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AGRICULTURAL POLICY IMPACT MODELS Theory and Implementation







24-26 January 2018, London





Training Programme

24 January (Morning) 1-1

10:15-10:45: Quantitative Impact Analysis (HK) (1-1-1)

10:45-12:15: Review of Analytical Models (OE/HK) (1-1-2)

24 January (Afternoon) 1-2

13:45-15:15: Econometric Models (OE) (1-2-1)

15:30-17:00: Sector Models, Data Requirements, Calibration (HK) (1-2-2)

25 January (Morning) 2-1

09:00-10:30:Development of a Demo Farm/Sector Model (HK) (2-1-1)

10:45-12:15: The GAMS Code and the Reference Model (OE) (2-1-2)

25 January (Afternoon) 2-2

13:45-15:15: Running and Interpreting Results of Reference Model (HK/OE) (2-2-1) 15:30-17:00: Model Extension Exercises and Policy Simulations (OE) (2-2-2)

26 January (Morning) 3-1

09:00-10:30: Review of TAGRIS and Features (OE) (3-1-1) 10:45-12:15: Review of Selected Policy Simulations with TAGRIS (OE) (3-1-2) 12:15-13:45: Potentials, Issues and Challenges (HK/OE) (3-1-3)





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Main Modelling Frameworks in Agriculture

Five core types of economic modeling forms are widely used in agricultural policy analysis:

(0) Biophysical Models (not an economic model)

- (1) Farm Household Models,
- (2) Agricultural Sector Models (Partial Equilibrium),
- (3) Computable General Equilibrium Models (CGE Models),
- (4) Partial Equilibrium Global Trade Models
- (5) General Equilibrium Global Trade Models



Spectrum of Analytical Models

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- Mathematical models to estimate plants growth as a function of environmental variables
- Estimation of plant development, and several other processes relevant to the simulation of the interaction plantsoil as affected by weather and agricultural management.
- Different levels of nitrat and irrigation will give different yields.
- CropSyst, EPIC, OMS (David et al., 2002), TIME (Rhaman et al., 2003), APSIM (McCown et al., 1996), APES (Donatelli et al., 2010)



(1-1-2)/1



(0) Biophysical Model: CropSyst

Necessary Inputs for CropSyst

Necessary Inputs	Outputs
Meteorology	Growth stages of crop,
Precipitation	yield, nitrate
Temperature min.	pollution, erosion. etc.
Temperature max.	
Solar Radiation	
Management & Production	
dates & types of :	
Rotation	
Planting	
Tillage	
Irrigation	
Yield	
Etc.	
Soil	
Composition of soil	
physiques and hydrologic	
properties	
Сгор	
Phenologic et biologic data	
Location	
Data of location	
Latitude etc.	



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(0) Biophysical Models

Core Modeling Types	Modeling Advantages	Modeling Disadvantages/Limitations
Biophysical Model (CropSyst, EPIC etc)	 Crop production function relationships can be better presented by them via engineering production functions. Yields of crops could change for different levels of inputs such as irrigation, manure etc. Better simulates climate changes. Better simulates the impacts of input substitution (i.e. different fertilizer and water combinations will lead to different levels of crop yield). All phenological/biological features of the crop even specific to region and climate can be incorporated within the model. 	 They are not economic models by themselves. They must be integrated into an economic model such as farm model, sector model etc. If this happens they are called bio-economic models. Integration into economic models are not easy to set up and implement. Their climate, soil, crop phenology data requirements are immense. For any specific field, such required data can be obtained by field-researches but as the regional aggregation goes up the required data will be very likely not available. An inter-disciplinary (biologist, agronomist, agricultural engineer, irrigation engineer, economist, etc) concentrated team work is generally required because of the nature of the modelling. Construction of such a team generally requires high funding facilities. No relationship with the value-chain of the concerned product unless otherwise they are integrated with economic models.





- Targeted to analyze the impact of the policy changes on a typology of farm households or enterprises.
- Household makes production, labour allocation and consumption decisions that may be interdependent upon one another.
- Household's objective is to maximize a discounted future stream of expected utility.
- A key assumption of most agricultural household models is that the household can obtain perfect substitutes for family labour and conversely, that it can sell its own labour at a given market wage.



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- Most agricultural household models are static and assume that households are risk neutral.
- Constraints typically include cash income, family time and endowments of fixed productive assets, and production, and prices of inputs, outputs, and nonproduced consumption goods.
- Can be constructed in linear or nonlinear programming forms.
- Some of them are constructed to include risk aversion factor using «Game Theoretical» farm level models based on maximin criteria are also available in the literature.





Adv	antages	Disadvantages	
0	Farm can be modelled in detail	 Product prices are fixed 	
0	Farm heterogeneity can be captured	 Disregards sectoral dimension 	
		 Disregards product substitution ar 	ıd
		complementarity at sector level	
		 Disregards general equilibrium impact 	ts
		 World prices (import/export prices) as 	re
		constant	
		 Limited scope for policy impa 	ct
		analysis	



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(1) Farm Household Models



	Modeling Advantages	Мо	deling Disadvantages/Limitations
	(Details)		(Details)
1.	Relatively easy to write and use (small dimension)	Α. [Disregards the country level sectoral and/or regional
2.	Small number of policy parameters	(partial equilibrium) supply/demand relationships and/or
3.	Targeted to analyze the impact of the policy changes	r	esource availabilities
	on a typology of farm households or enterprises	B. [Disregards the global level sectoral and/or regional
4.	Simulates (very) short run impacts.	(partial equilibrium) supply/demand relationships and/or
5.	Inputs can be modelled in detail	r	esource availabilities
6.	Crops can be modelled with many (sub) species	C. [Disregards the country level macroeconomic (general
7.	Crop rotations can be modelled in detail	e	equilibrium) supply/demand relationships and/or
8.	Tillage operations can be modelled in detail	r	esource availabilities
9.	Farm capital (physical and human) can be modelled in	D. [Disregards the global level macroeconomic (general
	detail.	e	equilibrium) supply/demand relationships and/or
10.	Accommodate the simultaneous nature of production,	r	esource availabilities
	consumption and labor allocation decisions.	E. 8	Should ideally be based on a stratified random sample
11.	A single model that treats all producers as	C	of existing farms (i.e. a detailed statistical study must
	homogeneous is unlikely to depict adequately the	Ł	be done previously). If this point is accomplished then
	complexity of structures in developing countries.	f	arm level modeling has an advantage (if not, they are
12.	Imperfect price transmission and subsistence	S	subject to far more misleading simulation results).
	production can be built in.		
13.	Liquidity and risk constraints can be built in		



(2) Agricultural Sector Models



- Partial Equilibrium
- Cover all of Agricultural Sector
- Cover most/all Agricultural Products
- Limited Coverage of Agro-Industry
- National and Regional Coverage
- Endogenous Domestic Demand and Supply
- Maximize Consumer and Producer Surplus
- Shadow Prices for Owned and Fixed Resources
- Exogenous Foreign Demand and Supply
- Calibration with Flexibility Constraints, PQP, Maximum Enthrophy



(2) Agricultural Sector Models



[ASM, DREMFIA, TAGRIS]

Advantages		Disadvantages	
0 0 0	Product prices are endogenous Includes sectoral dimension Includes product substitution and complementarity at sector level Farm can be modelled in detail by non- linear programming	0	Disregards general equilibrium impacts (but by integrating into a standard CGE model this can be fixed) World prices (import/export prices) are constant (But can be endogenize)
0	Farm heterogeneity can be captured		





Advantages (Details)

- Technically some advantages Farm Household Model can be achieved in an ASM but with a bit less detail.
- Structure of the country's agricultural sector can be represented in detail.
- Interaction between crop and animal production subsectors can be captured.
- Crops can be modelled in great detail such as "Durum Wheat" etc.
- Animal Products can be modelled in great detail such as "Goat Milk" etc.
- Substitution and complementarity between crop and animal subsectors can be captured.





Advantages (Details)

- Includes country level (domestic) product price changes
 - Domestic prices are endogenous
- Takes into account the switching between crops since output prices
 are not held constant
 - Includes the product substitution within the country
- Includes crop and animal product complementarity at sectoral and/or regional level
 - Takes into account the product complementarity
- Includes country level resource availability at sectoral and/or regional level
 - Land, water, labor, manure, seed, pesticide and tractor availability at sectoral and/or regional level in the country





Advantages (Details)

- Includes modelled all country-level sectoral and/or regional endogenous factor changes.
- Can take into account the country level components of the countrylevel product value-chain coming after the farm gate within the sector and/or region.
- ASM can be linked to a Global Trade Model.
 - If this is done, the advantages listed for Global Trade Models can be achieved.
- ASM can be linked to a standard CGE Model
 - If this is done, the advantages listed for a standard CGE Model can be achieved.
- ASM can be relatively easily linked to a Biophysical Models.
 - If this is done, the advantages listed for Bio-economic Models can be achieved.



(2) Agricultural Sector Models



Disadvantages (Details)

- Disregards the global level sectoral and/or regional (partial equilibrium) supply/demand relationships and/or resource availabilities
 - But if ASM is linked to a Global Trade Model (Partial Equilibrium), then this disadvantage disappears since these points becomes included within the integrated model.
 - A simple Global Trade module (Partial Equilibrium) can be written (Armington model can be used) or an existing Global Trade Model (Partial Equilibrium) can be employed.



(2) Agricultural Sector Models



Disadvantages (Details)

- Disregards the country level macroeconomic (general equilibrium) supply/demand relationships and/or resource availabilities
 - But if ASM is linked to a CGE Model (General Equilibrium Equilibrium) then this disadvantage disappears since these points becomes included within the integrated model.
 - A standard CGE Model (General Equilibrium) can be written or an existing CGE Model (GE) can be used.
 - But if ASM is linked to a Global Trade Model (General Equilibrium), then this disadvantage disappears since these points becomes included within the integrated model.
 - It is not easy to write a new Global Trade Model (GE) so it can be better to use an existing Global Trade Model (GE) such as GTAP.





Disadvantages (Details)

- Disregards the global level macroeconomic (general equilibrium) supply/demand relationships and/or resource availabilities
 - But if ASM is linked to a Global Trade Model (General Equilibrium), then this disadvantage disappears since these points becomes included within the integrated model.





- TASM → Turkish Agricultural Sector Model
- TAGRIS Model is the last version of TASM
- TAGRIS model represents the *third* generation of policy impact analysis using sector models, following TASM (Kasnakoğlu and Bauer, 1988) and TASM-EU (Çakmak and Kasnakoğlu, 2002).
- TAGRIS is a partial equilibrium agricultural sector model (ASM) with endogenous prices.
- The objective function of the model is given by the *Marshallian* surplus (sum of consumers' and producers' surplus).
- The calibration of demand follows an elasticity based approach. The calibration of supply follows Heckelei and Britz (1999 and 2000) and uses a *Maximum Entropy* integrated Positive Mathematical Programming (PMP) method.





- Foreign trade is allowed in raw and in raw equivalent form for processed products and trade is differentiated for EU and the rest of the world (ROW).
- The base period of the model is the average from 2014 to 2016.
- Model is written in GAMS (Brooke et al, 1998) and solved using the non-linear programming solver CONOPT 3.
- The code of TAGRIS Model is around 4500 lines with data.





- The basic features of the TAGRIS model may be summarized as:
- The production side of the model is disaggregated into four regions for the exploration of interregional comparative advantage in policy impact analysis.
 - Coastal Anatolia,
 - Central Anatolia,
 - East Anatolia, and
 - GAP (Southeastern Anatolia Project) Region
- The crop and livestock sub-sectors are integrated endogenously, i.e., the livestock sub-sector gets inputs from crop production.
- Foreign trade is allowed in *raw* and in *raw equivalent* form for processed products and trade is differentiated for the *EU* and the rest of the world (*ROW*).







Figure III.2.3 Input Output Structure in Production in TASM/TAGRIS



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Figure III.2.5 Regions in the TASM/TAGRIS Model



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- Contrary to Multi-market models it has a detailed and refined agricultural sector representation (using a non-linear programming approach) for Turkey coming from its initial version written in 1982 for The WorldBank by Le-Si, Scandizzo and Kasnakoglu (TASM).
 - The model does not only use elasticity based simple supply and demand equations.
 - The agricultural complexities are represented by a non-linear programming modeling approach with region and product specific constraints even different for irrigated and rainfed production techniques.
- Probably the most detailed representation of Turkish Agricultural Sector in the literature with around 4500 lines of coding in GAMS.





- Contrary to General Equilibrium models, TAGRIS includes disaggregated products such as Durum Wheat, etc.
 - This gives us the opportunity to capture product specific results.
- Since TAGRIS is an Agricultural Sector Model (ASM) it has all the advantages listed for agricultural sector modelling.
- Contrary to Farm Household Models, TAGRIS takes into account the sectoral situation and the sectoral interaction of crop and animal production.
 - Similar to farm models it includes a detailed structure for agricultural production techniques.





- According to Hazel and Norton (1986, p.136), every sector model's structure contains the following five basic elements as in the case of TAGRIS.
- These are also representing some main advantages of TAGRIS:
 - A detailed description of producers' economic behavior.
 - A detailed description of the production functions or the technology sets available to producers in each region of the model.
 - These functions relate yields to inputs, and they need to be differentiated by production regime (irrigated versus rain-fed agriculture, crop versus livestock products, annual versus perennial crops).





- A detailed definition of the resource endowments held by each group of producers such as land, irrigation water, family labor, initial stock of livestock, tree crops and farm machinery.
- A specification of market environment in which the producer operates.
 - This specification involve market forms plus associated consumer demand functions, possibilities for international trade and corresponding import supply functions, export demand functions. In most cases, the import supply functions are simple, that is perfectly elastic at a given c.i.f. price.
- A specification of the policy environment of the sector, such as input output subsidies, guaranteed minimum price schedules, import quotas and tariffs, export taxes and subsidies.



(2) Agricultural (Sub)Sector Models: Multi-Market Models



- Partial Equilibrium but not covers all agricultural sector
- Partial List of Products
- Partial Regional Coverage
- Exogenous Factor Prices
- Calibration using Flexibility Constraints
- No Complementarity and Competition relation with other sectors, products, regions.



(2) Agricultural (Sub)Sector Models: Multi-Market Models



[PEM]

Advantages

Disadvantages

- Product prices are endogenous
- Includes sectoral dimension
- Includes product substitution and complementarity at sector level (however this feature is limited compared to Agricultural Sector Models due to limited farm focus)
- Farm is not modelled by non-linear programming, therefore the focus of farm is limited compared to ASMs.
- Due to limited farm focus, the farm heterogeneity is adequately captured.
- Disregards general equilibrium impacts
- Generally world prices (import/export prices) are constant.





- The Multi-market models, also sometimes referred to as "limited general equilibrium"
- They focus only on one sector/product and do not include a number of balances, such as the balance on savings and investment, supply and demand of foreign exchange
- Multi-market models belong to the class of partial equilibrium models.





- If the policy reform is likely to have general equilibrium impacts, the analysis should be complemented by a CGE model.
- They can be used in estimating distributional impacts of the imposition or change in taxes, subsidies, quotas, tariffs on specific commodities; rise or fall in the price of imported or exported commodity.
- Demand side of the multi-market model is a matrix of own- and cross-price elasticities for a number of food and/or non-food commodity groups, and a vector of income elasticities of demand for the same commodity groups.



(2) Agricultural (Sub)Sector Models: Multi-Market Models



- Partial equilibrium multi-market (or multi-commodity) models are usually based on estimated parameters of the simple demand and supply curves.
- Agricultural sector models are also partial equilibrium models, however, contrary to partial equilibrium multi-market (or multicommodity) models, they may include different production technologies with cross effects, generally within the nonlinear mathematical optimization model setup.
- The multi-market models will generate reliable results when the reforms being analysed affect commodities or factors for which the set of <u>close substitutes and complements</u> are well defined.



(3) Computable General Equilibrium (CGE) Models



[DREM, DEVPEM]

Ađ	vantages	Dis	advantages
0	Includes general equilibrium impacts and hence input prices are endogenous. Output prices are endogenous	0	Uses Input-Output Table based Social Accounting Matrices (SAMs). Therefore the products cannot be disaggregated as in the case of ASMs. Disregards product substitution and complementarity because of product aggregation. World prices (import/export prices) are constant. Too much aggregation





Advantages (Details)

CGE Model takes into account the points listed in Disadvantage C of Farm Household Model and hence these points become the advantages of CGE Model.

Takes into account the country level macroeconomic (general equilibrium) supply/demand relationships and/or resource availabilities

- Takes into account country level (domestic) input price changes (domestic input prices are constant even if a huge supply/demand shift happens in the related input market such as labor, land etc.)
- Takes into account the switching between sectors (i.e. from agriculture to services sector) since sectoral outputs are held constant (Disregards sectoral substitution within country).
- Takes into account sectoral complementarity at national level such as agro-food sector and agricultural sector complementarity (Disregards sectoral complementarity)
- Takes into account country level resource availability at macroeconomic level (i.e. land, water, labor, manure, seed, pesticide, tractor and other factors availability at national level for the country)
- Takes into account all other country-level macroeconomic endogenous factor changes such as inflation, exchange rate changes, etc.
- Takes into account the impacts of the country level macroeconomic factors on the components of the country-level product value-chain even up to farm gate.


(3) Computable General Equilibrium (CGE) Models



Disadvantages (Details)

- 1. None of the advantages of Farm Household Model can be achieved.
- Input-Output Table's level of aggregation will limit the disaggregation level of agricultural sector.



 Disregards the country level sectoral and/or regional (partial equilibrium) supply/demand relationships and/or resource availabilities

[A Crucial Defect When Modelling Country's Agricultural Sector]

- Disregards country level (domestic) product price changes (domestic price is constant even if a huge supply/demand shift happens)
- 2. Underestimates switching between crops since output prices are held constant (Underestimates product substitution within country).
- Disregards crop and animal product complementarity at sectoral and/or regional level (Disregards product complementarity)
- Disregards country level resource availability at sectoral and/or regional level (i.e. land, water, labor, manure, seed, pesticide and tractor availability at sectoral and/or regional level in the country)
- Disregards all other country-level sectoral and/or regional endogenous factor changes.
- 6. Disregards the country level components of the country-level product value-chain coming after the farm gate within the sector and/or region.





(3) Computable General Equilibrium (CGE) Models

Disadvantages (Details)

- B. Disregards the global level sectoral and/or regional (partial equilibrium) supply/demand relationships and/or resource availabilities
 - Disregards global level product price changes (import/export prices and tariff related factors are, implicitly, held constant even if a significant global supply/demand shift and/or a global or regional trade agreement happens)
 - Disregards switching crop production between countries since national level output prices are (implicitly) held constant among countries (Disregards product substitution between countries).
 - Disregards global level crop and animal product complementarity at sectoral and/or regional level (Disregards product complementarity among countries)
 - 4. Disregards global resource availability at sectoral and/or regional level (i.e. land, water, labor, manure, seed, pesticide and tractor availability at sectoral and/or regional level in the whole world)
 - Disregards all other global-level sectoral and/or regional endogenous factor changes.
 - 6. Disregards the components of the global-level product value-chain coming after the farm gate within the global sector and/or region.

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European Bank for Reconstruction and Development

(3) Computable General Equilibrium (CGE) Models

European Bank for Reconstruction and Development

Disadvantages (Details)

 CGE Models can also be integrated to an Agricultural Sector Model (ASM) but since ASM's must include country specific features and therefore are not standard models it is not easy to accomplish this integration.



- D. Disregards the global level macroeconomic (general equilibrium) supply/demand relationships and/or resource availabilities
 - 1. Disregards global level all product price changes in all sectors (import/export prices and tariff related factors for all products from all sectors are, implicitly, held constant even if a significant global supply/demand shift and/or a global or regional trade agreement in any product of any sector happens)
 - 2. Disregards switching sectoral production between countries since global level output prices of some (non-included) sectors (other than agriculture such as instruction, mining etc.) are (implicitly) held constant among countries (Disregards sectoral substitution between countries)
 - Disregards global level sectoral complementarity of different countries (Disregards sectoral complementarity among countries)
 - 4. Disregards global level sectoral resource availability of all the countries in the world (i.e. sector level land, water, labor, etc availability in the whole world)
 - Disregards all other global-level macroeconomic endogenous factor changes.
 - 6. Disregards the impacts of the global level macroeconomic factors on the components of the global-level product value-chain even up to farm gate.



[FAPRI, SWOPSIM, CAPRI]

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		8-	

Disadvantages

- Product prices are endogenous
- Includes sectoral dimension
- Includes product substitution and 0 complementarity at sector level (however this feature limited is Agricultural compared to Sector Models)
- World prices are endogenous

- Farm is not modelled by non-linear programming, therefore the focus of farm is limited.
- Disregards general equilibrium impacts
- Turkey is included in CAPRI but not detailed as in TASM/TAGRIS





- CAPRI which stands for "Common Agricultural Policy Regionalized Impact analysis" is the acronym for an EU-wide quantitative agricultural sector modeling system.
- The purpose of the project was to analyze the impact of different elements of the Common Agricultural Policy (CAP) on EU's agriculture and environment.
- CAPRI is a comparative static equilibrium model.
- Since market and policy instruments require disaggregated modeling, a simultaneous system maximizing the sum of producer and consumer surplus for about 250 region and 40 products was infeasible.
 - Therefore, the model structure was split-up into a *supply* and a *market* component.





Global agricultural sector model with focus on EU27, Norway, Turkey and Western Balkans, iteratively linking:

Supply module (EU27+Norway+Western Balkans+Turkey): covering about 280 regions (NUTS 2 level) or even up to ten farm types for each region (in total 2,450 farm-regional models, EU27)

Market module: spatial, global multi-commodity model for agricultural products, 47 product, 77 countries in 40 trade blocks

Regional CGEs: Regionalized CGEs at NUTS 2 level for each European Country with a focus on Rural Development Measures under the second Pillar of the CAP







- Supply calibration: Positive Mathematical Modelling (PMP) similar to TAGRIS
 - The supply module consists of independent aggregate non-linear programming models representing activities of all farmers at regional or farm type level
 - The non-linear cost function allows for perfect calibration of the models and a smooth simulation response rooted in observed behavior (PMP).





- Demand Side: Generalized Leontief
 - The market model allows to simulate the dynamics of international trade among 69 countries divided into 40 trading blocks, for a total of about 50 agricultural products.
- Policy Instruments: premiums/activities; set aside (obligatory and voluntary); intervention prices; quotas (milk, sugar); border measures; wto limits; import tariffs, trqs; decoupling (on arable and grassland for hybrid decoupling systems)
- Model Output: market balances; agricultural production/income; processing industry income; consumer welfare; labour input, per activity; nitrogen-based environmental indicators (ghgs, ammonia)









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(5) General Equilibrium Global Trade Model

[GTAP, GREEN,]

Advantages		Disadvantages	
			_
0	Includes general equilibrium impacts and hence input prices are endogenous.	0	Uses Input-Output Table based Social Accounting Matrices (SAMs).
0	World prices are endogenous	0	Therefore the products cannot be disaggregated as in the case of ASMs. Disregards product substitution and
		0	aggregation. Too much aggregation
		0	Turkey is included in GTAP but too aggregated.



(5) General Equilibrium Global Trade Model: GTAP



- In 1990/91, collaborative work by Thomas W. Hertel at Purdue University in the United States with the IMPACT Project in Melbourne, Australia, catalysed an initiative known as the Global Trade Analysis Project (GTAP).
- The default GTAP model (Hertel 1997) is a standard multiregion CGE model.
- The standard GTAP model is a multi-region, multisector, computable general equilibrium model, with perfect competition and constant returns to scale (HERTEL, 1997).
- Bilateral trade is handled via the Armington assumption.



(5) General Equilibrium Global Trade Model: GTAP



- The main features of GTAP are:
 - Regional scope: World. (45 regions, including 4 EU member states, rest of EU, etc.)
 - Commodity/sectoral scope: Economy-wide. 50 sectors/commodities (Version 4), 12 primary agric., 8 food, 5 primary factors (land, 2 labour, capital, natural resources)
 - Standard multi-region CGE model. Constant returns, perfect competition
 - Agricultural commodities: 12 primary, 8 food processing, 1 forestry, 1 fishing
 - Variables generated: market and income/welfare values







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Econometric Models



- Econometric models are based on the **<u>estimation</u>** of parameters.
- Programming models are based on the <u>calibration</u> of parameters.

Consider $Y_t = A.K_t^{\alpha} L_t^{1-\alpha}$

(1) Econometric Models: α 's can be obtained (*estimated*) by the following PRF:

 $\ln Y_t = \ln A + \alpha \ln K_t + (1 - \alpha)L_t + u_t$

(2) Programming Models: α 's can be obtained (*calibrated*) using the base year data:

$$MP_{\kappa} = \alpha A K_t^{\alpha - 1} L_t^{1 - \alpha} = \frac{\alpha A K_t^{\alpha} L_t^{1 - \alpha}}{K_t} \Longrightarrow MP_{\kappa} = \frac{\alpha Y_t}{K_t}$$

In perfectly competitive environment MP_{κ} is equal to real rental rate of capital (r)

 $r = \frac{\alpha Y_t}{K_t} \Rightarrow rK_t = \alpha Y_t \Rightarrow \alpha = \frac{rK_t}{Y_t}$ which is the share of capital expenditure within total output.

Consider the base period values of $r^* K_t^*$ and Y_t^* , then α can be obtained $\alpha^* = \frac{r^* K_t^*}{Y_t^*}$





- A regional econometric sector model for Danish agriculture: regionalized ESMERALDA model (2001)
 - University of Copenhagen Department of Food and Resource Economics (IFRO)
- An econometric model is not formulated as an explicit optimisation problem, although the econometrically estimated behavioural relations implicitly reflect economic optimisation.
- Compared with the mathematical programming approach, the econometric approach is less sensitive to having full knowledge of all technical details in the production processes (although more knowledge is better than less knowledge– also in econometric models).





Econometric Sector Model

- However:
- Status quo is modelled → Econometric models are empirically founded on historical variations in data.
 - Hence, the validity of the behavioural parameters in an econometric model is in principle <u>limited to the data ranges</u>, for which these parameters are estimated
 - The impacts of a radical change is not expected (unless it is not a very detailed model) to be captured since the econometric parameters are estimated based on the historical series (without radical change)
- Subject to «Lucas Critique» → If the model setup is not adequate to capture the behavior of all economic agents and units, the estimations can not capture the impacts of policy shifts!
- Huge Cross Sectional Data → Model analysis is based on data from one year's sample in the agricultural accounts data base (<u>approximately</u> <u>2000 farms!</u>).



