. Overall impact is a boom of net exports. The exports of crop products grow by 50 percent, but huge expansion in livestock products imports pull up the net imports to SD 3 billion.

Almost all of the livestock imports are from the EU. Almost non existing level of trade in livestock products in the base period does not allow identifying any change in the direction of trade. However, the impact of membership on the livestock production points out that the weight of EU will be high in imports, and although at a lower level, with the impact vegetable exports, EU remains to be dominant in overall trade.

Net imports in cereals and oilseeds increase in the set-aside simulation. With the improvement in livestock yields, net imports of livestock products decline by 30 percent (USD 1 billion) relative to reference member scenario. Wheat imports go up, and barley exports decline. These results provide clues about one of the policy choices of Turkey, since the model structure links the crop and livestock production endogenously. Turkey would either improve the production conditions in livestock, and use the domestically produced (or imported) feed products in livestock production to decrease the imports, or would leave the livestock sub-sector as it is, and export (or import less) feed crops to continuously expand the imports of high value-added livestock products.

4. CONCLUSION

Membership to EU may be perceived either as a “threat” or an “opportunity” for the sector as a whole. The comparison of the institutional and technological level of EU with Turkey may lead to see it as a “threat”. However, it is possible to start paving the way towards an “opportunity” by the taking the proper policy measures until the accession. After all, EU has also responsibilities to diminish the development levels among the members of the Union. The weight of support tilted to second pillar policies - mainly targeted to regional development and structural change – in the recent enlargement process provides a clear signal in that direction. The candidates have also responsibilities that may go well beyond the adoption of the Acquis Communitaire. In general, the basic responsibility of the candidates at the start of the accession negotiations may be summarized as the “adjustment of mentality” to become a proper member, rather than concentrating on the possible flow of funds from the Union. Same attitude is valid for agriculture. Clear objectives should be set, and the appropriate policy tools should be selected to keep at least the competitiveness level of the sector, independent of membership.

Overall results of the membership to EU compared with non-member situation may be summarized as follows:

- The price level of crop products increases. However, the overall level of prices decline due to high decrease in the prices of livestock products.

- Farmers may suffer from the membership, except the producers of some selected products.
- Increased consumption will be realized with a lower level of expenditure. The expenditure for basic foods decreases.
- Livestock products are not competitive even at the EU prices. Herd size contracts, and net imports boom.
- The increase in the net exports of crop products is far from compensating the change in the net imports of livestock products.
- All imports of livestock products are from EU. Exports of crop products to the rest of the world increase slightly, yet the volume of trade with EU expand significantly.
- Barley, cotton, pulses, vegetables and fruits appear to be competitive at the potential level of prices.
- The compensatory area payments compensate more of the effects of decline in production due to the set-aside requirements.
- Even slight improvement in livestock production technology may increase the resistance of the sector against EU livestock products.

Naturally the results of the model are dependent on the policy set-up, growth possibilities and the level of world prices. It is possible to improve the structure and/or enlarge the data set. First priority may be given to incorporating processing sector in the model by holding intact the present structure of the model. It will be possible to define both domestic and foreign supply and demand in terms of processed products rather than in raw equivalent forms.

The model can not differentiate the effects of policy changes according to farm sizes. Farm size disaggregation may help in identifying the target size(s) and the corresponding level of decoupled payments whether or not Turkey becomes a member of EU, since Turkey has already started to implement direct income support in 2000.

The CMOs of EU are more or less incorporated in the model for the crop production. Yet, the structure of the livestock production is at the national level, and further the data do not permit to include the policy tools of CMOs in livestock and related products. Disaggregated livestock production activities may enable to conduct the impact analysis in a more appropriate and realistic way.

The demand structure is dependent on linear demand curves without allowing any substitution possibility on the demand side. With the support of additional data and use of more advanced calibration methods the model structure may be enriched not only on the demand side, but also on the supply side.

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