(1-2-1)/4



- **Econometric Trade Models Armington Model**
- Econometric models can be focused on international trade: Armington Models
- Multi-country computable general equilibrium (CGE) models are important tools for analysing tariff and trade policy changes.
- Most CGE models incorporate the 'Armington assumption'.
- The Armington assumption differentiates commodities by their country of origin.
- It takes the products of an industry which come from different countries to be imperfect substitutes for each other.
- The choice of the Armington assumption is an important one as it impacts on the outcomes of policy shocks introduced to CGE models.
- The terms of trade effect of a tariff is positively related to the home country's elasticity of substitution between domestic and imported goods;
- The terms of trade effect of a tariff is negatively related to the elasticity of substitution between domestic and imported goods in foreign countries and to all foreign countries' elasticities of substitution between import sources;





- Armington model imposes a two-step budgeting procedure.
- In the first stage, the importer decides how much of a particular commodity to import. In this stage the decision is determined according to the import demand function of the importer country (i.e. by the price elasticity for total import demand) for a product)
- In the second stage given the total amount imported, the importer decides how much to import from each supplier. This decision is based on the elasticity of substitution







Armington Model-New Developments



- The Armington specification now underlies the majority of practical policy-oriented CGE models.
- It is argued that traditional CGE models with Armington assumption fail to capture the extensive margin of trade, thereby underestimate the trade and welfare effects of trade opening.
- However its theoretical basis is also questioned. (For example, it implies that Japan produces a single variety of cars which is an imperfect substitute for the single variety produced in Germany)
- Since the 1980s trade theorists have been working on models in which varieties are distinguished by firms rather than countries.
- Land-mark models in this literature are Krugman (1980), Melitz (2003) and Dixon (2016).



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(1-2-1)/7

An Application of Armington Model



Topic: Analysis of agricultural trade liberalization between EU and mediterranean partner countries (MPCs) including Turkey (Eruygur and Çağatay, 2012).

Features:

- EU's agricultural trade data at 8 digit level (Combined Nomenclature, CN) is used.
- Totally 207 agricultural sub-chapters (goods) of CN used to represent the agricultural trade of EU.
- 27 regions are constructed in order to distinguish the regional impacts.
- All mediterranean partner countries including Turkey are seperately included as regions.
- Nested constant elasticity of substitution (CES) function consisting of 27 import sources (regions) employed to model EU imports
- Panel data estimation methods are used: Fixed and Random effects



(1-2-1)/8



European Bank for Reconstruction and Development

Features:

- The exports of EU is modelled by a nested constant elasticity of transformation (CET) function aggregator.
- The model assumes perfectly elastic export supplies for EU imports, hence
- "Given a set of import demand and substitution elasticities," the model simulates the maximum change possible in EU's imports ".
- The model assumes perfectly elastic import demands for EU exports, hence
- "Given a set of import demand and substitution elasticities," the model simulates the maximum change possible in EU's exports".



Trade Liberalization Impacts on EU's Imports



(1-2-1)/9

for Reconstruction and Development

	EU's Agricultural Imports			
	2011		Simulation	
	Imports (Euro, 2011 prices)	Imports (Euro, 2011 prices)	Change (Euro, 2011 prices)	Percentage Change(%)
ACP	13,207,078,770	13,400,407,699	193,328,929	1.46
ALGERIA	108,130,920	181,419,003	73,288,083	67.78
ANZ	4,316,412,130	4,330,320,614	13,908,484	0.32
ASEAN	9,446,030,600	9,469,545,845	23,515,245	0.25
CANADA	2,192,259,950	2,192,791,074	531,124	0.02
CENTAM	2,966,962,830	2,986,118,716	19,155,886	0.65
CHILE	2,072,567,990	2,082,911,930	10,343,940	0.50
CHINA	4,443,611,330	4,484,479,747	40,868,417	0.92
EFTA	4,438,892,500	4,453,032,644	14,140,144	0.32
EGYPT	727,772,930	906,831,560	179,058,630	24.60
INDPAK	2,861,373,380	2,876,350,191	14,976,811	0.52
ISRAEL	1,020,542,420	1,227,435,467	206,893,047	20.27
JORDAN	20,679,310	37,648,868	16,969,558	82.06
LEBANON	82,042,840	82,608,122	565,282	0.69
ME	849,930,160	856,698,126	6,767,966	0.80
MERCOSUR	21,830,934,640	22,014,816,393	183,881,753	0.84
MEXICO	832,123,360	841,153,637	9,030,277	1.09
MOROCCO	1,242,438,470	2,043,553,214	801,114,744	64.48
SAARCWIP	291,515,700	291,712,958	197,258	0.07
SAF	1,967,626,250	2,012,365,311	44,739,061	2.27
SAWMC	5,006,539,750	5,024,056,478	17,516,728	0.35
SYRIA	82,711,950	84,803,055	2,091,105	2.53
TUNISIA	323,835,110	470,254,548	146,419,438	45.21
TUR	3,486,389,660	3,763,115,777	276,726,117	7.94
UKR	2,616,039,580	2,618,850,244	2,810,664	0.11
USA	8,031,507,040	8,045,642,605	14,135,565	0.18
ROW	4,184,049,277	4,258,109,116	74,059,838	1.77
Total	98,649,998,847	101,037,032,941	2,387,034,093	2.42



Trade Liberalization Impacts on Turkey's Exports to EU

European Bank for Reconstruction and Development

(1-2-1)/10

HS4	GOODS DEFINITION	Change (1.000 Euros, 2011 prices)	Change (%)
702	TOMATOES, FRESH OR CHILLED	139,236	287.9
805	CITRUS FRUIT, FRESH OR DRIED	56,594	41.3
707	CUCUMBERS AND GHERKINS, FRESH	37,167	286.2
802	OTHER NUTS, FRESH OR DRIED	11,876	2.2
2002	TOMATOES, PREPARED OR PRESERVE	7,775	34.7
809	APRICOTS, CHERRIES, PEACHES	5,001	6.3
1904	PREPARED FOODS	2,932	17.4
806	GRAPES, FRESH OR DRIED	2,328	0.7
706	CARROTS, TURNIPS	2,222	49.9
709	OTHER VEGETABLES, FRESH OR CHILLED	1,948	2.9
1509	OLIVE OIL AND ITS FRACTIONS	1,385	83.2
1902	PASTA, WHETHER OR NOT COOKED	1,185	10.9
807	MELONS, INCL. WATERMELONS	1,154	12.6
703	ONIONS, SHALLOTS, GARLIC, LEEK	955	18.7
1704	SUGAR CONFECTIONERY	911	1.8
104	LIVE SHEEP AND GOATS	761	103.7
1006	RICE	574	29.7
2008	FRUITS, NUTS AND OTHER EDIBLE	544	0.1
2007	JAMS, FRUIT JELLIES, MARMALADE	409	1.1
2009	FRUIT JUICES, INCL. GRAPE MUST	389	0.3
1905	BREAD, PASTRY, CAKES, BISCUITS	366	0.6
1104	CEREAL GRAINS OTHERWISE WORKED	196	26.9
803	BANANAS, INCL. PLANTAINS	176	33.8
2202	WATERS, INCL. MINERAL WATERS	116	0.5
1701	CANE OR BEET SUGAR	102	87.5
Total	Sum of main goods	276,300	





Trade Liberalization Impacts EU Exports

European Bank for Reconstruction and Development

	EU's Exports By Regions (Euro, 2011 prices)		Change in EU's Exports			
	2011 Realization	Simulated Export	Change (Euro, 2011 prices)	Ranking	Change (%)	Ranking
ACP	8,299,929,310	8,594,926,295	294,996,985	6	4	11
ANZ	2,174,899,870	2,213,519,898	38,620,028	19	2	25
ASEAN	4,574,373,390	4,688,515,477	114,142,087	12	2	20
CANADA	2,526,171,720	2,561,759,377	35,587,657	20	1	26
CENTAM	385,380,400	395,726,550	10,346,150	25	3	17
CHILE	287,473,230	294,254,141	6,780,911	27	2	21
CHINA	4,812,532,970	4,877,461,382	64,928,412	17	1	27
EFTA	10,081,757,700	10,341,575,462	259,817,762	7	3	19
INDPAK	653,326,910	675,561,116	22,234,206	23	3	13
ALGERIA	3,108,875,490	3,585,546,112	476,670,622	4	15	7
EGYPT	1,222,895,630	1,549,533,014	326,637,384	5	27	4
ISRAEL	1,028,161,820	1,173,368,024	145,206,204	11	14	9
JORDAN	473,109,660	576,181,928	103,072,268	14	22	5
LEBANON	709,145,630	814,719,428	105,573,798	13	15	8
MOROCCO	1,304,966,210	1,814,942,469	509,976,259	3	39	2
SYRIA	448,385,290	524,143,806	75,758,516	15	17	6
TUNISIA	591,630,480	834,249,625	242,619,145	8	41	1
ME	6,825,237,430	7,052,110,914	226,873,484	10	3	14
MERCOSUR	1,604,483,510	1,636,442,372	31,958,862	21	2	23
MEXICO	848,225,170	866,434,773	18,209,603	24	2	22
SAARCWIP	339,405,370	348,412,495	9,007,125	26	3	18
SAF	1,356,806,380	1,403,128,327	46,321,947	18	3	12
SAWMC	843,577,990	868,837,590	25,259,600	22	3	15
TUR	3,065,750,680	3,997,897,697	932,147,017	1	30	3
UKR	1,811,403,220	1,881,383,635	69,980,415	16	4	10
USA	13,136,326,400	13,377,487,345	241,160,945	9	2	24
ROW	28,439,216,975	29,204,836,333	765,619,358	2	3	16
Total	100,953,448,835	106,152,955,585	5,199,506,750		5	

. . . .



(1-2-1)/12 Trade Liberalization Increases in Turkish Imports From EU

European Bank for Reconstruction and Development

HS4	GOODS DEFINITION	Change (1.000 Euros, 2011 prices)	Changes (%)
201	MEAT OF BOVINE ANIMALS, FRESH OR CHILLED	357,176	105.7
102	LIVE BOVINE ANIMALS	204,163	65.1
1005	MAIZE OR CORN	85,610	136.7
1001	WHEAT AND MESLIN	55,066	55.1
1206	SUNFLOWER SEEDS, WHETHER OR NOT BROKEN	33,127	18.6
104	LIVE SHEEP AND GOATS	20,171	32.0
2106	FOOD PREPARATIONS, N.E.S.	18,284	14.4
405	BUTTER, INCL. DEHYDRATED BUTTER AND GHEE	13,811	96.4
1006	RICE	12,927	38.1
406	CHEESE AND CURD	11,441	90.4
1003	BARLEY	10,736	109.4
2304	OILCAKE AND OTHER SOLID RESIDUES	9,036	14.3
1702	OTHER SUGARS	5,972	66.8
2401	UNMANUFACTURED TOBACCO	5,858	16.0
2208	UNDENATURED ETHYL ALCOHOL	5,790	4.8
808	APPLES, PEARS AND QUINCES, FRESH	5,641	49.1
1104	CEREAL GRAINS OTHERWISE WORKED	5,251	35.4
2008	FRUITS, NUTS AND OTHER EDIBLE PARTS	4,381	26.9
1209	SEEDS, FRUITS AND SPORES, FOR SOWING	4,253	5.4
2402	CIGARS, CHEROOTS, CIGARILLOS AND CIGARET	3,931	1.8
2309	PREPARATIONS OF A KIND USED IN ANIMAL FEEDING	3,451	5.4
902	TEA, WHETHER OR NOT FLAVOURED	2,843	109.5
1701	CANE OR BEET SUGAR	2,810	88.1
701	POTATOES, FRESH OR CHILLED	2,676	21.8
2204	WINE OF FRESH GRAPES	2,497	19.8
Total	Sum of main products	886,903	







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AGRICULTURAL POLICY IMPACT MODELS Theory and Implementation







24-26 January 2018, London





Training Programme

24 January (Morning) 1-1

10:15-10:45: Quantitative Impact Analysis (HK) (1-1-1)

10:45-12:15: Review of Analytical Models (OE/HK) (1-1-2)

24 January (Afternoon) 1-2

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26 January (Morning) 3-1

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The general structure of a simple GAMS input file contains the following elements:

1. SET

Declaration

Assignment of variables

2. DATA

(PARAMETERS, TABLES, SCALARS)

Declaration

Assignment of variables

3. VARIABLES

{indicates the variables that will be determined (calculated) within the model}

Declaration

Assignment of Variables

4. EQUATIONS

{first, the equations have to be declared, then they are defined}

Declaration

Definition

5. MODEL

{the model is given a name}

6. SOLVE

{the solution mode is specified, as well as a declaration whether the objective function should be maximized or minimized}







1. SETS

Subscript indexes are defined in GAMS with set (s) statements. Each entry declares the name of an index and shows it elements between / 's.

The set declaration contains ;

- the set name
- a list of elements contained in the set (up to 31 characters long spaces etc allowed in quotes)
- · optional labels describing the whole set
- optional labels defining individual set elements

General format for a set statement is:

```
SET setname optional_defining_text
```

/ first_set element_name defining_text
second_set element_name defining_text
... /;

Examples ;

SETS

C /x1,x2,x3/ R /r1 ,r2/;

SET PROCESS PRODUCTION PROCESSES /X1,X2,X3/;

SET commodities Crop commodities /

corn in bushels, wheat in metric tons, milk in hundred pounds/ ;









2.1. SCALAR

SCALAR format is used to enter items which are not defined with respect to sets.

```
scalar
item1name optional label text /numerical value/
item2name optional label text /numerical value/
...;
```

Examples ;

```
scalar dataitem /100/;
scalar landonfarm total arable acres /100/;
scalars
landonfarm /100/
pricecorn 1992 corn price per bushel /2.20/;
```





2.2. PARAMETERS

Parameter format is used to enter items defined with respect to sets. Generally parameter format is used when data items which are one-dimensional (vectors) although multidimensional cases can be entered.

The general format for parameter entry is:

Parameter

```
itemname(setdependency) optional text
/ first set name appropriate value,
second set name appropriate value,
... /;
```

Examples

```
PARAMETER c(j) / x1 3 ,x2 2 ,x3 0.5/
b(i) /r1 10 ,r2 3/;
PARAMETER
PRICE(PROCESS) PRODUCT PRICES BY PROCESS
/X1 3,X2 2,X3 0.5/;
RESORAVAIL(RESOURCE) RESOURCE AVAILABLITY
/CONSTRAIN1 10 ,CONSTRAIN2 3/;
Parameter multidim(i,j,k) three dimensional /i1.j1.k1 100
,i2.j1.k20 /;
```

Multidimensional parameters particular the useful when bringing data in other programs.







2.3. TABLE

TABLE format is used to enter items which are dependent on two more sets.

The general format is

```
Table itemname(setone, settwo ... ) descriptive text
set 2 element 1 set 2 element 2
set 1 element 1 value 11 value 12
set 1 element 2 value 21 value 22;
```

Examples

TABLE a(i,j) Corn wheat Land 1 1

Labor	6	4	8;		
	DEGOUDUGE		DD o GD G G	DEGOUDGE	

LARTE 1	RESOURUS.	E (RESOURCE, PROCE	LSS) RESOURCE	USAGE
		Makechair	Maketable	Makelamp
plantca	ар	3	2	1.1
salecon	ntrct	1	-1;	

cotton

1

```
Table fivedim(i,j,k,l,m) fivedimensional
             11.m1 12.m2
i1.j1.k2
             11
                       13
```

```
i2.j1.k11
            6
                     -3
```

+

In Contractor

	i3.m1	i2.m7
i1.j1.k2	1	3
i10.j1.k4	7	9;



Here alignment is important.







3. VARIABLES

GAMS requires the variables in each problem to be identified. Let us take a reference problem. Suppose we wish to solve the optimization problem



The simplest GAMS formulation for this problem is;

```
VARIABLES Z;
POSITIVE VARIABLES Xcorn , Xwheat , Xcotton;
EQUATIONS OBJ, land , labor;
OBJ.. 109*Xcorn + 90*Xwheat + 115*Xcotton = E = Z;
land.. Xcorn + Xwheat + Xcotton =L= 100;
labor.. 6*Xcorn + 4 * Xwheat + 8 * Xcotton =L= 500;
MODEL PROBLEM /ALL/;
SOLVE PROBLEM USING LP MAXIMIZING Z;
```

In our reference problem we have variables; Z, Xcorn, Xwheat, Xcotton.





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For our reference problem;

 $j = \{ \text{ corn, wheat, cotton } \}$

 $X_j = \{ X_{corn}, X_{wheat}, X_{cotton} \}$

 $i = \{ land, labor \}$

 $c_i = \{ 109, 90, 115 \}$

1 1

 $a_{ii} =$

1

GAMS AND ALGEBRA

Consider again our reference problem;

Maximize Z = 109 X_{corn} + 90 X_{wheat} + 115 X_{cotton}

subject to

X_{corn} + X_{wheat} + $X_{cotton} \leq 100$	(land)
$6 X_{corn}$ + $4 X_{wheat}$ + $8 X_{cotton} \le 500$	(labor)
X_{corn} , X_{wheat} , $X_{\text{cotton}} \ge 0$	(nonnegativity)

The problem above is a special case of the general resource allocation problem:

MAX
$$\sum_{j} c_{j} X_{j}$$

s.t. $\sum_{j} a_{ij} X_{j} \le b_{i}$ for all i
 $X_{j} > 0$ for all j
 $b_{i} = \{100, 500\}$




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Suppose X_i is defined with three elements. In algebra, we write it as ;

$$\sum_{i} X_i = \mathbf{X}_1 + \mathbf{X}_2 + \mathbf{X}_3$$

In GAMS we write it as the following;

z = SUM(I, X(I));

where,

i is a SET in GAMS,

- z is a SCALAR or VARIABLE,
- x(i) is a PARAMETER or VARIABLE defined over set i.







A BETTER ALGEBRAIC MODEL

We have written our reference problem as following;

```
VARIABLES Z;
POSITIVE VARIABLES Xcorn , Xwheat , Xcotton;
EQUATIONS OBJ, land , labor;
OBJ.. 109*Xcorn + 90*Xwheat + 115*Xcotton = E = Z;
land.. Xcorn + Xwheat + Xcotton =L= 100;
labor.. 6*Xcorn + 4*Xwheat + 8*Xcotton =L= 500;
MODEL PROBLEM /ALL/;
SOLVE PROBLEM USING LP MAXIMIZING Z;
```

Now we will write our reference problem by using SET statement;







j crops /Corn,Wheat,Cotton/ i resources /Land ,Labor/;

Note GAMS is not terribly sensitive about capitalization as the example illustrates. Any alternative capitalization sequence can be used. However, GAMS uses the first found capitalization sequence in all displays.

PARAMETER

```
c(j) price / corn 109 ,wheat 90 ,cotton 115/
b(i) resource availability /land 100 ,labor 500/;
```

TABLE a(i,j) resource requirements wheat corn cotton land 1 1 8; labor 6 4

```
POSITIVE VARIABLES x(j);
```

VARIABLES PROFIT ;

EQUATIONS

OBJective, constraint(i) ;

```
OBJective..PROFIT=E=SUM(J,(c(J))*x(J));
constraint(i)..SUM(J, a(i, J) * x(J)) = L = b(i);
```

MODEL RESALLOC /ALL/; SOLVE RESALLOC USING LP MAXIMIZING PROFIT:







sector_model.gms

* * * Sets c cro t per ;	* * * ps / iod /	wheat, jan,fe	* * * * beans, b,mar,aj	onions pr,may,	SETS * 5, cott jun,ju	* * * * * * on, maize, l,aug,sep,	* * * * * * * * * * * * * * * * * * *
* * *	* * *	* * *	* * * *	* * 1	DATA *	* * * * *	* * * * * * * * * * * *
Table	landr	eq(t,c)	month	s of la	and occ	upation by	y crop (hectares)
W	heat	beans	onions	cotton	maize	tomato	
jan	1.	1.	1.				
feb	1.	1.	1.				
mar	1.	1.	1.	.5			
apr	1.	1.	1.	1.			Parameter alpha (c) demand curve intercent
may	1.		.25	1.	.25		beta(c) demand curve gradient
jun				1.	1.		;
jul				1.	1.	.75	
aug				1.	1.	1.	<pre>beta(c) = demand(c,'ref-p')/(demand(c,'elas')*demand(c,'ref-q'));</pre>
sep				1.	1.	1.	alpha(c) = demand(c, 'ref-p') - beta(c) * demand(c, 'ref-g');
oct				1.	.5	1.	
nov	.5	.25	.5	.75		.75	
dec	1.	1.	1.				
;							
Table	labor	req(t,c) crop	labor 1	require	ments (man	n days per hectare)
	wheat	beans	onions	cottor	n maize	tomato	
jan	1.72	.75	5.16				
feb	.5	.75	5.				





EFMD

EQUIS

ACCREDITED



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```
landbal(t).. sum(c, xcrop(c)*landreg(t,c)) =l= land*fnum;
laborbal(t).. sum(c, xcrop(c)*laborreg(t,c)) =l= flab(t) + tlab(t);
              mcost =e= sum(c, xcrop(c)*miscost(c));
amisc..
alab..
              labcost =e= sum(t, tlab(t)*twage);
              rescost =e= sum(t, flab(t)*rwage);
ares..
              tcost =e= mcost + labcost + rescost;
acost..
             natprod(c) =e= xcrop(c)*yield(c);
proc(c)..
arevf..
              revenue =e= sum(c, natprod(c)*price(c));
              yfarm =e= revenue - tcost + rescost;
income..
** added equations
objective.. cps =e= sum(c,alpha(c)*natcon(c)+0.5*beta(c)*sqr(natcon(c)))
            - tcost;
balance(c).. natprod(c) =g= natcon(c);
pricedef(c).. natprice(c) =e= alpha(c) + beta(c)*natcon(c);
Model SUPPLYMODEL supply model /landbal, laborbal, amisc, alab, ares, acost,
                                 proc, arevf, income/;
Model SECTORMODEL sector model / all /;
```

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2





j crops /Corn,Wheat,Cotton/ i resources /Land ,Labor/;

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PARAMETER

```
c(j) price / corn 109 ,wheat 90 ,cotton 115/
b(i) resource availability /land 100 ,labor 500/;
```

TABLE a(i,j) resource requirements wheat corn cotton land 1 1 labor 6 8; 4

```
POSITIVE VARIABLES x(j);
```

VARIABLES PROFIT ;

EQUATIONS

OBJective, constraint(i) ;

```
OBJective..PROFIT=E=SUM(J,(c(J))*x(J));
constraint(i)..SUM(J, a(i, J) * x(J)) = L = b(i);
```

MODEL RESALLOC /ALL/; SOLVE RESALLOC USING LP MAXIMIZING PROFIT:



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REFERENCE PROBLEM SOLUTION

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REFERENCE PROBLEM SOLUTION

ex0.lst ex0.gms		
C o m p i l a t i o n Equation Listing SOLVE EXAMPLE Using LP Equation Column Listing SOLVE EXAMPLE Using LP Column Model Statistics SOLVE EXAMPLE Using LP Solution Report SOLVE EXAMPLE Using LP	GAMS 24.9.1 r63795 Released Aug 30, 2017 WEX-WEI x86 64bit/MS Windows 01/22/18 15:27:52 P General Algebraic Modeling System Compilation	~
P SolEQU P SolVAR	<pre>1 2 SET 3 C crops /wheat,maize/ 4 ; 5 scalar 6 tland total land /25/ 7 tlabor total labor /2000/ 8 ; 9 parameter 10 gm(c) gross margin /wheat 3000, maize 7000/ 11 labreq(c) labor requirement /wheat 50, maize 100/ 12 ; 13 variable 14 x(c) hectares per crops 15 R total revenu 16 ; 17 positive variable x 18 ; 19 equations 20 revenu objectif function 21 land land constraint 22 labor labor exectorint 21 labor labor exectorint 21 labor labor exectorint 21 labor labor exectorint 21 labor labor exectorint 22 labor labor exectorint 23 labor labor exectorint 24 labor labor exectorint 25 labor labor exectorint 26 labor labor exectorint 27 labor labor exectorint 28 labor labor exectorint 29 labor labor exectorint 20 labor labor exectorint 21 labor labor exectorint 21 labor labor exectorint 21 labor labor exectorint 22 labor labor exectorint 23 labor labor exectorint 24 labor labor exectorint 25 labor labor exectorint 26 labor labor exectorint 27 labor labor exectorint 28 labor labor exectorint 29 labor labor exectorint 20 labor labor exectorint 21 labor labor exectorint 22 labor labor exectorint 23 labor labor exectorint 24 labor labor exectorint 25 labor labor exectorint 25 labor labor exectorint 25 labor labor exectorint 26 labor exectorint 27 labor exectorint 27 labor exectorint 28 labor exectorint 29 labor exectorint 20 labor exector</pre>	
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ex0.lst ex0.gms		
C o m p i l a t i o n - Equation Listing SOLVE EXAMPLE Using LP ⊕ Equation - Column Listing SOLVE EXAMPLE Using LP ⊕ Column - Model Statistics SOLVE EXAMPLE Using LP - Solution Report SOLVE EXAMPLE Using LP ⊕ SolEQU ⊕ SolVAR	COMPILATION TIME = 0.000 SECONDS 3 MB 24.9.1 r63795 WEX-WEI GAMS 24.9.1 r63795 Released Aug 30, 2017 WEX-WEI x86 64bit/MS Windows 01/22/18 15:27:52 General Algebraic Modeling System Equation Listing SOLVE EXAMPLE Using LP From line 29	P
	revenu =E= objectif function	
	revenu 3000*x(wheat) + 7000*x(maize) - R = E= 0 ; (LHS = 0)	
	land =L= land constraint	
	land $x(wheat) + x(maize) = L = 25$; (LHS = 0)	
	labor =L= labor constraint	
	labor 50*x(wheat) + 100*x(maize) =L= 2000 ; (LHS = 0)	
	GAMS 24.9.1 r63795 Released Aug 30, 2017 WEX-WEI x86 64bit/MS Windows 01/22/18 15:27:52 General Algebraic Modeling System Column Listing SOLVE EXAMPLE Using LP From line 29	P
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ex0.lst ex0.gms							
ex0.lst ex0.gms C o m p i l a t i o n Equation Listing Equation Listing SOLVE EXAMPLE Using LP Column Listing SOLVE EXAMPLE Using LP Column Model Statistics Solution Report SOLVE EXAMPLE Using LP Solution Report SOLVE EXAMPLE Using LP SolUVE SolUVE EXAMPLE Using LP SolUVE SOLVE EXAMPLE Using LP SolUVE SOLVE EXAMPLE Using LP	Solution Report SOLVE EXAMPLE Using LP From line 29 SOLVE SUMMARY MODEL EXAMPLE OBJECTIVE R TYPE LP DIRECTION MAXIMIZE SOLVER CPLEX FROM LINE 29 **** SOLVER STATUS 1 Normal Completion **** MODEL STATUS 1 Optimal						
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7

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	LOWER	LEVEL	UPPER	MARGINAL
EQU revenu EQU land EQU labor	-INF -INF	20.000 2000.000	25.000 2000.000	-1.000 70.000
revenu objectif f land land constra labor labor const	unction int raint			
VAR x hectares	per crop	S		
LOWER L	EVEL	UPPER MAI	RGINAL	
wheat . maize . 2	0.000	+INF -50 +INF	0.000	
	LOWER	LEVEL	UPPER	MARGINAL
VAR R	-INF	1.4000E+5	+INF	
R total revenu				
**** REPORT SUMMARY	:	0 NONOP 0 INFEASIBL	r E	



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	LOWER	LEVEL	UPPER	MARGINAL	
winter	-INF 1	.000.000	1000.000		
summer	-INF	250.000	1000.000	-	
		LOWER	LEVEL	UPPER	MARGINAL
EQU	water	-INF	· .	1500.000	
EQU	ilandcons	-INF	· .	15.000	
EQU	equawater				6.000
water ilandco equawat	water cons ons irriga er equati	traint ted land on in ord	constraint ler to meas	ure total us	ed water
VAR	x hectare	s per cro	p per tech	niques	
	LOWER	LEVEL	UPPER	MARGINAL	
wheat.t1			+INF	-3600.000	
wheat.t2		25.000	+INF		
maize.t1			+INF	-450.000	
maize.t2			+INF	-4950.000	







AGRICULTURAL POLICY IMPACT MODELS Theory and Implementation







24-26 January 2018, London





Training Programme

24 January (Morning) 1-1

10:15-10:45: Quantitative Impact Analysis (HK) (1-1-1)

10:45-12:15: Review of Analytical Models (OE/HK) (1-1-2)

24 January (Afternoon) 1-2

13:45-15:15: Econometric Models (OE) (1-2-1)

15:30-17:00: Sector Models, Data Requirements, Calibration (HK) (1-2-2)

25 January (Morning) 2-1

09:00-10:30:Development of a Demo Farm/Sector Model (HK) (2-1-1)

10:45-12:15: The GAMS Code and the Reference Model (OE) (2-1-2)

25 January (Afternoon) 2-2

13:45-15:15: Running and Interpreting Results of Reference Model (HK/OE) (2-2-1) 15:30-17:00: Model Extension Exercises and Policy Simulations (OE) (2-2-2)

26 January (Morning) 3-1

09:00-10:30: Review of TAGRIS and Features (OE) (3-1-1) 10:45-12:15: Review of Selected Policy Simulations with TAGRIS (OE) (3-1-2) 12:15-13:45: Potentials, Issues and Challenges (HK/OE) (3-1-3)





2





EXERCISES

- A farmer has 25 hectares of land and 2000 hours of labor per year. The crops that he can produce are wheat and maize. Farmer earns 7000 \$ per hectare from the production of maize and 3000 \$ per hectare from the production of wheat. The labor requirement of maize production per year is 100 hours and the labor requirement of wheat production per year is 50 hours.
 - a) What is the optimum allocation of resources for the farmer in order to get the highest revenue possible?



ex0.gms

SET

C crops /wheat, maize/

scalar

tland total land /25/ tlabor total labor /2000/

parameter

```
gm(c) gross margin /wheat 3000, maize 7000/
labreq(c) labor requirement /wheat 50, maize 100/
```

variable

x(c) hectares per crops R total revenu

positive variable x

equations

```
revenu objectif function
land land constraint 50 hours.
labor labor constraint
;
revenu..sum(c,x(c)*gm(c))=E=R;
land..sum(c,x(c))=L=tland;
labor..sum(c,x(c)*labreg(c))=L=tlabor;
```

model EXAMPLE /ALL/;
solve EXAMPLE using LP maximizing R;



A farmer has 25 hectares of land and 2000 hours of labor per year. The crops that he can produce are wheat and maize. Farmer earns 7000 \$ per hectare from the production of maize and 3000 \$ per hectare from the production of wheat. The labor requirement of maize production per year is 100 hours and the labor requirement of wheat production per year is 50 hours.



ex1.gms

SET



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C crops /wheat, maize/

scalar

tland total land /25/ tlabor total labor /2000/

parameter

gm(c) gross margin /wheat 3000, maize 7000/ labreq(c) labor requirement /wheat 50, maize 100/

variable

x(c) hectares per crops R total revenu

positive variable x

```
x.LO ('wheat')=1;
```

equations

```
revenu objectif function
land land constraint
labor labor constraint
```

```
revenu..sum(c,x(c)*gm(c))=E=R;
land..sum(c,x(c))=L=tland;
labor..sum(c,x(c)*labreg(c))=L=tlabor;
```

model EX1 /ALL/; solve EX1 using LP maximizing R;



- a) What is the optimum allocation of resources for the farmer in order to get the highest revenue possible?
 - i) Suppose that the farmer should produce at least 1 hectare of wheat, solve again the optimization problem.



ex2.gms

SET

```
C crops /wheat, maize/
```

scalar

```
tland total land /25/
tlabor total labor /2000/
```

;

```
parameter
gm(c) gross margin /wheat 3000, maize 7000/
labreq(c) labor requirement /wheat 50, maize 100/
premium(c) /wheat 505/
```

variable

```
x(c) crop per hectare
R total revenu ;
positive variable x
```

 ii) Introduce a premium for wheat production, 505 \$/ha for wheat, in order to induce wheat production.

```
x.LO ('wheat')=1 ;
```

```
equations
```

```
revenu objectif function
land land constraint
```

```
labor labor constraint
```

```
revenu..sum(c,x(c)*(gm(c)+ premium(c)))=E=R;
land..sum(c,x(c))=L=tland;
labor..sum(c,x(c)*labreg(c))=L=tlabor;
```

```
model EXAMPLE /ALL/;
solve EXAMPLE using LP maximizing R;
```





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ex3.gms

SET



C crops /wheat, maize/

scalar

```
tland total land /25/
tlabor total labor /2000/
```

parameter

```
gm(c) gross margin /wheat 3000, maize 7000/
labreq(c) labor requirement /wheat 50, maize 100/
premium(c) /wheat 505/
```

;

```
variable
```

```
x(c) crop per hectare
R total revenu
```

```
positive variable x
```

iii) Suppose that farmer earns 3500 \$ from the production of wheat, solve again the optimization problem.

x.LO ('wheat')=1

equations

```
revenu objectif function
land land constraint
labor labor constraint
;
revenu..sum(c,x(c)*(gm(c)+ premium(c)))=E=R;
land..sum(c,x(c))=L=tland;
labor..sum(c,x(c)*labreq(c))=L=tlabor;
```

```
model EXAMPLE /ALL/;
solve EXAMPLE using LP maximizing R;
```

```
gm("wheat")=3500;
solve EXAMPLE using LP maximizing R;
```



ex3-4.gms

SET

```
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of Finance & Management
```

```
C crops /wheat,maize/
```

scalar

```
tland total land /25/
tlabor total labor /2000/
```

;

```
parameter
```

```
gm(c) gross margin /wheat 3000, maize 7000/
labreq(c) labor requirement /wheat 50, maize 100/
premium(c) /wheat 505/
```

; variable

```
x(c) crop per hectare
R total revenu
Z objective function
```

iv) Modify the model so that the objective become the minimization of total labor time consumed under the minimum revenue constraint of 120 000 \$.

positive variable x

```
x.LO ('wheat')=1
```

equations

```
revenu objectif function
land land constraint
labor labor constraint
```

```
revenu..sum(c,x(c)*(gm(c)+ premium(c)))=E=120000;
land..sum(c,x(c))=L=tland;
labor..sum(c,x(c)*labreg(c))=L=Z;
```

```
model EXAMPLE /ALL/;
solve EXAMPLE using LP minimizing Z;
```



ex4.qms

SET



scalar

tland total land /25/ tlabor total labor /2000/

; parameter

gm(c) gross margin /wheat 3000, maize 7000/ labreq(c) labor requirement /wheat 50, maize 100/

variable

x(c) crop per hectare R total revenu hlabor hired labor

positive variable x

b) Now suppose that the farmer can hire labor with a salary of 50 \$/hours, solve again the

optimization problem.

equations

revenu objectif function land land constraint labor labor constraint

;

;

revenu..sum(c,x(c)*gm(c))-50*hlabor=E=R; land..sum(c,x(c))=L=tland; labor..sum(c,x(c)*labreq(c))-hlabor=L=tlabor;

```
model EXAMPLE /ALL/;
solve EXAMPLE using LP maximizing R;
```









c) Now suppose two techniques of producing each crops; intensive (T2) and extensive

(T1), are introduced.

Yields of crops for each techniques (kg/ha)

	T1	T2
wheat	50	55
maize	70	80
Operation cos	ts (\$/ha)
	T1	T2
wheat	1600	1950
maize	2500	2600

In agricultural production total available labor is not uniform throughout the year. That's why it is better to express total available labor per periods. We can divide the year into two periods such that summer and winter. Now suppose that available labor in each is period is 1000 hours. In addition the labor requirements for each crops per period are as the following:

	winter	summer
Wheat.t1	30	10
Wheat.t2	40	10
Maize.t1	10	70
Maize.t2	20	80

Solve again the optimization problem.



```
ex5.gms
```

```
SET
C crops /wheat, maize/
T techniques /t1, t2/
P periods /winter, summer/
SCALAR
tland total land /25/
*tlabor total labor /2000/
TABLE yield(c,t) yields of crops per techniques
         t1
                 t2
         50
                 55
wheat
maize
        70
                 80
TABLE oc(c,t) operational cost
                 t2
         t1
wheat
        1600
               1950
        2500
maize
                 2600
TABLE labreg2(c,t,p) labor requir per technique and period
         winter summer
wheat.t1 30
                 10
wheat.t2 40
                 10
maize.t1 10
                 70
maize.t2 20
                 80
PARAMETER
```

price(c) price of crops /wheat 90, maize 120/ tlabor2(p) total labor per periods /winter 1000, summer 1000/





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```
PARAMETER gm(c,t) gross margin;
gm(c,t)=yield(c,t)*price(c)-oc(c,t);
display gm;
```

```
*parameter
*gm(c) gross margin /wheat 3000, maize 7000/
*labreq(c) labor requirement /wheat 50, maize 100/
*;
```

```
VARIABLE
*x(c) crop per hectare
x(c,t) hectares per crop per techniques
R total revenu
hlabor hired labor
```

```
POSITIVE VARIABLE X
```

```
EQUATIONS
```

revenu objectif function land land constraint *labor labor constraint labor(p) labor constraint per periods

```
*revenu..sum(c,x(c)*gm(c))-50*hlabor=E=R;
*land..sum(c,x(c))=L=tland;
*labor..sum(c,x(c)*labreq(c))-hlabor=L=tlabor;
```

```
revenu..sum((c,t),x(c,t)*gm(c,t))-50*hlabor=E=R;
land..sum((c,t),x(c,t))=L=tland;
labor(p)..sum((c,t),x(c,t)*labreq2(c,t,p))-hlabor=L=tlabor2(p);
```

```
model EXAMPLE /ALL/;
solve EXAMPLE using LP maximizing R;
```







d) Now introduce irrigation constraint to our model. Two techniques of production; irrigated (T1) and non irrigated (T2), are introduced.

Yields of crops for each techniques (kg/ha)

	T1	T2						
wheat	65	55	In agricu	ltural p	production to	al available labo	or is not unifor	m throughout the year. That's
maize	90	0	why it is	better	to express to	tal available lab	or per periods	s. We can divide the year into
			two perio	ods su	ch that summ	er and winter. N	low suppose	that available labor in each is
Operation cos	sts (\$/ha	ı)	period is 1000 hours. In addition the labor requirements for each crops per period are as					
	T1	T2	the follow	ving:				
wheat	1800	0						
maize	2700	0				winter	summer	
					Wheat.t1	50	30	
					Wheat.t2	40	10	
					Maize.t1	30	90	
					Maize.t2	0	0	

Solve again the optimization problem.



ex7.gms

SET

C crops /wheat, maize/ T techniques irrigated(t1) or non irrigated(t2) /t1, t2/ P periods /winter, summer/

SCALAR

```
tland total land /25/
twater total available water /1500/
```

```
TABLE yield(c,t) yields of crops per techniques
        t1
               t2
               55
        65
wheat
               0
maize
        90
TABLE oc(c,t) operational cost
        t1 t2
        1800 0
wheat
maize
        2700
               0
TABLE labreg2(c,t,p) labor requir per technique and period
        winter summer
wheat.t1 50
               30
wheat.t2 40
              10
           90
maize.t1 30
maize.t2 0
               0
```







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Table	watereq(c	;,t)
	t1	t2
wheat	450	0
maize	600	0

PARAMETER

price(c) price of crops /wheat 90, maize 120/ tlabor2(p) total labor per periods /winter 1000, summer 1000/

PARAMETER gm(c,t) gross margin; gm(c,t)=yield(c,t)*price(c)-oc(c,t); display gm;

VARIABLE

x(c,t) hectares per crop per techniques
R total revenu
hlabor hired labor ;
POSITIVE VARIABLE x ;
EQUATIONS
revenu objectif function

land land constraint
labor(p) labor constraint per periods
water water constraint;

revenu..sum((c,t),x(c,t)*gm(c,t))-50*hlabor=E=R; land..sum((c,t),x(c,t))=L=tland; labor(p)..sum((c,t),x(c,t)*labreq2(c,t,p))-hlabor=L=tlabor2(p); water..sum((c,t),x(c,t)*watereq(c,t))=l=twater;

model EXAMPLE /ALL/;
solve EXAMPLE using LP maximizing R;

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ex8.qms

```
SET
C crops /wheat, maize/
T techniques irrigated(t1) or non irrigated(t2) /t1, t2/
P periods /winter, summer/
ircrop(t) irrigated crop /t1/
nircrop(t) nonirrigated crop /t2/ ;
SCALAR
tland total land /25/
                                                            display gm;
twater total available water /1500/
iland total irrigated land /15/ ;
                                                            VARIABLE
TABLE yield(c,t) yields of crops per techniques
         t1
                t2
                 55
wheat
         65
                      ;
maize
         90
                 0
TABLE oc(c,t) operational cost
                t2
         t1
      1800
                 0
wheat
                                                            EQUATIONS
maize
        2700
                 0
TABLE labreg2(c,t,p) labor requir per technique and period
         winter summer
wheat.t1 50
                 30
wheat.t2 40
                10
maize.t1 30
               90
maize.t2 0
                 0
                      ;
Table watereg(c,t)
                t2
         t1
         450
wheat
                 0
maize
      600
                 0
                               ;
PARAMETER
price(c) price of crops /wheat 90, maize 120/
tlabor2(p) total labor per periods
                /winter 1000, summer 1000/
```





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```
PARAMETER gm(c,t) gross margin;
gm(c,t)=yield(c,t)*price(c)-oc(c,t);
display gm;
VARIABLE
x(c,t) hectares per crop per techniques
R total revenu
hlabor hired labor
;
POSITIVE VARIABLE x
;
EQUATIONS
revenu objectif function
land land constraint
labor(p) labor constraint per periods
water water constraint
ilandcons irrigated land constraint
;
```

```
revenu..sum((c,t),x(c,t)*gm(c,t))-50*hlabor=E=R;
land..sum((c,t),x(c,t))=L=tland;
labor(p)..sum((c,t),x(c,t)*labreq2(c,t,p))-hlabor=L=tlabor2(p);
water..sum((c,t),x(c,t)*watereq(c,t))=l=twater;
ilandcons..sum((c,t),x(c,t)$ircrop(t))=L=iland;
```

```
model EXAMPLE /ALL/;
solve EXAMPLE using LP maximizing R;
```



EQUIS

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e) Now suppose that total irrigated land is 15 ha. Solve again the optimization problem.

ex9.gms

SET

```
C crops /wheat, maize/
T techniques irrigated(t1) or non irrigated(t2) /t1, t2/
P periods /winter, summer/
ircrop(t) irrigated crop /t1/
nircrop(t) nonirrigated crop /t2/ ;
SCALAR
tland total land /25/
twater total available water /1500/
iland total irrigated land /15/
pricewat price of water /6/
TABLE yield(c,t) yields of crops per techniques
         t.1
                 t2
                55
         65
wheat
maize
                0
        90
TABLE oc(c,t) operational cost
        t1
              t2
       1800
                 0
wheat
maize
        2700
                0
TABLE labreg2(c,t,p) labor requir per technique and period
        winter summer
wheat.t1 50
                 30
             10
wheat.t2 40
             90
maize.t1 30
maize.t2 0
             0
                       ;
Table watereq(c,t)
        t1
                 t2
        450
                 0
wheat
maize
        600
                 0
                      ;
PARAMETER
price(c) price of crops /wheat 90, maize 120/
tlabor2(p) total labor per periods
               /winter 1000, summer 1000/
```



PARAMETER gm(c,t) gross margin; gm(c,t)=yield(c,t)*price(c)-oc(c,t); display gm;

VARIABLE

x(c,t) hectares per crop per techniques R total revenu hlabor hired labor tusedwat total used water

POSITIVE VARIABLE x, hlabor, tusedwat

EQUATIONS

revenu objectif function land land constraint labor(p) labor constraint per periods water water constraint ilandcons irrigated land constraint equawater equation in order to measure total used water

```
revenu..sum((c,t),x(c,t)*gm(c,t))-50*hlabor-pricewat*tusedwat=E=R;
land..sum((c,t),x(c,t))=L=tland;
labor(p)..sum((c,t),x(c,t)*labreq2(c,t,p))-hlabor=L=tlabor2(p);
water..sum((c,t),x(c,t)*watereq(c,t))=L=twater;
ilandcons..sum((c,t),x(c,t)$ircrop(t))=L=iland;
equawater..sum((c,t),x(c,t)*watereq(c,t))=e=tusedwat;
```

```
model EXAMPLE /ALL/;
solve EXAMPLE using LP maximizing R;
```



f) Suppose that price of water is 4 \$/m3. Solve again the optimization problem.

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ex10.qms



g) Do a LOOP statement in order to perform iterations for water prices of 0, 4, 5.25, 5.251



\$/m3. Is there a difference in the optimum production pattern for the water prices of

5.25 and 5.251 \$/m3? If so, why? What should be the price of water?

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```
ex10.qms
```

EOUIS

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```
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SET
                                                                                                     of Finance & Management
C crops /wheat, maize/
                                                                                               German Excellence, Global Relevance,
T techniques irrigated(t1) or non irrigated(t2) /t1, t2/
                                                            PARAMETER gm(c,t) gross margin;
P periods /winter, summer/
                                                            gm(c,t)=yield(c,t)*price(c)-oc(c,t);
ircrop(t) irrigated crop /t1/
                                                            display gm;
nircrop(t) nonirrigated crop /t2/
IT iterations for different elvels of water price /it1*it4/
                                                            Parameter iteration(it) different levels of water price
SCALAR
tland total land /25/
                                                            it1
                                                                    0
twater total available water /1500/
                                                            it2
                                                                     4
iland total irrigated land /15/
                                                                    5.25
                                                            it3
pricewat price of water
                                                            it4
                                                                    5.251/ ;
TABLE yield(c,t) yields of crops per techniques
                                                            VARIABLE
         ±1
                 t2
                                                            x(c,t) hectares per crop per techniques
         65
                 55
wheat
                                                                 total revenu
                                                            R
maize
         90
                 0
                                                            hlabor hired labor
TABLE oc(c,t) operational cost
                                                            tusedwat total used water
                 t2
         t1
                                                            POSITIVE VARIABLE x, hlabor, tusedwat
                                                                                                ;
         1800
                 0
wheat
                                                            EQUATIONS
maize
         2700
                 0
                                                            revenu objectif function
TABLE labreg2(c,t,p) labor requir per technique and period
                                                            land land constraint
         winter summer
                                                            labor(p) labor constraint per periods
wheat.t1 50
                 30
                                                            water water constraint
                           Parameter RESULT1(*,*);
wheat.t2 40
                10
                                                                                         aint.
maize.t1 30
                 90
                                                                                         neasure total used water
maize.t2 0
                0 ;
                           model EXAMPLE /ALL/;
                                                                                         )-50*hlabor-pricewat*tusedwat=E=R;
Table watereq(c,t)
                           LOOP (it, pricewat=iteration(it);
         t1
                 t2
                           solve EXAMPLE using LP maximizing R;
                                                                                         eq2(c,t,p))-hlabor=L=tlabor2(p);
         450
wheat
                 0
                           result1("water consumption", it) = tusedwat.L;
                                                                                         (c,t))=l=twater;
maize
         600
                 0
                                                                                         cop(t))=L=iland;
                                                                                         ereq(c,t)) = e=tusedwat;
                           DISPLAY RESULT1;
                                                                                                                      17
          EFMD
```

ex11.qms

SET

C crops /wheat, maize/ T techniques irrigated(t1) or non irrigated(t2) /t1, t2/ P periods /winter, summer/ ircrop(t) irrigated crop /t1/ nircrop(t) nonirrigated crop /t2/ IT iterations for different elvels of water price /it1*it4/

SCALAR

```
tland total land /25/
twater total available water /1500/
iland total irrigated land /15/
pricewat price of water
```

```
TABLE yield(c,t) yields of crops per techniques
         t1
                t2
        65
                55
wheat
maize
        90
                0
TABLE oc(c,t) operational cost
         t1
                t2
        1800
                0
wheat
maize
        2700
                0
TABLE labreq2(c,t,p) labor requir per technique and period
        winter summer
wheat.t1 50
                30
wheat.t2 40
               10
maize.t1 30
                90
maize.t2 0
                 0
```







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- h) Use DISPLAY command to get a simpler output file. What are
 - i) Water consumption,
 - ii) Farmer revenue,
 - iii) Marginal value of water constraint,
 - iv) Produced crops
 - for each level of water price?





PARAMETER

```
PARAMETER gm(c,t) gross margin;
gm(c,t)=yield(c,t)*price(c)-oc(c,t);
display gm;
```

Parameter iteration(it) different levels of water price

```
it1 0
it2 4
it3 5.25
it4 5.251/
```

VARIABLE

x(c,t) hectares per crop per techniques
R total revenu
hlabor hired labor
tusedwat total used water
;
POSITIVE VARIABLE x, hlabor,tusedwat

```
EQUATIONS
revenu objectif function
land land constraint
labor(p) labor constraint per periods
water water constraint
ilandcons irrigated land constraint
equawater equation in order to measure total used water
```

```
revenu..sum((c,t),x(c,t)*gm(c,t))-50*hlabor-pricewat*tusedwat=E=R;
land..sum((c,t),x(c,t))=L=tland;
labor(p)..sum((c,t),x(c,t)*labreq2(c,t,p))-hlabor=L=tlabor2(p);
water..sum((c,t),x(c,t)*watereq(c,t))=l=twater;
ilandcons..sum((c,t),x(c,t)$ircrop(t))=L=iland;
equawater..sum((c,t),x(c,t)*watereq(c,t))=e=tusedwat;
```

```
Parameter RESULT1(*,*);
Parameter RESULT2(*,*,*);
```

```
model EXAMPLE /ALL/;
LOOP (it,pricewat=iteration(it);
solve EXAMPLE using LP maximizing R;
result1("price_of_water",it)=pricewat;
result1("water_consumption",it)=tusedwat.L;
result1("farmer_revenu", it)=R.L;
result1("farmer_revenu", it)=R.L;
Result1("marginal_value_of_water",it)=water.M;
Result2(c,t,it)=X.L(c,t);
```

```
DISPLAY RESULT1, RESULT2;
```







A Simple Agricultural Sector Model

sector_model.gms

```
*****
       PMP
           CALIBRATED SECTOR MODEL EXAMPLE
                                                                          *SETS
                                CETC
Sets
         / wheat, beans, onions, cotton, maize, tomato /
c crops
t period / jan,feb,mar,apr,may,jun,jul,aug,sep,oct,nov,dec /
                               DATA * *
Table landreg(t,c) months of land occupation by crop (hectares)
    wheat beans onions cotton maize tomato
      1.
                    1.
jan
             1.
      1. 1.
feb
                    1.
                1.
     1. 1.
                            .5
mar
apr
     1. 1.
                    1.
                           1.
                     .25
                           1.
                                  .25
      1.
may
jun
                           1.
                                 1.
jul
                           1.
                                 1.
                                         .75
                           1.
                                 1.
aug
                                        1.
                           1.
                                 1.
sep
                                         1.
                                  .5
oct
                           1.
                                         1.
                            .75
                                         .75
       .5
              .25
                     .5
nov
dec
      1.
             1.
                    1.
```







Tabl	e labor	req(t,c) crop 1	labor r	equirem	ents (man	days j	per hectare)
	wheat	beans	onions	cotton	maize	tomato			
jan	1.72	.75	5.16						
feb	.5	.75	5.						
mar	1.	.75	5.	5.					
apr	1.	16.	19.58	5.					
may	17.16		2.42	9.	4.3				
jun	2.34			2.	5.04				
jul				1.5	7.16	17.			
aug				2.	7.97	15.			
sep				1.	4.41	12.			
oct				26.	1.12	7.			
nov	2.43	7.5	11.16	12.		6.			
dec	1.35	.75	4.68						
;									
Para	meters								
yiel	d(c) cr	op yiel	d (tons	per he	ctare)				
	/	wheat	1.5, bea	ans 1,	onio	ns 3			
		cotton	1.5, ma:	lze 2.	0, toma	to 3 /			
	()		(
pric	e(c) cr	op pric	es (aol.	Lars pe	r ton)	105			
	/	wneat	100, bea	ans 200	, onion	s 125			
		cotton	350, mai	lze /0	, tomat	0 120 /			





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```
miscost(c) misc cash costs (dollars per hectare)
          / wheat 10, beans 5, onions 50
           cotton 80, maize 5, tomato 50 /;
   farm data, size labor availability etc.
Scalars fnum
             number of farms in sector
                                                    /1500/
             farmsize (hectares)
                                                    / 4 /
       land
                                                   / 25 /
       famlab
              family labor available (days per month)
              reservation wage rate (dollars per day)
                                                   / 3/
       rwage
              temporary labor wage (dollars per day) / 4 /
       twage
              number of working days per month
                                             / 25 /
       dpm
                       * DEMAND DATA
Table demdat(c,*)
                 demand data
         ref-p
                 ref-q
                         elas
                                          imp-p
                                 exp-p
×
          ($)
                 (1000t)
                                  (5)
                                           (5)
                  2700 -0.8
wheat
          100
                                          140
                 900 -0.4
                                          270
         200
beans
onions
         125
              700 -1.0
                                  40
                                          inf
         350
              2100 -1.0
                                 300
                                          inf
cotton
maize
         70
                  3800 -0.5
                                          85
                 500 -1.2
                                          inf
tomato
         120
                                  60
```




Variables

ΕΟι

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cps	consumers and producers	surplus	(total	surplus)
yfarm	farm income	(dolla	rs)	
revenue	value of production	(dolla	rs)	
mcost	misc cash cost	(dolla	rs)	
labcost	labor cost	(dolla	rs)	
rescost	family labor reservation	n wage co	st (doll	ars)
tcost	total farm cost includin	ng rescos	t	







E.					
Positive Va	ariable				
xcrop(c)	cropping	activity	(hectares	5)	
flab(t)	family la	bor use	(days)		
tlab(t)	temporary	labor	(days)		
natprod (c) net produ	ction	(tons)		
natcon(c)) domestic	consumption	(1000 to	ns)	
natprice	(c) domestic	price	(dollars	per ton)	
;					
flab.up(t)	= famlab*fnu	m;			
Equations	landbal(t)	land balance		(hectares)	
	laborbal(t)	labor balance		(days)	
	amisc	cash cost accou	nting	(dollars)	
	alab	labor cost acco	unting	(dollars)	
	ares	reservation labo	or cost	(dollars)	
	acost	total cost accor	unting	(dollars)	
	proc(c)	net production of	definition	1	(tons)
	arevf	revenue account:	ing: fixed	d price model	(1000 \$)
	income	income definitio	on	(dollars)	
	objn	objective funct:	lon		
	dem(c)	national demand	balance	(1000 tons)	
	arevn	revenue account:	ing	(1000 Ş)	
	pdef(c)	price definition	n		
1					



-			Frankfurt School
111	landbal(t)	<pre>sum(c, xcrop(c)*landreq(t,c)) =l= land*fnum;</pre>	German Excellence. Global Relevance.
	laborbal(t)	<pre>sum(c, xcrop(c)*laborreq(t,c)) =l= flab(t) + tlab(t);</pre>	
	amisc	<pre>mcost =e= sum(c, xcrop(c)*miscost(c));</pre>	
	alab	<pre>labcost =e= sum(t, tlab(t)*twage);</pre>	
	ares	<pre>rescost =e= sum(t, flab(t)*rwage);</pre>	
	acost	<pre>tcost =e= mcost + labcost + rescost;</pre>	
	proc(c)	<pre>natprod(c) =e= xcrop(c)*yield(c);</pre>	
	arevf	<pre>revenue =e= sum(c, natprod(c)*price(c));</pre>	
	income	<pre>yfarm =e= revenue - tcost + rescost;</pre>	
	* added equat	tions	
	objn	<pre>cps =e= sum(c, alpha(c)*natcon(c) + .5*beta(c)*sqr(natcon(c))) - tcost;</pre>	
	dem(c)	<pre>natcon(c) =l= natprod(c);</pre>	
	arevn	<pre>revenue =e= sum(c, alpha(c)*natcon(c) + beta(c)*sqr(natcon(c)));</pre>	
	pdef(c)	<pre>natprice(c) =e= alpha(c) + beta(c)*natcon(c);</pre>	
	Model sector	<pre>sector model / landbal, laborbal,amisc,alab,ares,acost,</pre>	













```
********** SECTOR MODEL SOLUTION WITH PMP calibration
Equation CALIB(C);
CALIB(C)...natprod(c) = l = demdat(c, 'ref-g')*(1+0.0001);
Model cal sector sector model / landbal, laborbal, amisc, alab, ares, acost,
                                  proc, dem, objn, arevn, pdef, calib /;
Solve cal sector using nlp maximizing cps;
* adding pmp coefficients to supply
Parameter gamma(c), lambda(c);
lambda(c) = calib.m(c)/demdat(c, 'ref-g');
gamma(c) = (miscost(c)/yield(c)) - lambda(c)*demdat(c,'ref-g');
Equation obj pmp;
obj pmp.. cps =e= sum(c, alpha(c)*natcon(c) + .5*beta(c)*sqr(natcon(c)))
           - labcost - rescost - sum(c,gamma(c)*natprod(c) + lambda(c)*sgr(natprod(c)));
Model pmp sector sector model / landbal, laborbal, amisc, alab, ares, acost,
                                  proc, dem, obj pmp, arevn, pdef /;
Solve pmp sector using nlp maximizing cps;
Result('natprod', c, 'pmp') = natprod.l(c);
Result('natprice',c,'pmp') = natprice.l(c);
Result('natprod',c,'pmp check') = natprod.l(c)/demdat(c,'ref-g');
Result('natprice',c,'pmp check') = natprice.l(c)/demdat(c,'ref-p');
```







```
*** CLIMATE CHANGE SIMULATION
* a 30% decline in yields due to climate change
yield(C)=yield(C)*0.70;
Solve pmp_sector using nlp maximizing cps;
Result('natprod',c,'sim_cc') = natprod.l(c);
Result('natprice',c,'sim_cc') = natprice.l(c);
Result('natprod',c,'sim_change') = natprod.l(c)/demdat(c,'ref-q');
Result('natprice',c,'sim_change') = natprice.l(c)/demdat(c,'ref-p');
Display result;
```







-- 224 PARAMETER result

natprod .tomato

natprice.wheat

natprice.beans

natprice.onions

natprice.cotton natprice.maize

natprice.tomato

0.850

1.215

1.153

1.121 1.118

1.228

1.125

	base	sector	pmp	pmp_check	sim_cc
natprod .wheat	2700.000	3245.904	2700.189	1.000	2235.161
natprod .beans	900.000	1094.400	900.062	1.000	844.914
natprod .onions	700.000	984.517	700.037	1.000	615.167
natprod .cotton	2100.000	2930.000	2100.114	1.000	1852.214
natprod .maize	3800.000	4337.157	3800.296	1.000	3367.557
natprod .tomato	500.000	710.000	500.027	1.000	424.791
natprice.wheat	100.000	74.727	99.991	1.000	121.520
natprice.beans	200.000	92.000	199.966	1.000	230.603
natprice.onions	125.000	74.193	124.993	1.000	140.149
natprice.cotton	350.000	211.667	349.981	1.000	391.298
natprice.maize	70.000	50.210	69.989	1.000	85.932
natprice.tomato	120.000	78.000	119.995	1.000	135.042
+	sim_change				
natprod .wheat	0.828				
natprod .beans	0.939				
natprod .onions	0.879				
natprod .cotton	0.882				
natprod .maize	0.886				







AGRICULTURAL POLICY IMPACT MODELS Theory and Implementation







24-26 January 2018, London





Training Programme

24 January (Morning) 1-1

10:15-10:45: Quantitative Impact Analysis (HK) (1-1-1)

10:45-12:15: Review of Analytical Models (OE/HK) (1-1-2)

24 January (Afternoon) 1-2

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2

C:\Users\user\Desktop\2017_2018_01_masaustu_Bitti_EBRD_Proje_TAGRIS_modelleri___bitti__TAG



European Bank Acconstruction and Development

SIM0.gms

	\$TITLE	E TAGRIS	MODEL - V	/ersion:	3.5 (DECEMB	ER 25, 3	2017)			
	\$ontex	ĸt								
	*****	*******	*******	*******	*****	******	******	******	*******	k sk sk
	*****			TURKISH	AGRICULTURAL	SECTOR	model		***	***
	*****				(TAGRIS)				***	t sk sk
	*****	*******	*******	******	*****	******	******	******	*******	***
	*****	*******	*****	ksk sk	******	******	**	****	******	
	*****	*******	******	*** **	******	******	***	****	*******	ŀ
		***	* * *	*** **	r sk	***	***	**** *	* * *	
		***	******	**** **	** *****	******	***	**** *	*******	ŀ
		* * *	******	**** **	** *****	*** **	* *	****	*******	k sk
	,	* * *	***	*** **	r* ***	*** *	***	****	sk sk s	k sk
	,	* * *	* * *	*** **	******	***	****	****	*******	ŀ
	,	* * *	***	*** *	*****	***	****	****	******	
								Ver	sion: 2.0)
	*									*
	*		BASE	PERIOD	: 2014	-2016				*
	*									*
	*	#	Regional	: - Cror	Production,	4 regi	ons			*
	*		2	- Frui	ts and Nuts	Product	ion, 4	regions		*
	*			- Anim	al Productio	n, nati	onal			*
	*	#	66 Agrici	iltural	Products	,				*
	*	#	PMP – Doi	nestic s	supply functi	ons				*
	*	#	ME - Max	imum Ent	ropy based a	laorith	m			*
	*	#	PMP Calil	brated F	Export Supply	Functi	 			*
	*	11 #	Trade di	saddreda 1	ated into: EU	and RO	W			*
<		_								





- TAGRIS FEATURES
 - TAGRIS is an optimization model with endogenous prices.
 - The objective function of the model is the sum of consumers' and producers' surplus.
 - The production side of the model is disaggregated into four regions: Coastal Anatolia, Central Anatolia, East Anatolia, and Southeastern Anatolia Project Regions
 - The model contains more than 200 activities to describe the production of about 50+ commodities with approximately 250 equations and 350 variables.
 - Livestock production is an integrated part of the model. The feed supply is provided from the crop production sector, and disaggregated into six categories, namely direct or raw equivalent commercial feed consumption of cereals, milling by-products, oil seed by-products, straw or stalk by-products from the crop production, odder crops, and range land and meadow.
 - The inputs include, dry land, irrigated land, labor, machinery, fertilizer, seed and feed
 - Foreign trade is allowed in raw and in raw equivalent form for processed products
 - Trade is differentiated for the EU, USA and the rest of the world (ROW).
 - The calibration of demand follows an elasticity based approach.
 - The calibration of supply uses a Maximum Entropy integrated Positive Mathematical Programming (PMP) method.



(3-1-1)/2



TAGRIS INPUT-OUTPUT STRUCTURE





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5



TAGRIS PRODUCT COVERAGE

- The 50+ products of the model cover 96.3 % of Turkey's total harvested area
- **Cereals:** Common wheat, durum wheat, barley, corn, rice, oats, rye, spelt, millet.
- **Pulses:** Chick pea, dry bean, lentil.
- Industrial crops: Tobacco, sugar beet, cotton.
- **Oilseeds**: Sesame, sunflower, peanut, soybean.
- **Vegetables:** Melon, watermelon, cucumber, eggplant, fresh tomato, processing tomato, green pepper.
- Tubers: Onion, potato.
- **Fruits and nuts:** Apple, apricot, peach, table olive, oil olive, citrus, pistachio, hazelnut, dry fig, table grape, raisin grape, tea.
- Fodder crops: Cow vetch, wild vetch, alfalfa, sainfoin.
- Livestock and poultry products: Beef and veal, mutton and lamb, goat meat, poultry meat, cow milk, sheep milk, goat milk, egg, cow hide, sheep hide, goat hide, wool, hair.



(3-1-1)/4



for Reconstruction and Development

TAGRIS REGIONAL COVERAGE





(3-1-1)/5

TAGRIS DATA REQUIREMENTS

European Bank for Reconstruction and Development

Table 2. TASIM/TAGRIS Dat	a kequir	ements	-				
Data	Activity	Crops	Livestock	Regional	Turkey	Annual	Quarterly
Area	x	X		X	X	X	
Dry Areas	x	×		×	×	×	
Irrigated Area							1
Tree Area							
Production	X	X	X	X	X	X	
Consumption		X	X	X	X	X	
Population				X	X	X	
Elasticity							
Price		X	X		X	X	
Income		X	X		Х	X	
Trade							
Export Q		X	X		Х	X	
Export V		X	X		X	X	
Import Q		X	X		Х	X	
Import V		X	X		Х	X	
X or M Quotas		Х	X		Х	X	
Variable Resource Availability							
Fertilizers (N and P)	Х	X		Х	Х	X	
Water	Х			Х	Х	X	X
Labour	X			Х	Х	X	X
Tractor	Х	Х		Х	Х	X	Х
Seed/Seedling	Х	Х		Х	Х	X	
Feed	X		X	Х	Х	X	
Input Prices							
Reservation Wage				Х	Х	X	
Tractor Rental Price				Х	Х	X	X
Fertilizer Price					Х	X	
Water Price				Х	Х	X	X
Seed/Seedling Price					X	X	
Tree Investment Costs					X	X	
Input Output Coefficients	X	X	x	X	X	X	
Exchange Rate					X	X	
Interventions							
Input Subsidies		X	X	Х	Х	X	
Output Price Premiums		×	X	Х	X	X	
Tariffs		X	X		X	X	
Taxes		×	X		X	X	
Quotas		X	X	X	X	X	

_ _ _ _ _ _







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2



TAGRIS SIMULATIONS











SIMULATION 1: Impacts of Customs Union in Agricultural Products between EU and Turkey







SIM1.gms SIM1.lst								
		4435 PARAMET	ER DPRICE	STATISTICAL	AND MODEL PR	ICES		^
– ALPHA CEN								
- BMAT_FN		STATISTIC	MODEL	DEVIATION	EUM PRICE	RWM PRICE	EUX PRICE	
– ZETA_FN								
- PALPHA_FN	CWHT	302.000	283.027	0.937	130.000	248.000	374.000	
- PBMAI_FN	DWHT	304.000	281.395	0.926	130.000	334.000	495.000	
- CPI EN	BRL	255.000	234.814	0.921	110.000	105.000	500.000	
	CRN	254.000	246.550	0.971	105.000	100.000	563,000	
 Model Statistics SOLVE MEPMP Using NL 	RIC	667.000	630,630	0.945	450,000	441,000	499,000	
- Solution Report SOLVE MEPMP Using NI	RYE	252,000	237.299	0.942	115,000	112,000	443,000	
E Solvar	CHC	1105.000	1082.340	0.979	1381.000	900.000	1301.000	
Execution	DBN	1388.000	1362.157	0.981	4793.000	1150.000	1503.000	
⊟⊢ Display	FBN	918.000	913.041	0.995	765.000	1400.000	1464.000	
	LNT	774.000	760.189	0.982	1087.000	640,000	2102.000	
- RBALC	TOB	5457.000	5377.000	0.985	5377.000	5830,000	6897.000	
- KOALL - MARKBAI	SBE	70,000	68,653	0.981	29,000	23,000	185,000	
- BLIV	СОТ	586.000	573.790	0.979	1652,000	560,000	1704.000	
- SURPLU	SES	2298,000	2154 519	0.938	1796.000	1809.000	3112,000	
- FERTCST	SNE	711.000	686,482	0.966	550,000	542.000	2228,000	
	GNT	1447 000	1428 351	0.987	1050.000	1045 000	2318 000	
	SOY	444 000	418 000	0 941	434 000	418 000	661 000	
- TRACCST	ONT	251 000	248 798	0 991	206.000	200 000	255 000	
- TOTVARCST	POT	394 000	391 755	0 994	320 000	521 000	157 000	
	FONT	771 000	766 571	0 004	800.000	800.000	780 000	
	LOWI	//1.000	/00.3/1	0.554	000.000	000.000	100.000	
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SIM1.gms SIM1.lst								
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- ALPHA CFN		4435 PARAMETER	MARKBAL PR	ODUCTION AND	MARKET BALA	NCES		
- BMAT_FN								
- ZETA_FN		STATPROD	MODPROD	PRODDEV	TOTALTRAD	CONSUMPT	FEEDGRAIN	
- PALPHA_FN								
- PC FN	CWHT	17059.980	16861.095	0.988	507.101	11384.018	2543.934	
- CPI_FN	DWHT	3673.530	3312.682	0.902	394.000	2728.494		
LTL_FN	BRL	7000.390	6794.027	0.971	-339.900	1191.271	4970.164	
Model Statistics SOLVE MEPMP Using NL Solution Depart SOLVE MEPMP Using NL	CRN	6250.130	5674.694	0.908	-1288.700	6434.658	1076.280	
	RIC	533.980	454.134	0.850	-233.700	767.682		
⊕- SolVAR	RYE	538.380	526.718	0.978	-4.200	88.821	389.817	
— Execution	CHC	454.930	457.766	1.006	-4.600	459.526		
⊡- Display	DBN	228.320	261.268	1.144	-29.500	257.825		
	FBN	639.260	638.165	0.998	1.600	637.663		
- RBALL	LNT	356.710	385.028	1.079	-24.300	381.008		
- MARKBAL	TOB	70.860	52.539	0.741	42.200	28.661		
- BLIV	SBE	17410.450	16824.147	0.966	-1941.500	17610.890		
	COT	2166.970	2303.073	1.063	19.001	1281.179		
- SEEDCST	SES	18.590	13.383	0.720	-105.700	124.289		
- TINVCST	SNF	1663.030	1458.328	0.877	-705.200	1935.840		
- LABCST	GNT	145.100	113.603	0.783	-18.800	149.387		
- TRACCST	SOY	158.680	113.408	0.715	-2519.300	2646.245		
	ONI	1929.940	1915.049	0.992	94.900	1835.038		
- INPUTUSE FERT	POT	4562.920	4525.966	0.992	22.000	4540.926		
DEFPAY								~
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General Impacts



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	Base	SIMULATION	CHANGE
	2014-16	EU-CU	%
Total Surplus (Index)	100.0	100.4	0.4%
Producer Surplus	100.0	100.0	0.0%
Consumer Surplus	100.0	106.4	6.4%
Total Production			
Volume (with Base Period Prices)	63,285	61,938	-2.1%
Value	63,285	58,632	-7.4%
Crop Production			
Volume (with Base Period Prices)	40,244	39,983	-0.6%
Value	40,244	39,987	-0.6%
Livestock Production			
Volume (with Base Period Prices)	23,041	21,954	-4.7%
Value	23,041	18,645	-19.1%
Total Consumption			
Volume (with Base Period Prices)	54,198	57,294	5.7%
Value	54,198	52,912	-2.4%
Crop Consumption			
Volume (with Base Period Prices)	32,473	32,633	0.5%
Value	32,473	32,455	-0.1%
Livestock Consumption			
Volume (with Base Period Prices)	21,725	24,661	13.5%
Value	21,725	20,457	-5.8%
Net Exports	8,765	7,827	-10.7%
Crop Products	7,311	8,282	13.3%
Livestock Products	1,455	-455	-131.3%
Price Index (Laspeyres)	100.0	93.5	-6.5%
Crop Products	100.0	99.6	-0.4%
Livestock Products	100.0	84.3	-15.7%





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Impacts on Foreign Trade



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Net Exports (Million USD)								
		BASE			CUSTOMS UNION			
	EU	ROW	TOTAL	EU	ROW	TOTAL		
CROP PRODUCTS	5394	1917	7311	6370	1912	8282		
CEREALS	-173	737	564	-550	865	315		
Common Wheat	-61	667	605	-165	704	538		
Durum Wheat	-6	237	231	-75	257	183		
Barley	-15	-21	-36	-49	0	-49		
Corn	-58	-74	-132	-124	-76	-201		
Rice	-32	-71	-104	-137	-19	-156		
Rye	0	0	0	-1	0	-1		
PULSES	18	-63	-44	25	-15	10		
Chickpea	13	-13	0	19	-17	2		
Drybean	2	-36	-33	3	0	3		
Freash Bean	0	3	2	-2	3			
Lentil	3	-16	-14	4	0	4		
INDUSTRIAL CROPS	1085	-12	1073	1440	-132	1309		
Tobacco	-54	395	341	-160	403	244		
Sugarbeet	-4	-42	-45	-15	-47	-62		
Cotton	1142	-365	777	1615	-488	1127		





et Exports (Million USD)								
		BASE			CUSTOMS UNION			
	EU	ROW	TOTAL	EU	ROW	TOTAL		
OILSEEDS	-116	-1528	-1644	-515	-1323	-1838		
Sesame	10	-197	-187	14	-216	-202		
Sunflower	-104	-280	-384	-504	0	-504		
Groundnut	0	-20	-20	-26	-26	-51		
Soybean	-22	-1032	-1054	0	-1081	-1081		
TUBERS	-8	64	56	-20.0	56.6	37		
Onion (Dry)	3	21	24	4	16	20		
Potato	-15	28	13	-29	28	-1		
Onion (Fresh)	4	20	24	5	18			
Garlic (Dry)	0	-4	-4	0	-6			
Garlic (Fresh)	0	0	0	0	0			
VEGETABLES	154	263	417	209	233	442		
Melon	3	1	4	4	1	5		
Watermelon	5	0	5	6	-1	5		
Cucumber	3	2	5	4	2	6		
Eggplant	1	1	1	1	1	1		
Fresh Tomato	50	57	108	68	54	122		
Processing Tomato	41	169	210	54	143	197		
Green Pepper	16	3	19	23	3	26		
Red Pepper	35	30	66	50	31	80		





Net Exports (Million USD)							
		BASE		CUS	CUSTOMS UNION		
	EU	ROW	TOTAL	EU	ROW	TOTAL	
GREENHOUSE PRODUCTS	437	584	1021	583	544	1127	
Fresh Bean	0	1	1	0	1	1	
Melon	0	0	1	1	0	1	
Watermelon	2	0	2	3	0	3	
Cucumber	44	43	88	60	42	102	
Eggplant	5	6	12	7	6	13	
Tomato	287	501	788	377	465	842	
Green Pepper	99	31	130	135	30	165	
FRUITS AND NUTS	3997	1871	5868	5199	1682	6882	
Apple	344	102	446	451	88	539	
Apricot	281	203	484	380	186	566	
Peach	0	30	29	-26	27	1	
Table Olive	6	5	11	7	4	12	
Oil Olive	39	150	189	52	134	186	
Orange	10	128	138	14	124	138	
Grapefruit	42	38	80	58	37	95	
Lemon	77	189	266	107	183	290	
Mandarin	18	100	117	24	96	120	
Pistachio	36	27	62	48	25	73	
Hazelnut	2472	418	2890	3212	352	3564	
Fig (Dry)	139	109	248	182	97	279	
Fig (Fresh)	0	0	0	0	0		
Table Grape	42	117	159	55	104	160	
Raisin Grape	307	149	456	387	129	516	
Теа	12	-6	7	17	-8	8	
Cherry	136	60	196	185	56	241	
Pomegranate	36	53	89	47	47	94	





Net Exports (Million USD)						
		BASE		CUS	STOMS U	NION
	EU	ROW	TOTAL	EU	ROW	TOTAL
LIVESTOCK & POUL.	-32	1486	1455	-2021	1566	-455
MEAT	-11	42	31	-1496	79	-1417
Cow Meat	-11	36	25	-1304	59	-1245
Sheep Meat	0	6	6	-152	20	-132
Goat Meat	0	0	0	-40	0	-40
MILK	-19	590	570	-310	595	285
Cow Milk	-18	544	526	-280	544	265
Sheep Milk	-1	27	26	-21	30	9
Goat Milk	0	18	18	-10	21	11
POULTRY	-2	855	853	-215	893	678
Poultry Meat	0	415	415	-181	487	306
Egg	-2	440	438	-34	406	372
TOTAL	5362	3403	8765	4349	3478	7827





Impacts on Agricultural Production



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Production (Million USD)							
Volume (2014-16 prices) and \	/alue (scenario p	rices)					
	BA	BASE		CUSTOMS UNION		CHANGE	
	VALUE	VOLUME	VALUE	VOLUME	VALUE	VOLUME	
CROP PRODUCTS	40244	40244	39987	39983	-0.6%	-0.6%	
CEREALS	10133	10133	9110	9709	-10.1%	-4.2%	
Common Wheat	5152	5152	4772	5092	-7.4%	-1.2%	
Durum Wheat	1117	1117	932	1007	-16.5%	-9.8%	
Barley	1785	1785	1595	1732	-10.6%	-3.0%	
Corn	1587	1587	1399	1441	-11.9%	-9.2%	
Rice	356	356	286	303	-19.6%	-15.0%	
Rye	136	136	125	133	-7.9%	-2.2%	
PULSES	1683	1683	1727	1752	2.6%	4.1%	
Chickpea	503	503	495	506	-1.4%	0.6%	
Drybean	317	317	356	363	12.3%	14.4%	
Fresh Bean	587	587	583	586	-0.7%	-0.2%	
Lentil	276	276	293	298	6.0%	7.9%	
INDUSTRIAL CROPS	2875	2875	2759	2814	-4.0%	-2.1%	
Tobacco	387	387	283	287	-26.9%	-25.9%	
Sugarbeet	1219	1219	1155	1178	-5.2%	-3.4%	
Cotton	1270	1270	1321	1350	4.1%	6.3%	
OILSEEDS	1506	1506	1240	1282	-17.7%	-14.8%	
Sesame	43	43	29	31	-32.5%	-28.0%	
Sunflower	1182	1182	1001	1037	-15.3%	-12.3%	
Groundnut	210	210	162	164	-22.7%	-21.7%	
Sovbean	70	70	47	50	-32.7%	-28.5%	





Production (Million USD)						
Volume (2014-16 prices) and Valu	e (scenario p	rices)				
	BA	SE	CUSTOMS UNION		CHANGE	
	VALUE	VOLUME	VALUE	VOLUME	VALUE	VOLUME
TUBERS	2602	2602	2566	2582	-1.4%	-0.8%
Onion (Dry)	484	484	476	481	-1.6%	-0.8%
Potato	1798	1798	1773	1783	-1.4%	-0.8%
Onion (Fresh)	109	109	108	109	-0.8%	-0.2%
Garlic (Dry)	185	185	183	184	-1.3%	-0.9%
Garlic (Fresh)	26	26	26	26	-0.6%	0.0%
VEGETABLES	3779	3779	3757	3784	-0.6%	0.1%
Melon	539	539	536	540	-0.5%	0.2%
Watermelon	427	427	421	427	-1.3%	-0 .1%
Cucumber	128	128	127	129	-1.0%	0.7%
Eggplant	113	113	112	113	-0.8%	0.4%
Fresh Tomato	824	824	821	828	-0.3%	0.4%
Processing Tomato	751	751	733	737	-2.3%	-1.8%
Green Pepper	185	185	184	187	-0.3%	1.1%
Red Pepper	813	813	822	824	1.1%	1.4%
GREENHOUSE PRODUCTS	5188	5188	5342	5233	3.0%	0.9%
Fresh Bean	80	80	81	79	1.1%	-1.9%
Melon	123	123	125	119	2.0%	-2.9%
Watermelon	297	297	305	287	2.5%	-3.5%
Cucumber	773	773	793	778	2.6%	0.7%
Eggplant	129	129	132	126	2.2%	-2.1%
Tomato	3034	3034	3113	3063	2.6%	1.0%
Green Pepper	752	752	794	780	5.6%	3.7%





Production (Million USD)							
Volume (2014-16 prices) and Va	lue (scenario p	rices)					
	BA	ASE	CUSTO	CUSTOMS UNION		CHANGE	
	VALUE	VOLUME	VALUE	VOLUME	VALUE	VOLUME	
FRUITS AND NUTS	12478	12478	13486	12827	8.1%	2.8%	
Apple	1226	1226	1309	1271	6.8%	3.7%	
Apricot	521	521	566	552	8.6%	6.0%	
Peach	421	421	382	373	<mark>-9.2%</mark>	-11.3%	
Table Olive	650	650	675	623	3.8%	-4.0%	
Oil Olive	1517	1517	1537	1408	1.3%	-7.2%	
Orange	405	405	416	403	2.8%	-0.5%	
Grapefruit	47	47	54	52	16.2%	12.3%	
Lemon	323	323	341	334	5.7%	3.4%	
Mandarin	274	274	283	272	3.3%	-0.6%	
Pistachio	912	912	939	910	3.0%	-0.3%	
Hazelnut	2285	2285	2890	2676	26.5%	17.1%	
Fig (Dry)	351	351	394	371	12.1%	5.7%	
Fig (Fresh)	86	86	86	85	0.9%	-0.4%	
Table Grape	1297	1297	1317	1276	1.6%	-1.6%	
Raisin Grape	477	477	566	536	18.7%	12.3%	
Теа	806	806	810	792	0.5%	-1.8%	
Cherry	721	721	753	732	4.4%	1.5%	
Pomegranate	161	161	167	160	3.6%	-0.4%	





Production (Million USD)						
Volume (2014-16 prices) and V	alue (scenario p	rices)				
	BA	SE	CUSTO	IS UNION	CHA	ANGE
	VALUE	VOLUME	VALUE	VOLUME	VALUE	VOLUME
LIVESTOCK & POUL.	23041	23041	18645	21954	-19.1%	-4.7%
MEAT	9017	9017	5855	8454	-35.1%	-6.2%
Cow Meat	8012	8012	5115	7459	-36.2%	-6.9%
Sheep Meat	775	775	565	764	-27.0%	-1.3%
Goat Meat	231	231	175	231	-24.2%	0.0%
MILK	8642	8642	7854	8120	-9.1%	-6.0%
Cow Milk	7385	7385	6680	6875	<mark>-9.5%</mark>	-6.9%
Sheep Milk	902	902	840	890	-6.9%	-1.3%
Goat Milk	355	355	334	355	-5.9%	0.0%
POULTRY	5381	5381	4937	5380	-8.3%	0.0%
Poultry Meat	3449	3449	3132	3448	-9.2%	0.0%
Egg	1933	1933	1805	1932	-6.6%	0.0%
TOTAL	63285	63285	58632	61938	-7.4%	-2.1%





Impacts of Prices



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Prices of Selected Products	(USD/Ton)		
Laspeyres Index for Groups			
BASE=100	BASE	EU-CU	CHANGE (%)
CROP PRODUCTS	100.0	99.6	-0.4%
CEREALS	100.0	94.4	-5.6%
Common Wheat	302	283	-6.3%
Durum Wheat	304	281	-7.4%
Barley	255	235	-7.9%
Corn	254	247	-2.9%
Rice	667	631	-5.5%
Rye	252	237	-5.8%
PULSES	100.0	98.5	-1.5%
Chickpea	1,105	1,082	-2.1%
Drybean	1,388	1,362	-1.9%
Fresh Bean	918	913	-0.5%
Lentil	774	760	-1.8%
INDUSTRIAL CROPS	100.0	98.1	-1.9%
Tobacco	5,457	5,377	-1.5%
Sugarbeet	70	69	-1.9%
Cotton	586	574	-2.1%





Prices of Selected Products	(USD/Ton)		
Laspeyres Index for Groups			
BASE=100	BASE	EU-CU	CHANGE (%)
OILSEEDS	100.0	95.5	-4.5%
Sesame	2,298	2,155	-6.2%
Sunflower	711	686	-3.4%
Groundnut	1,447	1,428	-1.3%
Soybean	444	418	-5.9%
TUBERS	100.0	99.4	-0.6%
Onion (Dry)	251	249	-0.9%
Potato	394	392	-0.6%
Onion (Fresh)	771	767	-0.6%
Garlic (Dry)	1,885	1,877	-0.4%
Garlic (Fresh)	1,025	1,019	-0.6%
VEGETABLES	100.0	99.3	-0.7%
Melon	270	268	-0.7%
Watermelon	133	131	-1.2%
Cucumber	176	173	-1.6%
Eggplant	210	207	-1.2%
Fresh Tomato	178	177	-0.7%
Processing Tomato	182	181	-0.5%
Green Pepper	219	216	-1.4%
Red Pepper	742	740	-0.3%




Prices of Selected Products	(USD/Ton)		
Laspeyres Index for Groups			
BASE=100	BASE	EU-CU	CHANGE (%)
GREENHOUSE PRODUCTS	100.0	102.2	2.2%
Fresh Bean	1,744	1,797	3.0%
Melon	741	778	5.0%
Watermelon	424	450	6.1%
Cucumber	717	730	1.9%
Eggplant	442	462	4.5%
Tomato	843	857	1.6%
Green Pepper	1,252	1,274	1.8%
FRUITS AND NUTS	100.0	104.7	4.7%
Apple	461	475	3.0%
Apricot	931	954	2.5%
Peach	656	672	2.4%
Table Olive	1,537	1,663	8.2%
Oil Olive	1,158	1,264	9.1%
Orange	223	230	3.3%
Grapefruit	191	198	3.4%
Lemon	416	425	2.2%
Mandarin	232	241	4.0%
Pistachio	6,951	7,178	3.3%
Hazelnut	4,523	4,885	8.0%
Fig (Dry)	3,403	3,609	6.1%
Fig (Fresh)	1,096	1,111	1.3%
Table Grape	643	664	3.2%
Raisin Grape	1,517	1,603	5.7%
Теа	613	627	2.3%
Cherry	1,368	1,407	2.9%
Pomegranate	369	384	4.0%





Regional Impacts





Production Changes							
	CHANGE						
	Coastal	Central	Eastern	GAP			
CROP PRODUCTS							
Common Wheat	-6%	5%	-1%	-9%			
Durum Wheat	18%	-12%	-2%	-14%			
Barley	15%	-8%	-1%	-2%			
Corn	-13%	2%	-3%	-9%			
Rice	-15%	-17%	-5%	-17%			
Rye	-15%	4%	0%	-10%			
PULSES							
Chickpea	31%	-11%	-1%	-26%			
Drybean	200%	-10%	-2%	8%			
Fresh Bean	-7%	17%	-2%	66%			
Lentil	106%	5%	0%	6%			
INDUSTRIAL CROPS							
Tobacco	-27%	-28%	-6%	-25%			
Sugarbeet	18%	-5%	-3%	-26%			
Cotton	-10%	25%	-3%	18%			





Production Changes							
	CHANGE						
	Coastal	Central	Eastern	GAP			
OILSEEDS							
Sesame	-28%	-27%	-6%	-27%			
Sunflower	-14%	-10%	-2%	46%			
Groundnut	-23%	20%		-18%			
Soybean	-30%	-18%		3%			
TUBERS							
Onion (Dry)	19%	-15%	-3%	66%			
Potato	30%	-10%	-3%	1%			
Onion (Fresh)	24%	-26%	-4%	1%			
Garlic (Dry)	16%	1%	-3%	-43%			
Garlic (Fresh)	35%	10%	-4%	-45%			
VEGETABLES							
Melon	29%	-20%	-4%	-30%			
Watermelon	-29%	37%	-3%	58%			
Cucumber	3%	-7%	-4%	17%			
Eggplant	1%	13%	-3%	-9%			
Fresh Tomato	-17%	18%	-3%	56%			
Processing Tomato	-12%	54%	-2%	69%			
Green Pepper	-11%	18%	-3%	63%			
Red Pepper	-28%	43%	-1%	52%			





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roduction Changes				
		CH	ANGE	
	Coastal	Central	Eastern	GAP
GREENHOUSE PRODUCTS				
Fresh Bean	-2%	-39%		
Melon	-3%			
Watermelon	-3%			
Cucumber	5%	-47%	-48%	9%
Eggplant	-2%			-45%
Tomato	0%	33%	97%	
Green Pepper	4%	-46%		
FRUITS AND NUTS				
Apple	37%	-41%	38%	-25%
Apricot	72%	-49%	-18%	37%
Peach	-11%	-39%	133%	61%
Table Olive	-4%	-38%		24%
Oil Olive	-9%	-41%		27%
Orange	0%	-40%		
Grapefruit	12%			
Lemon	3%	-44%		
Mandarin	-1%	-36%		
Pistachio	200%	-36%	200%	-10%
Hazelnut	1%	118%	200%	
Fig (Dry)	6%			
Fig (Fresh)	-1%	47%	200%	-28%
Table Grape	4%	-38%	29%	12%
Raisin Grape	21%	-37%	-46%	-1%
Теа	-2%			
Cherry	-29%	30%	200%	21%
Pomegranate	0%	-36%	193%	5%





Climate Change Simulation

Simulation 2





General Impacts



	BASE	SIMULATION	CHANGE
Tatal Samplers (Index)	100.0	00.4	0.60/
De local Surplus (Index)	100.0	99.4	-0.0%
Producer Surplus	100.0	99.9	-0.1%
Consumer Surplus	100.0	92.1	-7.9%
Total Production			
Volume (with Base Period Prices)	63,285	58,423	-7.7%
Value	63,285	63,959	1.1%
Crop Production			
Volume (with Base Period Prices)	40,244	35,521	-11.7%
Value	40,244	40,920	1.7%
Livestock Production			
Volume (with Base Period Prices)	23,041	22,902	-0.6%
Value	23,041	23,039	0.0%
Total Consumption			
Volume (with Base Period Prices)	54,198	51,088	-5.7%
Value	54,198	55,088	1.6%
Crop Consumption			
Volume (with Base Period Prices)	32,473	29,487	-9.2%
Value	32,473	33,352	2.7%
Livestock Consumption			
Volume (with Base Period Prices)	21,725	21,601	-0.6%
Value	21,725	21,736	0.1%
Net Exports	8,765	7,137	-18.6%
Crop Products	7,311	5,660	-22.6%
Livestock Products	1,455	1,477	1.6%
Price Index (Laspeyres)	100.0	109.4	9.4%
Crop Products	100.0	115.2	15.2%
Livestock Products	100.0	100.6	0.6%







Impacts on Foreign Trade





Net Exports (Million USD)						
		BASE			CENARI	0
	EU	ROW	TOTAL	EU	ROW	TOTAL
CROP PRODUCTS	5394	1917	7311	4828	832	5660
CEREALS	-173	737	564	-196	394	198
Common Wheat	-61	667	605	-70	441	370
Durum Wheat	-6	237	231	-7	140	133
Barley	-15	-21	-36	-17	-24	-41
Corn	-58	-74	-132	-65	-83	-148
Rice	-32	-71	-104	-37	-79	-116
Rye	0	0	0	0	0	-1
PULSES	18	-63	-44	18	-73	-55
Chickpea	13	-13	0	14	-16	-2
Drybean	2	-36	-33	2	-42	-40
Freash Bean	0	3	2	0	3	
Lentil	3	-16	-14	3	-18	-16
INDUSTRIAL CROPS	1085	-12	1073	1020	-109	910
Tobacco	-54	395	341	0	356	356
Sugarbeet	-4	-42	-45	-4	-48	-53
Cotton	1142	-365	777	1024	-417	607
OILSEEDS	-116	-1528	-1644	-104	-1641	-1745
Sesame	10	-197	-187	11	-213	-203
Sunflower	-104	-280	-384	-115	-323	-437
Groundnut	0	-20	-20	0	-23	-23
Soybean	-22	-1032	-1054	0	-1082	-1082





Net Exports (Million USD)						
	BASE				0	
	EU	ROW	TOTAL	EU	ROW	TOTAL
TUBERS	-8	64	56	-10.9	56.2	45
Onion (Dry)	3	21	24	3	19	22
Potato	-15	28	13	-18	23	6
Onion (Fresh)	4	20	24	4	19	
Garlic (Dry)	0	-4	-4	0	-5	
Garlic (Fresh)	0	0	0	0	0	
VEGETABLES	154	263	417	123	90	213
Melon	3	1	4	3	1	4
Watermelon	5	0	5	4	0	4
Cucumber	3	2	5	2	2	5
Eggplant	1	1	1	1	1	1
Fresh Tomato	50	57	108	49	54	103
Processing Tomato	41	169	210	14	0	14
Green Pepper	16	3	19	16	3	19
Red Pepper	35	30	66	34	30	64
GREENHOUSE PRODUCTS	437	584	1021	437	584	1021
Fresh Bean	0	1	1	0	1	1
Melon	0	0	1	0	0	1
Watermelon	2	0	2	2	0	2
Cucumber	44	43	88	44	43	88
Eggplant	5	6	12	5	6	12
Tomato	287	501	788	287	501	788
Green Pepper	99	31	130	99	31	130





et Exports (Million USD)						
		BASE			0	
	EU	ROW	TOTAL	EU	ROW	TOTAL
FRUITS AND NUTS	3997	1871	5868	3542	1531	5072
Apple	344	102	446	103	0	103
Apricot	281	203	484	282	205	487
Peach	0	30	29	0	30	30
Table Olive	6	5	11	6	5	11
Oil Olive	39	150	189	30	97	128
Orange	10	128	138	10	129	139
Grapefruit	42	38	80	43	38	81
Lemon	77	189	266	78	191	269
Mandarin	18	100	117	18	101	119
Pistachio	36	27	62	26	19	46
Hazelnut	2472	418	2890	2554	440	2994
Fig (Dry)	139	109	248	0	0	0
Fig (Fresh)	0	0	0	0	0	
Table Grape	42	117	159	32	83	115
Raisin Grape	307	149	456	174	84	258
Теа	12	-6	7	12	-6	6
Cherry	136	60	196	137	61	198
Pomegranate	36	53	89	36	54	90





Net Exports (Million USD)						
		BASE				0
	EU	ROW	TOTAL	EU	ROW	TOTAL
LIVESTOCK & POUL.	-32	1486	1455	-36	1514	1477
MEAT	-11	42	31	-12	36	23
Cow Meat	-11	36	25	-12	36	23
Sheep Meat	0	6	6	0	0	0
Goat Meat	0	0	0	0	0	0
MILK	-19	590	570	-22	624	602
Cow Milk	-18	544	526	-21	579	558
Sheep Milk	-1	27	26	-1	25	24
Goat Milk	0	18	18	0	20	20
POULTRY	-2	855	853	-2	854	852
Poultry Meat	0	415	415	0	414	414
Egg	-2	440	438	-2	440	438
TOTAL	5362	3403	8765	4792	2345	7137





Impacts on Agricultural Production





Production (Million USD)						
Volume (2014-16 prices) and V	/alue (scenario p	rices)				
	BA	ASE	SCE	NARIO	CHANGE	
	VALUE	VOLUME	VALUE	VOLUME	VALUE	VOLUME
CROP PRODUCTS	40244	40244	40920	35521	1.7%	-11.7%
CEREALS	10133	10133	10724	7880	5.8%	-22.2%
Common Wheat	5152	5152	5031	3640	-2.4%	-29.3%
Durum Wheat	1117	1117	997	731	-10.7%	-34.5%
Barley	1785	1785	2548	1702	42.7%	-4.7%
Corn	1587	1587	1621	1385	2.1%	-12.7%
Rice	356	356	322	286	-9.5%	-19.7%
Rye	136	136	206	135	51.5%	-0 .1%
PULSES	1683	1683	1718	1645	2.1%	-2.2%
Chickpea	503	503	493	504	-2.0%	0.2%
Drybean	317	317	328	299	3.6%	-5.8%
Fresh Bean	587	587	600	581	2.2%	-1.0%
Lentil	276	276	297	262	7.6%	-5.2%
INDUSTRIAL CROPS	2875	2875	2791	2499	-2.9%	-13.1%
Tobacco	387	387	435	407	12.4%	5.3%
Sugarbeet	1219	1219	1274	1151	4.5%	-5.5%
Cotton	1270	1270	1082	941	-14.8%	-25.9%
OILSEEDS	1506	1506	1273	1159	-15.4%	-23.0%
Sesame	43	43	30	31	-30.9%	-26.3%
Sunflower	1182	1182	995	890	-15.9%	-24.7%
Groundnut	210	210	202	189	-3.6%	-10.1%
Sovhean	70	70	46	49	-34.0%	-29.9%





Production (Million USD)						
Volume (2014-16 prices) and Valu	e (scenario p	rices)				
	BA	ASE	SCE	NARIO	CHANGE	
	VALUE	VOLUME	VALUE	VOLUME	VALUE	VOLUME
TUBERS	2602	2602	2731	2555	4.9%	-1.8%
Onion (Dry)	484	484	501	478	3.3%	-1.3%
Potato	1798	1798	1906	1761	6.0%	-2.1%
Onion (Fresh)	109	109	110	107	1.2%	-1.6%
Garlic (Dry)	185	185	188	183	1.3%	-1.1%
Garlic (Fresh)	26	26	26	26	2.1%	-0.6%
VEGETABLES	3779	3779	4111	3490	8.8%	-7.6%
Melon	539	539	553	535	2.6%	-0.7%
Watermelon	427	427	446	418	4.6%	-2.1%
Cucumber	128	128	136	124	6.2%	-2.8%
Eggplant	113	113	118	111	4.8%	-2.2%
Fresh Tomato	824	824	881	809	6.9%	-1.9%
Processing Tomato	751	751	959	505	27.6%	-32.8%
Green Pepper	185	185	195	180	5.6%	-2.5%
Red Pepper	813	813	823	808	1.3%	-0.5%
GREENHOUSE PRODUCTS	5188	5188	5188	5188	0.0%	0.0%
Fresh Bean	80	80	80	80	0.0%	0.0%
Melon	123	123	123	123	0.0%	0.0%
Watermelon	297	297	297	297	0.0%	0.0%
Cucumber	773	773	773	773	0.0%	0.0%
Eggplant	129	129	129	129	0.0%	0.0%
Tomato	3034	3034	3034	3034	0.0%	0.0%
Green Pepper	752	752	752	752	0.0%	0.0%





Production (Million USD)						
/olume (2014-16 prices) and \	/alue (scenario p	rices)				
	B	ASE	SCE	NARIO	CH	ANGE
	VALUE	VOLUME	VALUE	VOLUME	VALUE	VOLUME
FRUITS AND NUTS	12478	12478	12383	11103	-0.8%	-11.0%
Apple	1226	1226	1393	871	13.7%	-28.9%
Apricot	521	521	522	523	0.0%	0.4%
Peach	421	421	418	422	-0.6%	0.2%
Table Olive	650	650	640	659	-1.4%	1.5%
Oil Olive	1517	1517	1458	1062	-3.9%	-30.0%
Orange	405	405	402	406	-0.8%	0.3%
Grapefruit	47	47	46	47	-0.5%	0.7%
Lemon	323	323	322	325	-0.2%	0.6%
Mandarin	274	274	271	275	-0.8%	0.6%
Pistachio	912	912	977	843	7.2%	-7.6%
HazeInut	2285	2285	2299	2361	0.6%	3.3%
Fig (Dry)	351	351	176	90	-49.8%	-74.2%
Fig (Fresh)	86	86	85	86	-0.3%	0.1%
Table Grape	1297	1297	1355	1161	4.5%	-10.5%
Raisin Grape	477	477	339	278	-28.9%	-41.7%
Теа	806	806	800	807	-0.7%	0.1%
Cherry	721	721	717	724	-0.5%	0.4%
Pomegranate	161	161	160	162	-0.6%	0.7%





Production (Million USD)						
Volume (2014-16 prices) and V	alue (scenario p	rices)				
	BA	SE	SCE	NARIO	CHA	NGE
	VALUE	VOLUME	VALUE	VOLUME	VALUE	VOLUME
LIVESTOCK & POUL.	23041	23041	23039	22902	0.0%	-0.6%
MEAT	9017	9017	9021	8947	0.0%	-0.8%
Cow Meat	8012	8012	8018	7960	0.1%	-0.6%
Sheep Meat	775	775	771	746	-0.5%	-3.6%
Goat Meat	231	231	232	240	0.6%	4.2%
MILK	8642	8642	8638	8576	0.0%	-0.8%
Cow Milk	7385	7385	7384	7337	0.0%	-0.6%
Sheep Milk	902	902	896	869	-0.7%	-3.6%
Goat Milk	355	355	359	370	0.9%	4.2%
POULTRY	5381	5381	5380	5379	0.0%	0.0%
Poultry Meat	3449	3449	3444	3447	-0.1%	0.0%
Egg	1933	1933	1936	1932	0.2%	0.0%
TOTAL	63285	63285	63959	58423	1.1%	-7.7%





Impacts on Prices





Prices of Selected Products	(USD/Ton)		
Laspeyres Index for Groups			
BASE=100	BASE	SCENARIO	CHANGE (%)
CROP PRODUCTS	100.0	115.2	15.2%
CEREALS	100.0	131.4	31.4%
Common Wheat	302	417	38.2%
Durum Wheat	304	414	36.3%
Barley	255	382	49.7%
Corn	254	297	17.0%
Rice	667	751	12.6%
Rye	252	382	51.7%
PULSES	100.0	104.8	4.8%
Chickpea	1,105	1,080	-2.2%
Drybean	1,388	1,526	10.0%
Fresh Bean	918	947	3.2%
Lentil	774	879	13.6%
INDUSTRIAL CROPS	100.0	111.9	11.9%
Tobacco	5,457	5,826	6.8%
Sugarbeet	70	77	10.7%
Cotton	586	674	15.1%
OILSEEDS	100.0	103.0	3.0%
Sesame	2,298	2,155	-6.2%
Sunflower	711	795	11.8%
Groundnut	1,447	1,552	7.3%
Sovbean	444	418	-5.9%





Prices of Selected Products	(USD/Ton)		
Laspeyres Index for Groups			
BASE=100	BASE	SCENARIO	CHANGE (%)
TUBERS	100.0	106.9	6.9%
Onion (Dry)	251	263	4.7%
Potato	394	426	8.2%
Onion (Fresh)	771	793	2.8%
Garlic (Dry)	1,885	1,929	2.4%
Garlic (Fresh)	1,025	1,053	2.7%
VEGETABLES	100.0	120.1	20.1%
Melon	270	279	3.3%
Watermelon	133	142	6.8%
Cucumber	176	192	9.3%
Eggplant	210	225	7.1%
Fresh Tomato	178	194	9.0%
Processing Tomato	182	346	89.9%
Green Pepper	219	237	8.3%
Red Pepper	742	756	1.8%
GREENHOUSE PRODUCTS	100.0	100.0	0.0%
Fresh Bean	1,744	1,744	0.0%
Melon	741	741	0.0%
Watermelon	424	424	0.0%
Cucumber	717	717	0.0%
Eggplant	442	442	0.0%
Tomato	843	843	0.0%
Green Pepper	1.252	1.252	0.0%





Prices of Selected Products	(USD/Ton)		
Laspeyres Index for Groups			
BASE=100	BASE	SCENARIO	CHANGE (%)
FRUITS AND NUTS	100.0	117.9	17.9%
Apple	461	737	59.9%
Apricot	931	928	-0.4%
Peach	656	650	-0.9%
Table Olive	1,537	1,493	-2.9%
Oil Olive	1,158	1,590	37.3%
Orange	223	220	-1.2%
Grapefruit	191	189	-1.2%
Lemon	416	413	-0.8%
Mandarin	232	229	-1.4%
Pistachio	6,951	8,057	15.9%
Hazelnut	4,523	4,404	-2.6%
Fig (Dry)	3,403	6,633	94.9%
Fig (Fresh)	1,096	1,091	-0.5%
Table Grape	643	751	16.8%
Raisin Grape	1,517	1,852	22.1%
Теа	613	608	-0.8%
Cherry	1,368	1,356	-0.9%
Pomegranate	369	364	-1.4%





Prices of Selected Products	(USD/Ton)		
Laspeyres Index for Groups			
BASE=100	BASE	SCENARIO	CHANGE (%)
LIVESTOCK & POUL.	100.0	100.6	0.6%
MEAT	100.0	100.8	0.8%
Cow Meat	8,138	8,198	0.7%
Sheep Meat	8,181	8,450	3.3%
Goat Meat	7,519	7,258	-3.5%
MILK	100.0	100.7	0.7%
Cow Milk	437	440	0.6%
Sheep Milk	788	812	3.1%
Goat Milk	758	734	-3.2%
POULTRY	100.0	100.0	0.0%
Poultry Meat	1,820	1,818	-0.1%
Egg	1,787	1,791	0.2%
TOTAL	100.0	109.4	9.4%





Regional Impacts





Production Changes							
	CHANGE						
	Coastal	Central	Eastern	GAP			
CROP PRODUCTS							
Common Wheat	-31%	-50%	-8%	28%			
Durum Wheat	-31%	-45%	-7%	-22%			
Barley	-17%	-2%	-15%	5%			
Corn	-6%	-8%	2%	-30%			
Rice	-23%	11%	-5%	-27%			
Rye	59%	-29%	-10%	107%			
PULSES							
Chickpea	133%	-61%	-54%	-41%			
Drybean	-29%	-3%	-2%	-29%			
Fresh Bean	9%	-29%	0%	-28%			
Lentil	200%	165%	-7%	-20%			
INDUSTRIAL CROPS							
Tobacco	-65%	200%	29%	200%			
Sugarbeet	-29%	-6%	1%	122%			
Cotton	-49%	-23%	2%	-9%			
OILSEEDS							
Sesame	-30%	-2%	-8%	-29%			
Sunflower	-51%	22%	-2%	-29%			
Groundnut	-10%	-30%		-27%			
Sovbean	-30%	-29%		-28%			





Production Changes				
		CH	ANGE	
	Coastal	Central	Eastern	GAP
TUBERS				
Onion (Dry)	-29%	15%	-2%	-28%
Potato	200%	-69%	32%	200%
Onion (Fresh)	-19%	22%	2%	-29%
Garlic (Dry)	-30%	-20%	0%	106%
Garlic (Fresh)	-29%	-28%	-4%	51%
VEGETABLES				
Melon	-33%	38%	16%	-29%
Watermelon	14%	-30%	2%	-28%
Cucumber	-29%	39%	10%	-28%
Eggplant	9%	-29%	0%	-21%
Fresh Tomato	-67%	125%	15%	-36%
Processing Tomato	-68%	191%	200%	170%
Green Pepper	9%	-29%	0%	-30%
Red Pepper	17%	-28%	-1%	-30%
GREENHOUSE PRODUCTS				
Fresh Bean	0%	0%		
Melon	0%			
Watermelon	0%			
Cucumber	0%	0%	0%	0%
Eggplant	0%			0%
Tomato	0%	0%	0%	
Green Pepper	0%	0%		





roduction Changes				
		CH	ANGE	
	Coastal	Central	Eastern	GAP
FRUITS AND NUTS		[[ĺ	
Apple	-25%	-64%	200%	200%
Apricot	67%	-30%	-29%	-29%
Peach	4%	-29%	-28%	-29%
Table Olive	3%	-28%		-29%
Oil Olive	-32%	-29%		4%
Orange	0%	-29%		
Grapefruit	1%			
Lemon	1%	-29%		
Mandarin	1%	-28%		
Pistachio	200%	200%	200%	-27%
Hazelnut	8%	-29%	-28%	
Fig (Dry)	-74%			
Fig (Fresh)	5%	-29%	-28%	-29%
Table Grape	-62%	38%	-19%	128%
Raisin Grape	-62%	100%	-29%	-29%
Теа	0%			
Cherry	25%	-30%	-29%	-28%
Pomegranate	6%	-28%	-30%	-30%





%25 Fertilizer Price Increase (An Equivalent Decline in Fertilizer Subsidies)

Simulation 3





General Impacts



	Base	SIMULATION	CHANGE
Total Surplus (Index)	100.0	99.9	-0.1%
Producer Surplus	100.0	100.0	0.0%
Consumer Surplus	100.0	99.6	-0.4%
Total Production			
Volume (with Base Period Prices)	63,285	62,850	-0.7%
Value	63,285	63,289	0.0%
Crop Production			
Volume (with Base Period Prices)	40,244	39,822	-1.0%
Value	40,244	40,255	0.0%
Livestock Production			
Volume (with Base Period Prices)	23,041	23,029	-0.1%
Value	23,041	23,034	0.0%
Total Consumption			
Volume (with Base Period Prices)	54,198	53,988	-0.4%
Value	54,198	54,218	0.0%
Crop Consumption			
Volume (with Base Period Prices)	32,473	32,268	-0.6%
Value	32,473	32,493	0.1%
Livestock Consumption			
Volume (with Base Period Prices)	21,725	21,720	0.0%
Value	21,725	21,725	0.0%
Net Exports	8,765	8,659	-1.2%
Crop Products	7,311	7,175	-1.9%
Livestock Products	1,455	1,484	2.1%
Price Index (Laspeyres)	100.0	100.4	0.4%
Crop Products	100.0	100.7	0.7%
Livestock Products	100.0	100.0	0.0%







Impacts on Foreign Trade





Net Exports (Million USD)						
		BASE		5	CENARI	0
	EU	ROW	TOTAL	EU	ROW	TOTAL
CROP PRODUCTS	5394	1917	7311	5407	1768	7175
CEREALS	-173	737	564	-190	694	504
Common Wheat	-61	667	605	-67	644	577
Durum Wheat	-6	237	231	-7	225	218
Barley	-15	-21	-36	-17	-22	-39
Corn	-58	-74	-132	-64	-78	-141
Rice	-32	-71	-104	-36	-75	-111
Rye	0	0	0	0	0	-1
PULSES	18	-63	-44	18	-66	-48
Chickpea	13	-13	0	13	-14	-1
Drybean	2	-36	-33	2	-37	-35
Freash Bean	0	3	2	0	3	
Lentil	3	-16	-14	3	-17	-14
INDUSTRIAL CROPS	1085	-12	1073	1118	-31	1087
Tobacco	-54	395	341	0	396	396
Sugarbeet	-4	-42	-45	-4	-44	-48
Cotton	1142	-365	777	1122	-383	739





		BASE			SCENARIO		
OILSEEDS	EU -116	ROW -1528	TOTAL -1644	EU -104	ROW -1603	TOTAL -1708	
Sesame	10	-197	-187	10	-207	-197	
Sunflower	-104	-280	-384	-114	-294	-408	
Groundnut	0	-20	-20	0	-21	-21	
Soybean	-22	-1032	-1054	0	-1082	-1082	
TUBERS	-8	64	56	-9.5	63.1	54	
Onion (Dry)	3	21	24	3	21	24	
Potato	-15	28	13	-17	28	11	
Onion (Fresh)	4	20	24	4	19		
Garlic (Dry)	0	-4	-4	0	-4		
Garlic (Fresh)	0	0	0	0	0		
VEGETABLES	154	263	417	153	262	415	
Melon	3	1	4	3	1	4	
Watermelon	5	0	5	5	0	5	
Cucumber	3	2	5	3	2	5	
Eggplant	1	1	1	1	1	1	
Fresh Tomato	50	57	108	50	57	107	
Processing Tomato	41	169	210	41	168	209	
Green Pepper	16	3	19	16	3	19	
Red Pepper	35	30	66	35	30	66	





Net Exports (Million USD)							
	BASE				SCENARIO		
	EU	ROW	TOTAL	EU	ROW	TOTAL	
GREENHOUSE PRODUCTS	437	584	1021	437	583	1020	
Fresh Bean	0	1	1	0	1	1	
Melon	0	0	1	0	0	1	
Watermelon	2	0	2	2	0	2	
Cucumber	44	43	88	44	43	87	
Eggplant	5	6	12	5	6	11	
Tomato	287	501	788	286	501	787	
Green Pepper	99	31	130	99	31	130	
FRUITS AND NUTS	3997	1871	5868	3985	1866	5851	
Apple	344	102	446	344	102	446	
Apricot	281	203	484	281	203	484	
Peach	0	30	29	0	29	29	
Table Olive	6	5	11	6	5	11	
Oil Olive	39	150	189	39	151	190	
Orange	10	128	138	10	127	137	
Grapefruit	42	38	80	42	38	80	
Lemon	77	189	266	77	187	264	
Mandarin	18	100	117	17	99	116	
Pistachio	36	27	62	36	27	63	
HazeInut	2472	418	2890	2463	415	2878	
Fig (Dry)	139	109	248	140	110	251	
Fig (Fresh)	0	0	0	0	0		
Table Grape	42	117	159	42	117	159	
Raisin Grape	307	149	456	304	148	452	
Теа	12	-6	7	12	-6	6	
Cherry	136	60	196	136	60	196	
Pomegranate	36	53	89	36	53	89	





Net Exports (Million USD)							
		BASE			SCENARIO		
	EU	ROW	TOTAL	EU	ROW	TOTAL	
LIVESTOCK & POUL.	-32	1486	1455	-35	1519	1484	
MEAT	-11	42	31	-12	36	24	
Cow Meat	-11	36	25	-12	36	24	
Sheep Meat	0	6	6	0	0	0	
Goat Meat	0	0	0	0	0	0	
MILK	-19	590	570	-21	628	607	
Cow Milk	-18	544	526	-20	583	563	
Sheep Milk	-1	27	26	-1	27	26	
Goat Milk	0	18	18	0	19	19	
POULTRY	-2	855	853	-2	855	853	
Poultry Meat	0	415	415	0	415	415	
Egg	-2	440	438	-2	440	438	
TOTAL	5362	3403	8765	5372	3287	8659	





Impacts on Agricultural Production




Production (Million USD)	/alue (scenario r					
volume (2014-10 prices) and v	B	ASE	SCE	SCENARIO		ANGE
	VALUE	VOLUME	VALUE	VOLUME	VALUE	VOLUME
CROP PRODUCTS	40244	40244	40255	39822	0.0%	-1.0%
CEREALS	10133	10133	10192	9866	0.6%	-2.6%
Common Wheat	5152	5152	5181	4991	0.6%	-3.1%
Durum Wheat	1117	1117	1116	1068	-0.1%	-4.4%
Barley	1785	1785	1841	1780	3.1%	-0.3%
Corn	1587	1587	1571	1556	-1.0%	-2.0%
Rice	356	356	344	335	-3.4%	-5.9%
Rye	136	136	140	136	3.2%	0.3%
PULSES	1683	1683	1683	1676	0.0%	-0.4%
Chickpea	503	503	500	503	-0.4%	0.0%
Drybean	317	317	316	314	-0.2%	-1.0%
Fresh Bean	587	587	588	586	0.2%	-0.1%
Lentil	276	276	278	274	0.7%	-0.9%
INDUSTRIAL CROPS	2875	2875	2898	2841	0.8%	-1.2%
Tobacco	387	387	441	442	14.1%	14.3%
Sugarbeet	1219	1219	1228	1202	0.8%	-1.4%
Cotton	1270	1270	1228	1198	-3.3%	-5.7%
OILSEEDS	1506	1506	1417	1405	-5.9%	-6.7%
Sesame	43	43	30	30	-29.8%	-29.9%
Sunflower	1182	1182	1133	1118	-4.2%	-5.4%
Groundnut	210	210	208	207	-0.7%	-1.2%
Soybean	70	70	46	49	-34.1%	-30.0%





Production (Million USD)						
Volume (2014-16 prices) and \	/alue (scenario p	rices)				
	B	ASE	SCE	NARIO	CH	ANGE
	VALUE	VOLUME	VALUE	VOLUME	VALUE	VOLUME
TUBERS	2602	2602	2611	2596	0.3%	-0.2%
Onion (Dry)	484	484	487	483	0.6%	-0.2%
Potato	1798	1798	1803	1794	0.3%	-0.2%
Onion (Fresh)	109	109	109	109	0.3%	-0.3%
Garlic (Dry)	185	185	186	185	0.1%	-0.2%
Garlic (Fresh)	26	26	26	26	0.5%	-0.2%
VEGETABLES	3779	3779	3793	3773	0.4%	-0.2%
Melon	539	539	540	538	0.3%	-0.1%
Watermelon	427	427	428	426	0.3%	-0.1%
Cucumber	128	128	129	128	0.8%	-0.3%
Eggplant	113	113	115	112	1.5%	-0.7%
Fresh Tomato	824	824	827	823	0.4%	-0.1%
Processing Tomato	751	751	753	749	0.3%	-0.2%
Green Pepper	185	185	186	184	0.9%	-0.4%
Red Pepper	813	813	814	812	0.2%	-0.1%





Production (Million USD)	o (cooperie -	ricoc)				
volume (2014-16 prices) and valu	e (scenario p	nces)	SCE		CHI	NGE
	VALUE	VOLUME	VALUE	VOLUME	VALUE	VOLUME
GREENHOUSE PRODUCTS	5188	5188	5188	5186	0.0%	0.0%
Fresh Bean	80	80	80	80	-0.1%	0.2%
Melon	123	123	123	123	0.0%	0.0%
Watermelon	297	297	297	298	-0.1%	0.2%
Cucumber	773	773	773	773	0.0%	0.0%
Eggplant	129	129	129	128	0.2%	-0.4%
Tomato	3034	3034	3035	3033	0.0%	0.0%
Green Pepper	752	752	752	752	0.0%	-0.1%
FRUITS AND NUTS	12478	12478	12472	12477	0.0%	0.0%
Apple	1226	1226	1226	1226	0.0%	0.0%
Apricot	521	521	521	521	0.0%	-0.1%
Peach	421	421	421	421	0.0%	0.0%
Table Olive	650	650	647	653	-0.4%	0.4%
Oil Olive	1517	1517	1514	1528	-0.2%	0.8%
Orange	405	405	407	404	0.6%	-0.3%
Grapefruit	47	47	47	46	0.3%	-0.4%
Lemon	323	323	323	321	0.1%	-0.5%
Mandarin	274	274	275	273	0.5%	-0.3%
Pistachio	912	912	911	913	-0.2%	0.1%
Hazelnut	2285	2285	2283	2276	-0.1%	-0.4%
Fig (Dry)	351	351	352	354	0.1%	0.6%
Fig (Fresh)	86	86	86	86	-0.1%	0.0%
Table Grape	1297	1297	1296	1297	0.0%	0.0%
Raisin Grape	477	477	475	473	-0.4%	-0.9%
Теа	806	806	806	804	0.0%	-0.2%
Cherry	721	721	721	721	0.0%	0.0%
Pomegranate	161	161	161	161	0.0%	0.0%





Production (Million USD)						
Volume (2014-16 prices) and V	alue (scenario p	rices)				
	BA	ASE	SCE	NARIO	CH	ANGE
	VALUE	VOLUME	VALUE	VOLUME	VALUE	VOLUME
LIVESTOCK & POUL.	23041	23041	23034	23029	0.0%	-0.1%
MEAT	9017	9017	9016	9011	0.0%	-0.1%
Cow Meat	8012	8012	8014	8010	0.0%	0.0%
Sheep Meat	775	775	769	767	-0.7%	-1.0%
Goat Meat	231	231	233	234	1.0%	1.3%
MILK	8642	8642	8638	8637	-0.1%	-0.1%
Cow Milk	7385	7385	7383	7383	0.0%	0.0%
Sheep Milk	902	902	895	893	-0.8%	-1.0%
Goat Milk	355	355	359	360	1.1%	1.3%
POULTRY	5381	5381	5380	5381	0.0%	0.0%
Poultry Meat	3449	3449	3444	3449	-0.1%	0.0%
Egg	1933	1933	1936	1933	0.2%	0.0%
TOTAL	63285	63285	63289	62850	0.0%	-0.7%





Impacts on Prices





Prices of Selected Products	(USD/Ton)		
Laspeyres Index for Groups			
BASE=100	BASE	SCENARIO	CHANGE (%)
CROP PRODUCTS	100.0	100.7	0.7%
CEREALS	100.0	103.1	3.1%
Common Wheat	302	314	3.8%
Durum Wheat	304	318	4.5%
Barley	255	264	3.4%
Corn	254	256	1.0%
Rice	667	685	2.7%
Rye	252	259	2.9%
PULSES	100.0	100.4	0.4%
Chickpea	1,105	1,100	-0.4%
Drybean	1,388	1,399	0.8%
Fresh Bean	918	921	0.4%
Lentil	774	786	1.6%
INDUSTRIAL CROPS	100.0	102.1	2.1%
Tobacco	5,457	5,449	-0.1%
Sugarbeet	70	72	2.2%
Cotton	586	601	2.6%





Prices of Selected Products	(USD/Ton)		
Laspeyres Index for Groups			
BASE=100	BASE	SCENARIO	CHANGE (%)
OILSEEDS	100.0	98.4	-1.6%
Sesame	2,298	2,302	0.2%
Sunflower	711	720	1.3%
Groundnut	1,447	1,454	0.5%
Soybean	444	418	-5.9%
TUBERS	100.0	100.6	0.6%
Onion (Dry)	251	253	0.8%
Potato	394	396	0.5%
Onion (Fresh)	771	776	0.6%
Garlic (Dry)	1,885	1,891	0.3%
Garlic (Fresh)	1,025	1,032	0.7%
VEGETABLES	100.0	100.5	0.5%
Melon	270	271	0.4%
Watermelon	133	134	0.5%
Cucumber	176	178	1.1%
Eggplant	210	215	2.2%
Fresh Tomato	178	179	0.5%
Processing Tomato	182	183	0.5%
Green Pepper	219	222	1.2%
Red Pepper	742	744	0.3%





Prices of Selected Products	(USD/Ton)		
Laspeyres Index for Groups			
BASE=100	BASE	SCENARIO	CHANGE (%)
GREENHOUSE PRODUCTS	100.0	100.0	0.0%
Fresh Bean	1,744	1,740	-0.2%
Melon	741	741	-0.1%
Watermelon	424	423	-0.3%
Cucumber	717	717	0.0%
Eggplant	442	445	0.7%
Tomato	843	843	0.0%
Green Pepper	1,252	1,253	0.1%
FRUITS AND NUTS	100.0	99.8	-0.2%
Apple	461	461	0.0%
Apricot	931	932	0.1%
Peach	656	656	0.1%
Table Olive	1,537	1,524	-0.8%
Oil Olive	1,158	1,147	-0.9%
Orange	223	225	0.8%
Grapefruit	191	192	0.7%
Lemon	416	419	0.7%
Mandarin	232	234	0.9%
Pistachio	6,951	6,930	-0.3%
HazeInut	4,523	4,537	0.3%
Fig (Dry)	3,403	3,384	-0.6%
Fig (Fresh)	1,096	1,095	-0.1%
Table Grape	643	643	-0.1%
Raisin Grape	1,517	1,524	0.5%
Теа	613	615	0.3%
Cherry	1,368	1,369	0.1%
Pomegranate	369	369	0.1%





Prices of Selected Products	(USD/Ton)		
Laspeyres Index for Groups			
BASE=100	BASE	SCENARIO	CHANGE (%)
LIVESTOCK & POUL.	100.0	100.0	0.0%
MEAT	100.0	100.1	0.1%
Cow Meat	8,138	8,141	0.0%
Sheep Meat	8,181	8,207	0.3%
Goat Meat	7,519	7,498	-0.3%
MILK	100.0	100.0	0.0%
Cow Milk	437	437	0.0%
Sheep Milk	788	790	0.2%
Goat Milk	758	756	-0.3%
POULTRY	100.0	100.0	0.0%
Poultry Meat	1,820	1,817	-0.1%
Egg	1,787	1,790	0.2%
TOTAL	100.0	100.4	0.4%





Regional Impacts





Production Changes					
	CHANGE				
	Coastal	Central	Eastern	GAP	
CROP PRODUCTS					
Common Wheat	-18%	-1%	0%	23%	
Durum Wheat	-3%	-2%	-1%	-8%	
Barley	35%	-6%	0%	-13%	
Corn	7%	1%	-1%	-22%	
Rice	-6%	-7%	-4%	-30%	
Rye	-11%	6%	0%	26%	
PULSES					
Chickpea	17%	-8%	0%	-6%	
Drybean	-30%	3%	0%	-2%	
Fresh Bean	9%	-27%	0%	-26%	
Lentil	-15%	35%	0%	-3%	
INDUSTRIAL CROPS					
Tobacco	22%	-7%	0%	-4%	
Sugarbeet	-30%	1%	0%	-30%	
Cotton	12%	17%	-1%	-19%	





Production Changes						
	CHANGE					
	Coastal	Central	Eastern	GAP		
OILSEEDS						
Sesame	-30%	-30%	-1%	-30%		
Sunflower	-17%	16%	-1%	-15%		
Groundnut	-1%	-20%		-24%		
Soybean	-30%	-30%		-30%		
TUBERS						
Onion (Dry)	50%	-25%	-3%	-30%		
Potato	-30%	9%	1%	85%		
Onion (Fresh)	-28%	36%	-1%	-29%		
Garlic (Dry)	6%	2%	-1%	-20%		
Garlic (Fresh)	-30%	-30%	-4%	55%		
VEGETABLES						
Melon	-30%	28%	2%	10%		
Watermelon	12%	-8%	-1%	-30%		
Cucumber	1%	10%	0%	-30%		
Eggplant	-8%	74%	-3%	-30%		
Fresh Tomato	4%	-11%	0%	9%		
Processing Tomato	3%	-11%	-3%	-30%		
Green Pepper	7%	-13%	-1%	-30%		
Red Pepper	18%	-30%	0%	-30%		





Production Changes				
		CH	ANGE	
	Coastal	Central	Eastern	GAP
GREENHOUSE PRODUCTS				
Fresh Bean	0%	-30%		
Melon	0%			
Watermelon	0%			
Cucumber	3%	-30%	-30%	6%
Eggplant	0%			-30%
Tomato	-1%	13%	60%	
Green Pepper	-1%	101%		
FRUITS AND NUTS				
Apple	-4%	4%	12%	-23%
Apricot	14%	3%	-8%	-30%
Peach	0%	0%	-3%	-28%
Table Olive	0%	8%		-8%
Oil Olive	1%	14%		-9%
Orange	0%	-30%		
Grapefruit	0%			
Lemon	-1%	-30%		
Mandarin	0%	-30%		
Pistachio	-18%	20%	-30%	0%
Hazelnut	-1%	2%	-6%	
Fig (Dry)	1%			
Fig (Fresh)	2%	-16%	-30%	-10%
Table Grape	-4%	-4%	45%	11%
Raisin Grape	0%	-19%	-30%	8%
Теа	0%			
Cherry	2%	-3%	19%	-28%
Pomegranate	4%	4%	13%	-29%





%20 Increase in GAP's Irrigated Land

Simulation 4





General Impacts



	Base	SIMULATION	CHANGE
Total Surplus (Index)	100.0	100.2	0.2%
Producer Sumhus	100.0	100.2	0.2%
Consumer Surplus	100.0	100.6	0.6%
Total Production			10.116.400 A
Volume (with Base Period Prices)	63,285	63,500	0.3%
Value	63,285	63,070	-0.3%
Crop Production			
Volume (with Base Period Prices)	40,244	40,458	0.5%
Value	40,244	40,036	-0.5%
Livestock Production			
Volume (with Base Period Prices)	23,041	23,042	0.0%
Value	23,041	23,034	0.0%
Total Consumption			
Volume (with Base Period Prices)	54,198	54,380	0.3%
Value	54,198	54,020	-0.3%
Crop Consumption			
Volume (with Base Period Prices)	32,473	32.648	0.5%
Value	32,473	32,296	-0.5%
Livestock Consumption		and a standard	
Volume (with Base Period Prices)	21,725	21,732	0.0%
Value	21,725	21,724	0.0%
Net Exports	8 765	8 041	2.0%
Cron Products	7 311	7 456	2.0%
Livestaal Products	1 455	1 485	2.078
Livestock Floducts	1,455	1,405	2.170
Price Index (Laspeyres)	100.0	99.3	-0.7%
Crop Products	100.0	98.9	-1.1%
Livestock Products	100.0	100.0	0.0%





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Impacts on Foreign Trade





Net Exports (Million USD)						
		BASE			SCENARIO	
	EU	ROW	TOTAL	EU	ROW	TOTAL
CROP PRODUCTS	5394	1917	7311	5598	1858	7456
CEREALS	-173	737	564	-173	736	563
Common Wheat	-61	667	605	-69	672	603
Durum Wheat	-6	237	231	-7	240	233
Barley	-15	-21	-36	0	-22	-22
Corn	-58	-74	-132	-61	-75	-137
Rice	-32	-71	-104	-36	-79	-114
Rye	0	0	0	0	0	0
PULSES	18	-63	-44	18	-66	-47
Chickpea	13	-13	0	13	-14	0
Drybean	2	-36	-33	2	-37	-35
Freash Bean	0	3	2	0	3	
Lentil	3	-16	-14	3	-17	-14
INDUSTRIAL CROPS	1085	-12	1073	1143	-42	1101
Tobacco	-54	395	341	0	395	395
Sugarbeet	-4	-42	-45	-4	-45	-49
Cotton	1142	-365	777	1147	-392	755
OILSEEDS	-116	-1528	-1644	-105	-1616	-1721
Sesame	10	-197	-187	10	-204	-194
Sunflower	-104	-280	-384	-115	-309	-423
Groundnut	0	-20	-20	0	-21	-21
Soybean	-22	-1032	-1054	0	-1082	-1082





let Exports (Million USD)						
		BASE			CENARI	0
	EU	ROW	TOTAL	EU	ROW	TOTAL
TUBERS	-8	64	56	-8.7	64.2	55
Onion (Dry)	3	21	24	3	21	24
Potato	-15	28	13	-16	28	12
Onion (Fresh)	4	20	24	4	20	
Garlic (Dry)	0	-4	-4	0	-4	
Garlic (Fresh)	0	0	0	0	0	
VEGETABLES	154	263	417	154	264	418
Melon	3	1	4	3	1	4
Watermelon	5	0	5	5	0	5
Cucumber	3	2	5	3	2	5
Eggplant	1	1	1	1	1	1
Fresh Tomato	50	57	108	50	57	108
Processing Tomato	41	169	210	41	169	210
Green Pepper	16	3	19	16	3	19
Red Pepper	35	30	66	35	31	66
GREENHOUSE PRODUCTS	437	584	1021	437	584	1021
Fresh Bean	0	1	1	0	1	1
Melon	0	0	1	0	0	1
Watermelon	2	0	2	2	0	2
Cucumber	44	43	88	44	43	88
Eggplant	5	6	12	5	6	12
Tomato	287	501	788	287	501	788
Green Pepper	99	31	130	99	31	130





let Exports (Million USD)						
		BASE			SCENARIO	
	EU	ROW	TOTAL	EU	ROW	TOTAL
FRUITS AND NUTS	3997	1871	5868	4132	1934	6066
Apple	344	102	446	349	104	453
Apricot	281	203	484	284	207	491
Peach	0	30	29	0	30	30
Table Olive	6	5	11	6	5	11
Oil Olive	39	150	189	40	156	195
Orange	10	128	138	10	129	139
Grapefruit	42	38	80	43	38	81
Lemon	77	189	266	78	191	269
Mandarin	18	100	117	18	101	119
Pistachio	36	27	62	38	28	66
Hazelnut	2472	418	2890	2572	444	3016
Fig (Dry)	139	109	248	145	114	258
Fig (Fresh)	0	0	0	0	0	
Table Grape	42	117	159	43	121	164
Raisin Grape	307	149	456	322	155	477
Теа	12	-6	7	12	-6	6
Cherry	136	60	196	137	62	199
Pomegranate	36	53	89	36	54	91





Net Exports (Million USD)						
		BASE			SCENARI	0
	EU	ROW	TOTAL	EU	ROW	TOTAL
LIVESTOCK & POUL.	-32	1486	1455	-35	1520	1485
MEAT	-11	42	31	-12	36	24
Cow Meat	-11	36	25	-12	36	24
Sheep Meat	0	6	6	0	0	0
Goat Meat	0	0	0	0	0	0
MILK	-19	590	570	-20	629	609
Cow Milk	-18	544	526	-19	583	564
Sheep Milk	-1	27	26	-1	27	26
Goat Milk	0	18	18	0	19	18
POULTRY	-2	855	853	-2	855	853
Poultry Meat	0	415	415	0	415	415
Egg	-2	440	438	-2	440	438
TOTAL	5362	3403	8765	5563	3378	8941





Impacts on Agricultural Products





Production (Million USD)						
Volume (2014-16 prices) and V	alue (scenario p	rices)				
	B	ASE	SCE	NARIO	CHANGE	
	VALUE	VOLUME	VALUE	VOLUME	VALUE	VOLUME
CROP PRODUCTS	40244	40244	40036	40458	-0.5%	0.5%
CEREALS	10133	10133	10103	10190	-0.3%	0.6%
Common Wheat	5152	5152	5123	5171	-0.6%	0.4%
Durum Wheat	1117	1117	1114	1127	-0.2%	0.9%
Barley	1785	1785	1818	1834	1.8%	2.7%
Corn	1587	1587	1573	1581	-0.9%	-0.4%
Rice	356	356	340	342	-4.4%	-4.0%
Rye	136	136	135	136	-0.5%	0.4%
PULSES	1683	1683	1677	1680	-0.3%	-0.1%
Chickpea	503	503	501	503	-0.3%	0.0%
Drybean	317	317	314	315	-0.8%	-0.5%
Fresh Bean	587	587	586	587	-0.1%	0.0%
Lentil	276	276	275	275	-0.4%	-0.3%
INDUSTRIAL CROPS	2875	2875	2869	2880	-0.2%	0.2%
Tobacco	387	387	441	442	14.1%	14.2%
Sugarbeet	1219	1219	1203	1207	-1.3%	-1.0%
Cotton	1270	1270	1224	1232	-3.6%	-3.0%
OILSEEDS	1506	1506	1404	1413	-6.8%	-6.1%
Sesame	43	43	34	34	-20.1%	-19.7%
Sunflower	1182	1182	1115	1121	-5.7%	-5.2%
Groundnut	210	210	208	208	-1.1%	-0.9%
Sovbean	70	70	47	49	-33.9%	-29.8%





Production (Million USD)						
Volume (2014-16 prices) and Valu	ie (scenario p	rices)				
	BA	BASE		NARIO	CHANGE	
	VALUE	VOLUME	VALUE	VOLUME	VALUE	VOLUME
TUBERS	2602	2602	2599	2602	-0.1%	0.0%
Onion (Dry)	484	484	484	485	-0.1%	0.0%
Potato	1798	1798	1795	1797	-0.1%	0.0%
Onion (Fresh)	109	109	109	109	0.0%	0.1%
Garlic (Dry)	185	185	185	185	-0.1%	-0.1%
Garlic (Fresh)	26	26	26	26	-0.1%	0.0%
VEGETABLES	3779	3779	3775	3780	-0.1%	0.0%
Melon	539	539	538	539	-0.1%	0.0%
Watermelon	427	427	426	427	-0.2%	0.1%
Cucumber	128	128	128	128	-0.2%	0.1%
Eggplant	113	113	113	113	-0.2%	0.1%
Fresh Tomato	824	824	823	824	-0.1%	0.0%
Processing Tomato	751	751	751	751	-0.1%	0.0%
Green Pepper	185	185	184	185	-0.2%	0.1%
Red Pepper	813	813	812	813	0.0%	0.0%
GREENHOUSE PRODUCTS	5188	5188	5188	5188	0.0%	0.0%
Fresh Bean	80	80	80	80	0.0%	0.0%
Melon	123	123	123	123	0.0%	0.0%
Watermelon	297	297	297	297	0.0%	0.0%
Cucumber	773	773	773	773	0.0%	0.0%
Eggplant	129	129	129	129	0.0%	0.0%
Tomato	3034	3034	3034	3034	0.0%	0.0%
Green Pepper	752	752	752	752	0.0%	0.0%





Production (Million USD)						
Volume (2014-16 prices) and V	alue (scenario p	rices)				
	BA	ASE	SCE	NARIO	CHA	ANGE
	VALUE	VOLUME	VALUE	VOLUME	VALUE	VOLUME
FRUITS AND NUTS	12478	12478	12421	12724	-0.5%	2.0%
Apple	1226	1226	1218	1233	-0.6%	0.6%
Apricot	521	521	522	527	0.1%	1.1%
Peach	421	421	418	422	-0.7%	0.3%
Table Olive	650	650	638	661	-1.8%	1.8%
Oil Olive	1517	1517	1503	1566	-0.9%	3.3%
Orange	405	405	401	407	-1.0%	0.4%
Grapefruit	47	47	46	47	-0.6%	0.9%
Lemon	323	323	322	325	-0.2%	0.7%
Mandarin	274	274	271	276	-1.0%	0.7%
Pistachio	912	912	891	929	-2.2%	1.9%
Hazelnut	2285	2285	2302	2377	0.7%	4.0%
Fig (Dry)	351	351	352	361	0.3%	2.8%
Fig (Fresh)	86	86	85	86	-0.4%	0.2%
Table Grape	1297	1297	1287	1312	-0.7%	1.2%
Raisin Grape	477	477	486	498	1.9%	4.5%
Теа	806	806	801	809	-0.6%	0.4%
Cherry	721	721	716	725	-0.6%	0.5%
Pomegranate	161	161	160	163	-0.9%	1.0%





Production (Million USD)						
Volume (2014-16 prices) and V	alue (scenario p	rices)				
	BA	ASE	SCE	NARIO	СНА	ANGE
	VALUE	VOLUME	VALUE	VOLUME	VALUE	VOLUME
LIVESTOCK & POUL.	23041	23041	23034	23042	0.0%	0.0%
MEAT	9017	9017	9015	9018	0.0%	0.0%
Cow Meat	8012	8012	8013	8016	0.0%	0.0%
Sheep Meat	775	775	769	769	-0.7%	-0.7%
Goat Meat	231	231	233	233	1.1%	1.0%
MILK	8642	8642	8639	8643	0.0%	0.0%
Cow Milk	7385	7385	7385	7388	0.0%	0.0%
Sheep Milk	902	902	895	896	-0.8%	-0.7%
Goat Milk	355	355	359	359	1.1%	1.0%
POULTRY	5381	5381	5380	5381	0.0%	0.0%
Poultry Meat	3449	3449	3444	3449	-0.1%	0.0%
Egg	1933	1933	1936	1933	0.2%	0.0%
TOTAL	63285	63285	63070	63500	-0.3%	0.3%





Impacts on Prices





Prices of Selected Products	(USD/Ton)		
Laspeyres Index for Groups			
BASE=100	BASE	SCENARIO	CHANGE (%)
CROP PRODUCTS	100.0	98.9	-1.1%
CEREALS	100.0	99.2	-0.8%
Common Wheat	302	299	-0.9%
Durum Wheat	304	301	-1.1%
Barley	255	253	-0.9%
Corn	254	253	-0.5%
Rice	667	664	-0.4%
Rye	252	250	-0.9%
PULSES	100.0	99.8	-0.2%
Chickpea	1,105	1,101	-0.3%
Drybean	1,388	1,383	-0.3%
Fresh Bean	918	917	-0.1%
Lentil	774	773	-0.1%
INDUSTRIAL CROPS	100.0	99.6	-0.4%
Tobacco	5,457	5,453	-0.1%
Sugarbeet	70	70	-0.3%
Cotton	586	582	-0.6%
OILSEEDS	100.0	97.4	-2.6%
Sesame	2,298	2,286	-0.5%
Sunflower	711	707	-0.5%
Groundnut	1,447	1,444	-0.2%
Sovbean	444	418	-5.9%





Prices of Selected Products	(USD/Ton)		
Laspeyres Index for Groups			
BASE=100	BASE	SCENARIO	CHANGE (%)
TUBERS	100.0	99.9	-0.1%
Onion (Dry)	251	251	-0.1%
Potato	394	394	-0.1%
Onion (Fresh)	771	770	-0.1%
Garlic (Dry)	1,885	1,884	-0.1%
Garlic (Fresh)	1,025	1,024	-0.1%
VEGETABLES	100.0	99.9	-0.1%
Melon	270	270	-0.1%
Watermelon	133	133	-0.2%
Cucumber	176	175	-0.3%
Eggplant	210	210	-0.2%
Fresh Tomato	178	178	-0.1%
Processing Tomato	182	182	-0.1%
Green Pepper	219	218	-0.3%
Red Pepper	742	742	-0.1%
GREENHOUSE PRODUCTS	100.0	100.0	0.0%
Fresh Bean	1,744	1,744	0.0%
Melon	741	741	0.0%
Watermelon	424	424	0.0%
Cucumber	717	717	0.0%
Eggplant	442	442	0.0%
Tomato	843	843	0.0%
Green Pepper	1.252	1.252	0.0%





Prices of Selected Products	(USD/Ton)		
Laspeyres Index for Groups			
BASE=100	BASE	SCENARIO	CHANGE (%)
FRUITS AND NUTS	100.0	97.7	-2.3%
Apple	461	456	-1.2%
Apricot	931	921	-1.0%
Peach	656	649	-1.1%
Table Olive	1,537	1,483	-3.5%
Oil Olive	1,158	1,111	-4.0%
Orange	223	220	-1.4%
Grapefruit	191	188	-1.4%
Lemon	416	412	-0.9%
Mandarin	232	228	-1.7%
Pistachio	6,951	6,669	-4.1%
Hazelnut	4,523	4,380	-3.2%
Fig (Dry)	3,403	3,318	-2.5%
Fig (Fresh)	1,096	1,089	-0.6%
Table Grape	643	631	-1.8%
Raisin Grape	1,517	1,480	-2.4%
Теа	613	607	-1.0%
Cherry	1,368	1,352	-1.1%
Pomegranate	369	362	-1.8%





Prices of Selected Products	(USD/Ton)		
Laspeyres Index for Groups			
BASE=100	BASE	SCENARIO	CHANGE (%)
LIVESTOCK & POUL.	100.0	100.0	0.0%
MEAT	100.0	100.0	0.0%
Cow Meat	8,138	8,135	0.0%
Sheep Meat	8,181	8,182	0.0%
Goat Meat	7,519	7,522	0.0%
MILK	100.0	100.0	0.0%
Cow Milk	437	437	0.0%
Sheep Milk	788	787	-0.1%
Goat Milk	758	758	0.1%
POULTRY	100.0	100.0	0.0%
Poultry Meat	1,820	1,817	-0.1%
Egg	1,787	1,790	0.2%
TOTAL	100.0	99.3	-0.7%





Regional Impacts





Production Changes					
	CHANGE				
	Coastal	Central	Eastern	GAP	
CROP PRODUCTS					
Common Wheat	-1%	0%	0%	3%	
Durum Wheat	9%	-3%	0%	4%	
Barley	17%	1%	0%	-4%	
Corn	-8%	-4%	-1%	17%	
Rice	-5%	-4%	0%	34%	
Rye	2%	0%	0%	-18%	
PULSES					
Chickpea	10%	-3%	0%	-12%	
Drybean	35%	-6%	0%	21%	
Fresh Bean	0%	0%	0%	33%	
Lentil	37%	3%	0%	-1%	
INDUSTRIAL CROPS					
Tobacco	22%	0%	0%	-9%	
Sugarbeet	10%	-2%	0%	16%	
Cotton	-28%	-4%	-1%	15%	
OILSEEDS					
Sesame	-22%	-8%	0%	-18%	
Sunflower	-8%	-1%	0%	30%	
Groundnut	-1%	1%		20%	
Soybean	-30%	-27%		-26%	





Production Changes					
	CHANGE				
	Coastal	Central	Eastern	GAP	
TUBERS					
Onion (Dry)	6%	-5%	0%	34%	
Potato	10%	-3%	-1%	24%	
Onion (Fresh)	4%	-8%	-1%	20%	
Garlic (Dry)	-2%	-4%	-1%	12%	
Garlic (Fresh)	2%	-3%	-1%	0%	
VEGETABLES					
Melon	3%	-6%	-1%	10%	
Watermelon	-10%	3%	-1%	30%	
Cucumber	-3%	-5%	-1%	23%	
Eggplant	-4%	-2%	-1%	18%	
Fresh Tomato	-4%	0%	0%	31%	
Processing Tomato	-3%	6%	0%	33%	
Green Pepper	-3%	0%	0%	32%	
Red Pepper	-15%	3%	0%	28%	
GREENHOUSE PRODUCTS					
Fresh Bean	0%	0%			
Melon	0%				
Watermelon	0%				
Cucumber	0%	0%	0%	0%	
Eggplant	0%			0%	
Tomato	0%	0%	0%		
Green Pepper	0%	0%			





Production Changes						
		CHANGE				
	Coastal	Central	Eastern	GAP		
FRUITS AND NUTS						
Apple	-1%	2%	-12%	136%		
Apricot	-26%	39%	6%	107%		
Peach	1%	-3%	-25%	93%		
Table Olive	0%	-1%		110%		
Oil Olive	-4%	33%		106%		
Orange	0%	-27%				
Grapefruit	1%					
Lemon	1%	23%				
Mandarin	1%	-25%				
Pistachio	-27%	-25%	-26%	4%		
Hazelnut	9%	-27%	-25%			
Fig (Dry)	3%					
Fig (Fresh)	-13%	-27%	-25%	128%		
Table Grape	-28%	23%	-26%	91%		
Raisin Grape	-16%	14%	17%	119%		
Теа	0%					
Cherry	20%	-29%	-27%	116%		
Pomegranate	-14%	-24%	-30%	113%		





%20 Increase in GAP and Central Anatolia's Irrigated Land

Simulation 5




General Impacts



	Base	SIMULATION	CHANGE
Total Surplus (Index)	100.0	100.3	0.3%
Producer Sumlus	100.0	100.2	0.2%
Consumer Surplus	100.0	101.4	1.4%
Total Production			
Volume (with Base Period Prices)	63,285	64,200	1.4%
Value	63,285	62,984	-0.5%
Crop Production			
Volume (with Base Period Prices)	40,244	41,155	2.3%
Value	40,244	39,951	-0.7%
Livestock Production			
Volume (with Base Period Prices)	23,041	23,045	0.0%
Value	23,041	23,033	0.0%
Total Consumption			
Volume (with Base Period Prices)	54,198	54,639	0.8%
Value	54,198	53,769	-0.8%
Crop Consumption			
Volume (with Base Period Prices)	32,473	32,905	1.3%
Value	32,473	32,046	-1.3%
Livestock Consumption			
Volume (with Base Period Prices)	21,725	21,734	0.0%
Value	21,725	21,723	0.0%
Net Exports	8,765	9,324	6.4%
Crop Products	7,311	7,838	7.2%
Livestock Products	1,455	1,486	2.1%
Price Index (Laspeyres)	100.0	98.4	-1.6%
Crop Products	100.0	97.4	-2.6%
Livestock Products	100.0	99.9	-0.1%







Impacts on Foreign Trade





Net Exports (Million USD)					_		
		BASE			SCENARIO		
	EU	ROW	TOTAL	EU	ROW	TOTAL	
CROP PRODUCTS	5394	1917	7311	5898	1940	7838	
CEREALS	-173	737	564	-97	742	645	
Common Wheat	-61	667	605	0	676	676	
Durum Wheat	-6	237	231	0	242	242	
Barley	-15	-21	-36	0	-22	-22	
Corn	-58	-74	-132	-61	-75	-137	
Rice	-32	-71	-104	-36	-79	-114	
Rye	0	0	0	0	0	0	
PULSES	18	-63	-44	18	-66	-47	
Chickpea	13	-13	0	14	-14	0	
Drybean	2	-36	-33	2	-37	-35	
Freash Bean	0	3	2	0	3		
Lentil	3	-16	-14	3	-17	-14	
INDUSTRIAL CROPS	1085	-12	1073	1146	-42	1104	
Tobacco	-54	395	341	0	396	396	
Sugarbeet	-4	-42	-45	-4	-45	-49	
Cotton	1142	-365	777	1149	-392	757	
OILSEEDS	-116	-1528	-1644	-105	-1616	-1721	
Sesame	10	-197	-187	10	-204	-194	
Sunflower	-104	-280	-384	-115	-309	-423	
Groundnut	0	-20	-20	0	-21	-21	
Sovbean	-22	-1032	-1054	0	-1082	-1082	





Net Exports (Million USD)						
	BASE		SCENARIO		0	
	EU	ROW	TOTAL	EU	ROW	TOTAL
TUBERS	-8	64	56	-8.7	64.3	56
Onion (Dry)	3	21	24	3	21	24
Potato	-15	28	13	-16	28	12
Onion (Fresh)	4	20	24	4	20	
Garlic (Dry)	0	-4	-4	0	-4	
Garlic (Fresh)	0	0	0	0	0	
VEGETABLES	154	263	417	154	264	418
Melon	3	1	4	3	1	4
Watermelon	5	0	5	5	0	5
Cucumber	3	2	5	3	2	5
Eggplant	1	1	1	1	1	1
Fresh Tomato	50	57	108	50	57	108
Processing Tomato	41	169	210	41	169	210
Green Pepper	16	3	19	16	3	19
Red Pepper	35	30	66	35	31	66
GREENHOUSE PRODUCTS	437	584	1021	442	589	1031
Fresh Bean	0	1	1	0	1	1
Melon	0	0	1	0	0	1
Watermelon	2	0	2	2	0	2
Cucumber	44	43	88	45	44	88
Eggplant	5	6	12	5	7	12
Tomato	287	501	788	290	506	795
Green Pepper	99	31	130	100	32	132





et Exports (Million USD)						
		BASE			CENARI	0
	EU	ROW	TOTAL	EU	ROW	TOTAL
FRUITS AND NUTS	3997	1871	5868	4349	2003	6352
Apple	344	102	446	365	112	476
Apricot	281	203	484	297	222	519
Peach	0	30	29	0	31	31
Table Olive	6	5	11	6	5	11
Oil Olive	39	150	189	41	163	204
Orange	10	128	138	10	132	142
Grapefruit	42	38	80	44	39	83
Lemon	77	189	266	80	195	275
Mandarin	18	100	117	18	104	122
Pistachio	36	27	62	38	28	67
Hazelnut	2472	418	2890	2720	455	3175
Fig (Dry)	139	109	248	153	115	268
Fig (Fresh)	0	0	0	0	0	
Table Grape	42	117	159	47	129	176
Raisin Grape	307	149	456	341	155	496
Теа	12	-6	7	12	0	12
Cherry	136	60	196	140	64	204
Pomegranate	36	53	89	37	55	92





Net Exports (Million USD)						
		BASE			SCENARI	0
	EU	ROW	TOTAL	EU	ROW	TOTAL
LIVESTOCK & POUL.	-32	1486	1455	-35	1520	1486
MEAT	-11	42	31	-12	36	24
Cow Meat	-11	36	25	-12	36	24
Sheep Meat	0	6	6	0	0	0
Goat Meat	0	0	0	0	0	0
MILK	-19	590	570	-20	629	609
Cow Milk	-18	544	526	-19	584	564
Sheep Milk	-1	27	26	-1	27	26
Goat Milk	0	18	18	0	19	18
POULTRY	-2	855	853	-2	855	853
Poultry Meat	0	415	415	0	415	415
Egg	-2	440	438	-2	440	438
TOTAL	5362	3403	8765	5864	3460	9324





Impacts on Agricultural Production





Production (Million USD)						
Volume (2014-16 prices) and V	/alue (scenario p	rices)				
	BA	ASE	SCE	NARIO	CH	ANGE
	VALUE	VOLUME	VALUE	VOLUME	VALUE	VOLUME
CROP PRODUCTS	40244	40244	39951	41155	-0.7%	2.3%
CEREALS	10133	10133	10280	10440	1.4%	3.0%
Common Wheat	5152	5152	5301	5386	2.9%	4.5%
Durum Wheat	1117	1117	1132	1154	1.4%	3.4%
Barley	1785	1785	1802	1835	0.9%	2.8%
Corn	1587	1587	1570	1585	-1.1%	-0.1%
Rice	356	356	341	343	-4.4%	-3.7%
Rye	136	136	134	136	-1.1%	0.4%
PULSES	1683	1683	1674	1682	-0.5%	0.0%
Chickpea	503	503	500	503	-0.5%	0.1%
Drybean	317	317	313	316	-1.2%	-0.3%
Fresh Bean	587	587	586	587	-0.1%	0.0%
Lentil	276	276	274	275	-0.6%	-0.2%
INDUSTRIAL CROPS	2875	2875	2865	2888	-0.3%	0.4%
Tobacco	387	387	441	442	14.1%	14.3%
Sugarbeet	1219	1219	1199	1209	-1.6%	-0.8%
Cotton	1270	1270	1225	1237	-3.5%	-2.6%
OILSEEDS	1506	1506	1406	1421	-6.6%	-5.6%
Sesame	43	43	34	35	-19.4%	-18.7%
Sunflower	1182	1182	1118	1129	-5.5%	-4.6%
Groundnut	210	210	208	209	-1.1%	-0.7%
Soybean	70	70	47	49	-33.9%	-29.8%





Production (Million USD)							
Volume (2014-16 prices) and Valu	e (scenario p	rices)					
	BA	ASE	SCE	SCENARIO		CHANGE	
	VALUE	VOLUME	VALUE	VOLUME	VALUE	VOLUME	
TUBERS	2602	2602	2597	2603	-0.2%	0.0%	
Onion (Dry)	484	484	483	485	-0.2%	0.1%	
Potato	1798	1798	1794	1798	-0.2%	0.0%	
Onion (Fresh)	109	109	109	109	-0.1%	0.1%	
Garlic (Dry)	185	185	185	185	-0.2%	-0.1%	
Garlic (Fresh)	26	26	26	26	-0.2%	0.0%	
VEGETABLES	3779	3779	3772	3781	-0.2%	0.1%	
Melon	539	539	538	539	-0.2%	0.0%	
Watermelon	427	427	426	427	-0.3%	0.1%	
Cucumber	128	128	128	128	-0.4%	0.2%	
Eggplant	113	113	113	113	-0.3%	0.1%	
Fresh Tomato	824	824	822	824	-0.2%	0.1%	
Processing Tomato	751	751	750	751	-0.1%	0.1%	
Green Pepper	185	185	184	185	-0.3%	0.1%	
Red Pepper	813	813	812	813	-0.1%	0.0%	
GREENHOUSE PRODUCTS	5188	5188	5180	5217	-0.2%	0.5%	
Fresh Bean	80	80	80	81	-0.4%	0.6%	
Melon	123	123	122	124	-0.7%	1.0%	
Watermelon	297	297	295	301	-0.8%	1.3%	
Cucumber	773	773	771	776	-0.2%	0.5%	
Eggplant	129	129	128	130	-0.5%	1.0%	
Tomato	3034	3034	3032	3049	-0.1%	0.5%	
Green Pepper	752	752	752	756	-0.1%	0.5%	





Production (Million USD)						
Volume (2014-16 prices) and	Value (scenario p	rices)				
	BA	ASE	SCE	NARIO	CHA	ANGE
	VALUE	VOLUME	VALUE	VOLUME	VALUE	VOLUME
FRUITS AND NUTS	12478	12478	12176	13124	-2.4%	5.2%
Apple	1226	1226	1193	1257	-2.7%	2.6%
Apricot	521	521	518	550	-0.6%	5.4%
Peach	421	421	412	425	-2.2%	0.9%
Table Olive	650	650	615	682	-5.4%	4.9%
Oil Olive	1517	1517	1468	1651	-3.2%	8.8%
Orange	405	405	394	410	-2.7%	1.2%
Grapefruit	47	47	46	48	-1.6%	2.4%
Lemon	323	323	321	329	-0.6%	2.0%
Mandarin	274	274	266	279	-2.9%	1.9%
Pistachio	912	912	864	945	-5.3%	3.7%
Hazelnut	2285	2285	2263	2488	-0.9%	8.9%
Fig (Dry)	351	351	346	372	-1.6%	5.7%
Fig (Fresh)	86	86	85	86	-1.2%	0.5%
Table Grape	1297	1297	1249	1357	-3.7%	4.7%
Raisin Grape	477	477	468	518	-1.9%	8.6%
Теа	806	806	808	831	0.3%	3.1%
Cherry	721	721	707	732	-1.9%	1.6%
Pomegranate	161	161	156	164	-3.0%	2.2%





Production (Million USD)						
Volume (2014-16 prices) and V	alue (scenario p	rices)				
	BA	SE	SCE	NARIO	CHANGE	
	VALUE	VOLUME	VALUE	VOLUME	VALUE	VOLUME
LIVESTOCK & POUL.	23041	23041	23033	23045	0.0%	0.0%
MEAT	9017	9017	9015	9019	0.0%	0.0%
Cow Meat	8012	8012	8013	8017	0.0%	0.1%
Sheep Meat	775	775	769	769	-0.7%	-0.7%
Goat Meat	231	231	233	233	1.1%	1.0%
MILK	8642	8642	8639	8644	0.0%	0.0%
Cow Milk	7385	7385	7385	7389	0.0%	0.1%
Sheep Milk	902	902	895	896	-0.8%	-0.7%
Goat Milk	355	355	359	359	1.1%	1.0%
POULTRY	5381	5381	5380	5381	0.0%	0.0%
Poultry Meat	3449	3449	3444	3449	-0.1%	0.0%
Egg	1933	1933	1936	1933	0.2%	0.0%
TOTAL	63285	63285	62984	64200	-0.5%	1.4%





Impacts on Prices





Prices of Selected Products	(USD/Ton)		
Laspeyres Index for Groups			
BASE=100	BASE	SCENARIO	CHANGE (%)
CROP PRODUCTS	100.0	97.4	-2.6%
CEREALS	100.0	98.6	-1.4%
Common Wheat	302	297	-1.6%
Durum Wheat	304	298	-2.0%
Barley	255	250	-1.8%
Corn	254	252	-1.0%
Rice	667	662	-0.7%
Rye	252	248	-1.4%
PULSES	100.0	99.5	-0.5%
Chickpea	1,105	1,098	-0.6%
Drybean	1,388	1,376	-0.8%
Fresh Bean	918	916	-0.2%
Lentil	774	771	-0.4%
INDUSTRIAL CROPS	100.0	99.2	-0.8%
Tobacco	5,457	5,447	-0.2%
Sugarbeet	70	69	-0.8%
Cotton	586	581	-0.9%
OILSEEDS	100.0	97.2	-2.8%
Sesame	2,298	2,280	-0.8%
Sunflower	711	704	-1.0%
Groundnut	1,447	1,441	-0.4%
Soybean	444	418	-5.9%





Prices of Selected Products	(USD/Ton)		
Laspeyres Index for Groups			
BASE=100	BASE	SCENARIO	CHANGE (%)
TUBERS	100.0	99.8	-0.2%
Onion (Dry)	251	250	-0.3%
Potato	394	393	-0.2%
Onion (Fresh)	771	769	-0.2%
Garlic (Dry)	1,885	1,882	-0.1%
Garlic (Fresh)	1,025	1,023	-0.2%
VEGETABLES	100.0	99.8	-0.2%
Melon	270	269	-0.2%
Watermelon	133	132	-0.4%
Cucumber	176	175	-0.6%
Eggplant	210	209	-0.4%
Fresh Tomato	178	178	-0.2%
Processing Tomato	182	182	-0.2%
Green Pepper	219	218	-0.5%
Red Pepper	742	741	-0.1%
GREENHOUSE PRODUCTS	100.0	99.3	-0.7%
Fresh Bean	1,744	1,726	-1.0%
Melon	741	729	-1.7%
Watermelon	424	415	-2.1%
Cucumber	717	713	-0.6%
Eggplant	442	435	-1.5%
Tomato	843	838	-0.5%
Green Pepper	1.252	1.245	-0.6%





Prices of Selected Products	(USD/Ton)		
Laspeyres Index for Groups			
BASE=100	BASE	SCENARIO	CHANGE (%)
FRUITS AND NUTS	100.0	93.1	-6.9%
Apple	461	437	-5.1%
Apricot	931	877	-5.8%
Peach	656	636	-3.1%
Table Olive	1,537	1,386	-9.8%
Oil Olive	1,158	1,030	-11.1%
Orange	223	214	-3.9%
Grapefruit	191	184	-3.9%
Lemon	416	405	-2.6%
Mandarin	232	221	-4.7%
Pistachio	6,951	6,351	-8.6%
Hazelnut	4,523	4,114	-9.0%
Fig (Dry)	3,403	3,167	-6.9%
Fig (Fresh)	1,096	1,078	-1.6%
Table Grape	643	592	-8.0%
Raisin Grape	1,517	1,370	-9.7%
Теа	613	596	-2.7%
Cherry	1,368	1,321	-3.5%
Pomegranate	369	350	-5.0%





Prices of Selected Products	(USD/Ton)		
Laspeyres Index for Groups			
BASE=100	BASE	SCENARIO	CHANGE (%)
LIVESTOCK & POUL.	100.0	99.9	-0.1%
MEAT	100.0	100.0	0.0%
Cow Meat	8,138	8,134	-0.1%
Sheep Meat	8,181	8,177	-0.1%
Goat Meat	7,519	7,527	0.1%
MILK	100.0	99.9	-0.1%
Cow Milk	437	437	-0.1%
Sheep Milk	788	787	-0.2%
Goat Milk	758	759	0.1%
POULTRY	100.0	100.0	0.0%
Poultry Meat	1,820	1,817	-0.1%
Egg	1,787	1,790	0.2%
TOTAL	100.0	98.4	-1.6%





Regional Impacts





Production Changes						
	CHANGE					
	Coastal	Central	Eastern	GAP		
CROP PRODUCTS						
Common Wheat	3%	7%	0%	4%		
Durum Wheat	17%	3%	0%	0%		
Barley	18%	1%	0%	-5%		
Corn	-14%	20%	-1%	13%		
Rice	-7%	21%	-1%	44%		
Rye	8%	-4%	0%	-18%		
PULSES						
Chickpea	17%	-6%	0%	-15%		
Drybean	19%	-3%	-1%	-7%		
Fresh Bean	-9%	25%	-1%	38%		
Lentil	52%	0%	0%	-1%		
INDUSTRIAL CROPS						
Tobacco	24%	-7%	-1%	-15%		
Sugarbeet	-27%	1%	-1%	-26%		
Cotton	-29%	25%	-1%	16%		
OILSEEDS						
Sesame	-20%	-12%	-1%	-18%		
Sunflower	-17%	17%	-1%	37%		
Groundnut	-1%	29%		17%		
Soybean	-30%	-27%		-26%		





Production Changes				
		CH	ANGE	
	Coastal	Central	Eastern	GAP
TUBERS		((
Onion (Dry)	-21%	9%	-1%	33%
Potato	-26%	8%	-1%	5%
Onion (Fresh)	-10%	9%	-1%	12%
Garlic (Dry)	-14%	17%	-1%	-3%
Garlic (Fresh)	0%	24%	-1%	-18%
VEGETABLES				
Melon	-3%	3%	-1%	0%
Watermelon	-20%	31%	-1%	35%
Cucumber	-16%	15%	-1%	19%
Eggplant	-9%	26%	-1%	13%
Fresh Tomato	-18%	25%	-1%	34%
Processing Tomato	-6%	39%	-1%	41%
Green Pepper	-13%	27%	-1%	37%
Red Pepper	-19%	29%	0%	34%
GREENHOUSE PRODUCTS				
Fresh Bean	0%	200%		
Melon	1%			
Watermelon	1%			
Cucumber	-8%	101%	15%	-28%
Eggplant	1%			138%
Tomato	2%	-27%	-30%	
Green Pepper	0%	200%		





Production Changes							
	CHANGE						
	Coastal	Central	Eastern	GAP			
FRUITS AND NUTS							
Apple	-28%	41%	-26%	169%			
Apricot	-28%	124%	-2%	-28%			
Peach	-18%	192%	-25%	121%			
Table Olive	-2%	200%		180%			
Oil Olive	-3%	200%		173%			
Orange	1%	64%					
Grapefruit	2%						
Lemon	2%	200%					
Mandarin	2%	112%					
Pistachio	-27%	-25%	-26%	6%			
Hazelnut	15%	-27%	-25%				
Fig (Dry)	6%						
Fig (Fresh)	-20%	-27%	-25%	200%			
Table Grape	-28%	141%	-26%	-19%			
Raisin Grape	-28%	141%	121%	126%			
Теа	3%						
Cherry	21%	-29%	-27%	179%			
Pomegranate	-28%	156%	-30%	193%			





%20 Decline in Cotton Deficiency Payments

Simulation 6





General Impacts



	Base	SIMULATION	CHANGE
Total Surplus (Index)	100.0	100.0	0.0%
Producer Surplus	100.0	100.0	0.0%
Consumer Surplus	100.0	100.1	0.1%
Total Production			
Volume (with Base Period Prices)	63,285	63,030	-0.4%
Value	63,285	63,057	-0.4%
Crop Production			
Volume (with Base Period Prices)	40,244	39,988	-0.6%
Value	40,244	40,024	-0.5%
Livestock Production			
Volume (with Base Period Prices)	23,041	23,042	0.0%
Value	23,041	23,034	0.0%
Total Consumption			
Volume (with Base Period Prices)	54,198	54,181	0.0%
Value	54,198	54,123	-0.1%
Crop Consumption			
Volume (with Base Period Prices)	32,473	32,450	-0.1%
Value	32,473	32,399	-0.2%
Livestock Consumption			
Volume (with Base Period Prices)	21,725	21,731	0.0%
Value	21,725	21,724	0.0%
Net Exports	8,765	8,627	-1.6%
Crop Products	7,311	7,142	-2.3%
Livestock Products	1,455	1,485	2.1%
Price Index (Laspeyres)	100.0	99.9	-0.1%
Crop Products	100.0	99.9	-0.1%
Livestock Products	100.0	100.0	0.0%



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Impacts on Foreign Trade





Net Exports (Million USD)						
		BASE			SCENARI	0
	EU	ROW	TOTAL	EU	ROW	TOTAL
CROP PRODUCTS	5394	1917	7311	5350	1792	7142
CEREALS	-173	737	564	-189	734	545
Common Wheat	-61	667	605	-69	671	601
Durum Wheat	-6	237	231	-7	239	232
Barley	-15	-21	-36	-16	-22	-38
Corn	-58	-74	-132	-61	-75	-137
Rice	-32	-71	-104	-36	-79	-114
Rye	0	0	0	0	0	0
PULSES	18	-63	-44	18	-66	-47
Chickpea	13	-13	0	13	-14	0
Drybean	2	-36	-33	2	-37	-35
Freash Bean	0	3	2	0	3	
Lentil	3	-16	-14	3	-17	-14
INDUSTRIAL CROPS	1085	-12	1073	1046	-42	1004
Tobacco	-54	395	341	0	395	395
Sugarbeet	-4	-42	-45	-4	-45	-49
Cotton	1142	-365	777	1050	-392	658
OILSEEDS	-116	-1528	-1644	-105	-1615	-1721
Sesame	10	-197	-187	10	-204	-194
Sunflower	-104	-280	-384	-115	-309	-423
Groundnut	0	-20	-20	0	-21	-21
Sovbean	-22	-1032	-1054	0	-1082	-1082





Net Exports (Million USD)						
	BASE				SCENARI	0
	EU	ROW	TOTAL	EU	ROW	TOTAL
TUBERS	-8	64	56	-8.7	64.1	55
Onion (Dry)	3	21	24	3	21	24
Potato	-15	28	13	-16	28	12
Onion (Fresh)	4	20	24	4	20	
Garlic (Dry)	0	-4	-4	0	-4	
Garlic (Fresh)	0	0	0	0	0	
VEGETABLES	154	263	417	154	264	417
Melon	3	1	4	3	1	4
Watermelon	5	0	5	5	0	5
Cucumber	3	2	5	3	2	5
Eggplant	1	1	1	1	1	1
Fresh Tomato	50	57	108	50	57	108
Processing Tomato	41	169	210	41	169	210
Green Pepper	16	3	19	16	3	19
Red Pepper	35	30	66	35	31	66
GREENHOUSE PRODUCTS	437	584	1021	437	584	1021
Fresh Bean	0	1	1	0	1	1
Melon	0	0	1	0	0	1
Watermelon	2	0	2	2	0	2
Cucumber	44	43	88	44	43	88
Eggplant	5	6	12	5	6	12
Tomato	287	501	788	287	501	788
Green Pepper	99	31	130	99	31	130





Net Exports (Million USD)						
		BASE			SCENARI	0
	EU	ROW	TOTAL	EU	ROW	TOTAL
FRUITS AND NUTS	3997	1871	5868	3997	1871	5868
Apple	344	102	446	344	102	446
Apricot	281	203	484	281	203	484
Peach	0	30	29	0	30	29
Table Olive	6	5	11	6	5	11
Oil Olive	39	150	189	39	150	189
Orange	10	128	138	10	128	138
Grapefruit	42	38	80	42	38	80
Lemon	77	189	266	77	189	266
Mandarin	18	100	117	18	100	117
Pistachio	36	27	62	36	27	62
Hazelnut	2472	418	2890	2473	418	2891
Fig (Dry)	139	109	248	139	109	248
Fig (Fresh)	0	0	0	0	0	
Table Grape	42	117	159	42	117	159
Raisin Grape	307	149	456	307	149	456
Теа	12	-6	7	12	-6	6
Cherry	136	60	196	136	60	196
Pomegranate	36	53	89	36	53	89





Net Exports (Million USD)						
		BASE			SCENARI	0
	EU	ROW	TOTAL	EU	ROW	TOTAL
LIVESTOCK & POUL.	-32	1486	1455	-35	1520	1485
MEAT	-11	42	31	-12	36	24
Cow Meat	-11	36	25	-12	36	24
Sheep Meat	0	6	6	0	0	0
Goat Meat	0	0	0	0	0	0
MILK	-19	590	570	-20	629	609
Cow Milk	-18	544	526	-19	583	564
Sheep Milk	-1	27	26	-1	27	26
Goat Milk	0	18	18	0	19	18
POULTRY	-2	855	853	-2	855	853
Poultry Meat	0	415	415	0	415	415
Egg	-2	440	438	-2	440	438
TOTAL	5362	3403	8765	5315	3312	8627





Impacts on Agricultural Production





Production (Million USD)						
Volume (2014-16 prices) and \	/alue (scenario p	rices)				
	BA	SE	SCE	NARIO	CH	ANGE
	VALUE	VOLUME	VALUE	VOLUME	VALUE	VOLUME
CROP PRODUCTS	40244	40244	40024	39988	-0.5%	-0.6%
CEREALS	10133	10133	10098	10164	-0.3%	0.3%
Common Wheat	5152	5152	5136	5172	-0.3%	0.4%
Durum Wheat	1117	1117	1115	1123	-0.2%	0.6%
Barley	1785	1785	1794	1808	0.5%	1.3%
Corn	1587	1587	1577	1583	-0.7%	-0.3%
Rice	356	356	340	341	-4.4%	-4.1%
Rye	136	136	137	137	0.6%	1.3%
PULSES	1683	1683	1677	1680	-0.3%	-0.1%
Chickpea	503	503	501	503	-0.3%	0.0%
Drybean	317	317	314	315	-0.8%	-0.5%
Fresh Bean	587	587	587	587	-0.1%	0.0%
Lentil	276	276	275	275	-0.5%	-0.3%
INDUSTRIAL CROPS	2875	2875	2804	2685	-2.5%	-6.6%
Tobacco	387	387	441	442	14.1%	14.2%
Sugarbeet	1219	1219	1204	1206	-1.2%	-1.0%
Cotton	1270	1270	1159	1037	-8.7%	-18.3%
OILSEEDS	1506	1506	1403	1411	-6.8%	-6.3%
Sesame	43	43	34	34	-20.3%	-19.9%
Sunflower	1182	1182	1115	1119	-5.7%	-5.3%
Groundnut	210	210	208	208	-1.1%	-0.9%
Soybean	70	70	47	49	-33.9%	-29.8%





Production (Million USD)						
Volume (2014-16 prices) and Valu	e (scenario p	rices)				
	BA	ASE	SCE	NARIO	CHANGE	
	VALUE	VOLUME	VALUE	VOLUME	VALUE	VOLUME
TUBERS	2602	2602	2600	2602	-0.1%	0.0%
Onion (Dry)	484	484	484	485	-0.1%	0.0%
Potato	1798	1798	1796	1797	-0.1%	0.0%
Onion (Fresh)	109	109	109	109	0.0%	0.0%
Garlic (Dry)	185	185	185	185	-0.1%	-0.1%
Garlic (Fresh)	26	26	26	26	-0.1%	0.0%
VEGETABLES	3779	3779	3776	3780	-0.1%	0.0%
Melon	539	539	538	539	-0.1%	0.0%
Watermelon	427	427	426	427	-0.1%	0.0%
Cucumber	128	128	128	128	-0.1%	0.1%
Eggplant	113	113	113	113	-0.1%	0.0%
Fresh Tomato	824	824	823	824	-0.1%	0.0%
Processing Tomato	751	751	751	751	0.0%	0.0%
Green Pepper	185	185	184	185	-0.1%	0.1%
Red Pepper	813	813	812	813	0.0%	0.0%
GREENHOUSE PRODUCTS	5188	5188	5188	5188	0.0%	0.0%
Fresh Bean	80	80	80	80	0.0%	0.0%
Melon	123	123	123	123	0.0%	0.0%
Watermelon	297	297	297	297	0.0%	0.0%
Cucumber	773	773	773	773	0.0%	0.0%
Eggplant	129	129	129	129	0.0%	0.0%
Tomato	3034	3034	3034	3034	0.0%	0.0%
Green Pepper	752	752	752	752	0.0%	0.0%





Production (Million USD)						
Volume (2014-16 prices) and V	alue (scenario p	rices)				
	BA	ASE	SCE	NARIO	CHANGE	
	VALUE	VOLUME	VALUE	VOLUME	VALUE	VOLUME
FRUITS AND NUTS	12478	12478	12477	12477	0.0%	0.0%
Apple	1226	1226	1226	1226	0.0%	0.0%
Apricot	521	521	521	521	0.0%	0.0%
Peach	421	421	421	421	0.0%	0.0%
Table Olive	650	650	650	650	0.0%	0.0%
Oil Olive	1517	1517	1517	1517	0.0%	0.0%
Orange	405	405	405	405	0.0%	0.0%
Grapefruit	47	47	47	47	0.0%	0.0%
Lemon	323	323	323	323	0.0%	0.0%
Mandarin	274	274	274	274	0.0%	0.0%
Pistachio	912	912	912	912	0.0%	0.0%
Hazelnut	2285	2285	2285	2285	0.0%	0.0%
Fig (Dry)	351	351	351	351	0.0%	0.0%
Fig (Fresh)	86	86	86	86	0.0%	0.0%
Table Grape	1297	1297	1297	1297	0.0%	0.0%
Raisin Grape	477	477	477	477	0.0%	0.0%
Теа	806	806	805	805	-0.1%	-0.1%
Cherry	721	721	721	721	0.0%	0.0%
Pomegranate	161	161	161	161	0.0%	0.0%





Production (Million USD)						
Volume (2014-16 prices) and	Value (scenario p	rices)				
	BASE		SCENARIO		CHANGE	
	VALUE	VOLUME	VALUE	VOLUME	VALUE	VOLUME
LIVESTOCK & POUL.	23041	23041	23034	23042	0.0%	0.0%
MEAT	9017	9017	9015	9018	0.0%	0.0%
Cow Meat	8012	8012	8013	8016	0.0%	0.0%
Sheep Meat	775	775	769	769	-0.7%	-0.7%
Goat Meat	231	231	233	233	1.1%	1.0%
MILK	8642	8642	8639	8643	0.0%	0.0%
Cow Milk	7385	7385	7385	7388	0.0%	0.0%
Sheep Milk	902	902	895	896	-0.8%	-0.7%
Goat Milk	355	355	359	359	1.1%	1.0%
POULTRY	5381	5381	5380	5381	0.0%	0.0%
Poultry Meat	3449	3449	3444	3449	-0.1%	0.0%
Egg	1933	1933	1936	1933	0.2%	0.0%
TOTAL	63285	63285	63057	63030	-0.4%	-0.4%





Impacts on Prices





Prices of Selected Products	(USD/Ton)			
Laspeyres Index for Groups			CHANGE (%)	
BASE=100	BASE	SCENARIO		
CROP PRODUCTS	100.0	99.9	-0.1%	
CEREALS	100.0	99.4	-0.6%	
Common Wheat	302	300	-0.7%	
Durum Wheat	304	302	-0.8%	
Barley	255	253	-0.8%	
Corn	254	253	-0.4%	
Rice	667	665	-0.3%	
Rye	252	250	-0.6%	
PULSES	100.0	99.8	-0.2%	
Chickpea	1,105	1,102	-0.3%	
Drybean	1,388	1,384	-0.3%	
Fresh Bean	918	917	-0.1%	
Lentil	774	772	-0.3%	
INDUSTRIAL CROPS	100.0	104.0	4.0%	
Tobacco	5,457	5,454	-0.1%	
Sugarbeet	70	70	-0.2%	
Cotton	586	655	11.7%	
OILSEEDS	100.0	97.5	-2.5%	
Sesame	2,298	2,288	-0.4%	
Sunflower	711	708	-0.4%	
Groundnut	1,447	1,445	-0.2%	
Sovbean	444	418	-5.9%	




Prices of Selected Products	(USD/Ton)		
Laspeyres Index for Groups			
BASE=100	BASE	SCENARIO	CHANGE (%)
TUBERS	100.0	99.9	-0.1%
Onion (Dry)	251	251	-0.1%
Potato	394	394	-0.1%
Onion (Fresh)	771	770	-0.1%
Garlic (Dry)	1,885	1,884	-0.1%
Garlic (Fresh)	1,025	1,024	-0.1%
VEGETABLES	100.0	99.9	-0.1%
Melon	270	270	-0.1%
Watermelon	133	133	-0.2%
Cucumber	176	176	-0.2%
Eggplant	210	210	-0.2%
Fresh Tomato	178	178	-0.1%
Processing Tomato	182	182	-0.1%
Green Pepper	219	219	-0.2%
Red Pepper	742	742	0.0%
GREENHOUSE PRODUCTS	100.0	100.0	0.0%
Fresh Bean	1,744	1,744	0.0%
Melon	741	741	0.0%
Watermelon	424	424	0.0%
Cucumber	717	717	0.0%
Eggplant	442	442	0.0%
Tomato	843	843	0.0%
Green Pepper	1,252	1,252	0.0%





Prices of Selected Products	(USD/Ton)		
Laspeyres Index for Groups			
BASE=100	BASE	SCENARIO	CHANGE (%)
FRUITS AND NUTS	100.0	100.0	0.0%
Apple	461	461	0.0%
Apricot	931	931	0.0%
Peach	656	656	0.0%
Table Olive	1,537	1,537	0.0%
Oil Olive	1,158	1,158	0.0%
Orange	223	223	0.0%
Grapefruit	191	191	0.0%
Lemon	416	416	0.0%
Mandarin	232	232	0.0%
Pistachio	6,951	6,951	0.0%
Hazelnut	4,523	4,523	0.0%
Fig (Dry)	3,403	3,403	0.0%
Fig (Fresh)	1,096	1,096	0.0%
Table Grape	643	643	0.0%
Raisin Grape	1,517	1,517	0.0%
Теа	613	613	0.0%
Cherry	1,368	1,368	0.0%
Pomegranate	369	369	0.0%





Prices of Selected Products	(USD/Ton)		
Laspeyres Index for Groups			
BASE=100	BASE	SCENARIO	CHANGE (%)
LIVESTOCK & POUL.	100.0	100.0	0.0%
MEAT	100.0	100.0	0.0%
Cow Meat	8,138	8,135	0.0%
Sheep Meat	8,181	8,183	0.0%
Goat Meat	7,519	7,521	0.0%
MILK	100.0	100.0	0.0%
Cow Milk	437	437	0.0%
Sheep Milk	788	787	-0.1%
Goat Milk	758	758	0.0%
POULTRY	100.0	100.0	0.0%
Poultry Meat	1,820	1,817	-0.1%
Egg	1,787	1,790	0.2%
TOTAL	100.0	99.9	-0.1%





Regional Impacts





Production Changes				
		CH	ANGE	
	Coastal	Central	Eastern	GAP
CROP PRODUCTS				
Common Wheat	0%	1%	0%	1%
Durum Wheat	11%	-1%	0%	0%
Barley	8%	0%	0%	2%
Corn	-1%	-1%	0%	2%
Rice	-4%	-3%	0%	13%
Rye	3%	0%	0%	-2%
PULSES				
Chickpea	6%	-2%	0%	-4%
Drybean	25%	-4%	0%	2%
Fresh Bean	0%	0%	0%	10%
Lentil	15%	-1%	0%	-1%
INDUSTRIAL CROPS				
Tobacco	20%	0%	0%	2%
Sugarbeet	6%	-2%	0%	-2%
Cotton	-29%	-8%	-1%	-11%
OILSEEDS				
Sesame	-22%	-7%	0%	-8%
Sunflower	-8%	-2%	0%	10%
Groundnut	-1%	1%		1%
Sovbean	-30%	-26%		-24%





Production Changes				
		CH	ANGE	
	Coastal	Central	Eastern	GAP
TUBERS				
Onion (Dry)	5%	-3%	0%	12%
Potato	7%	-2%	0%	3%
Onion (Fresh)	5%	-6%	0%	4%
Garlic (Dry)	3%	-2%	0%	-3%
Garlic (Fresh)	8%	-1%	-1%	-8%
VEGETABLES				
Melon	4%	-4%	-1%	-3%
Watermelon	-4%	3%	0%	10%
Cucumber	1%	-3%	-1%	5%
Eggplant	0%	-1%	0%	1%
Fresh Tomato	-2%	1%	0%	10%
Processing Tomato	-1%	5%	0%	11%
Green Pepper	-1%	0%	0%	11%
Red Pepper	-5%	4%	0%	9%
GREENHOUSE PRODUCTS				
Fresh Bean	0%	0%		
Melon	0%			
Watermelon	0%			
Cucumber	0%	0%	0%	0%
Eggplant	0%			0%
Tomato	0%	0%	0%	
Green Pepper	0%	0%		





roduction Changes				
-		CH	ANGE	
	Coastal	Central	Eastern	GA
FRUITS AND NUTS				
Apple	0%	0%	0%	0%
Apricot	0%	0%	0%	0%
Peach	0%	0%	0%	0%
Table Olive	0%	0%		0%
Oil Olive	0%	0%		0%
Orange	0%	0%		
Grapefruit	0%			
Lemon	0%	0%		
Mandarin	0%	0%		
Pistachio	0%	0%	0%	0%
Hazelnut	0%	0%	0%	
Fig (Dry)	0%			
Fig (Fresh)	0%	0%	-1%	0%
Table Grape	0%	0%	0%	0%
Raisin Grape	0%	0%	0%	0%
Теа	0%			
Cherry	0%	0%	0%	0%
Pomegranate	0%	0%	0%	0%





9% GDP Growth (net of population growth)

Demand expansion due to income and pop growth

5 year later

GDP GROWTH 0.159274074

POP GROWTH 0.068819823

GDP Growth net of pop growth is 0.09

Simulation 7





General Impacts



	Base	SIMULATION	CHANGE
Total Surplus (Index)	100.0	102.5	2.5%
Producer Surplus	100.0	102.3	1.2%
Consumer Surplus	100.0	122.4	22.4%
Concounter Scriptus	10010		22.170
Total Production			
Volume (with Base Period Prices)	63,285	68,224	7.8%
Value	63,285	79,492	25.6%
Crop Production			
Volume (with Base Period Prices)	40,244	43,549	8.2%
Value	40,244	48,126	19.6%
Livestock Production			
Volume (with Base Period Prices)	23,041	24,675	7.1%
Value	23,041	31,367	36.1%
Total Consumption			
Volume (with Base Period Prices)	54,198	60,843	12.3%
Value	54,198	71,304	31.6%
Crop Consumption			
Volume (with Base Period Prices)	32,473	36,714	13.1%
Value	32,473	40,625	25.1%
Livestock Consumption			
Volume (with Base Period Prices)	21,725	24,129	11.1%
Value	21,725	30,679	41.2%
Net Exports	8,765	6,593	-24.8%
Crop Products	7,311	5,846	-20.0%
Livestock Products	1,455	747	-48.7%
Price Index (Laspeyres)	100.0	117.5	17.5%
Crop Products	100.0	111.1	11.1%
Livestock Products	100.0	127.2	27.2%





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Impacts on Foreign Trade





Net Exports (Million USD)						
		BASE			SCENARI	0
	EU	ROW	TOTAL	EU	ROW	TOTAL
CROP PRODUCTS	5394	1917	7311	4651	1195	5846
CEREALS	-173	737	564	-188	599	411
Common Wheat	-61	667	605	-67	575	508
Durum Wheat	-6	237	231	-7	197	190
Barley	-15	-21	-36	-16	-22	-38
Corn	-58	-74	-132	-62	-77	-140
Rice	-32	-71	-104	-35	-74	-109
Rye	0	0	0	0	0	-1
PULSES	18	-63	-44	17	-68	-51
Chickpea	13	-13	0	12	-14	-2
Drybean	2	-36	-33	2	-39	-37
Freash Bean	0	3	2	0	3	
Lentil	3	-16	-14	3	-17	-14
INDUSTRIAL CROPS	1085	-12	1073	1087	-52	1035
Tobacco	-54	395	341	0	381	381
Sugarbeet	-4	-42	-45	-4	-45	-49
Cotton	1142	-365	777	1091	-388	703
OILSEEDS	-116	-1528	-1644	-126	-1583	-1709
Sesame	10	-197	-187	8	-204	-196
Sunflower	-104	-280	-384	-109	-300	-410
Groundnut	0	-20	-20	0	-22	-22
Sovbean	-22	-1032	-1054	-25	-1057	-1082





Net Exports (Million USD)						
		BASE		5	CENARI	0
	EU	ROW	TOTAL	EU	ROW	TOTAL
TUBERS	-8	64	56	-9.8	61.7	52
Onion (Dry)	3	21	24	3	20	23
Potato	-15	28	13	-17	27	10
Onion (Fresh)	4	20	24	4	19	
Garlic (Dry)	0	-4	-4	0	-5	
Garlic (Fresh)	0	0	0	0	0	
VEGETABLES	154	263	417	152	259	411
Melon	3	1	4	3	1	4
Watermelon	5	0	5	4	0	4
Cucumber	3	2	5	2	2	5
Eggplant	1	1	1	1	1	1
Fresh Tomato	50	57	108	50	57	107
Processing Tomato	41	169	210	41	166	206
Green Pepper	16	3	19	16	3	19
Red Pepper	35	30	66	35	30	65
GREENHOUSE PRODUCTS	437	584	1021	260	361	621
Fresh Bean	0	1	1	0	0	0
Melon	0	0	1	0	0	0
Watermelon	2	0	2	0	0	0
Cucumber	44	43	88	25	25	50
Eggplant	5	6	12	2	0	2
Tomato	287	501	788	179	319	497
Green Pepper	99	31	130	54	17	71





et Exports (Million USD)						
		BASE			SCENARI	0
	EU	ROW	TOTAL	EU	ROW	TOTAL
FRUITS AND NUTS	3997	1871	5868	3459	1617	5076
Apple	344	102	446	324	92	416
Apricot	281	203	484	270	188	457
Peach	0	30	29	0	27	27
Table Olive	6	5	11	5	4	9
Oil Olive	39	150	189	35	127	162
Orange	10	128	138	9	121	131
Grapefruit	42	38	80	40	36	77
Lemon	77	189	266	74	180	254
Mandarin	18	100	117	17	94	110
Pistachio	36	27	62	31	23	55
Hazelnut	2472	418	2890	2068	311	2379
Fig (Dry)	139	109	248	117	90	207
Fig (Fresh)	0	0	0	0	0	
Table Grape	42	117	159	39	105	144
Raisin Grape	307	149	456	253	123	376
Теа	12	-6	7	12	-6	5
Cherry	136	60	196	130	55	185
Pomegranate	36	53	89	34	48	82





Net Exports (Million USD)						
		BASE			CENARI	0
	EU	ROW	TOTAL	EU	ROW	TOTAL
LIVESTOCK & POUL.	-32	1486	1455	-35	782	747
MEAT	-11	42	31	-12	17	5
Cow Meat	-11	36	25	-12	17	5
Sheep Meat	0	6	6	0	0	0
Goat Meat	0	0	0	0	0	0
MILK	-19	590	570	-21	431	409
Cow Milk	-18	544	526	-20	415	394
Sheep Milk	-1	27	26	-1	12	11
Goat Milk	0	18	18	0	4	4
POULTRY	-2	855	853	-2	334	332
Poultry Meat	0	415	415	0	84	84
Egg	-2	440	438	-2	250	248
TOTAL	5362	3403	8765	4616	1977	6593





Impacts on Agricultural Production





Production (Million USD)						
Volume (2014-16 prices) and \	/alue (scenario p	rices)				
	BA	SE	SCE	NARIO	CH	ANGE
	VALUE	VOLUME	VALUE	VOLUME	VALUE	VOLUME
CROP PRODUCTS	40244	40244	48126	43549	19.6%	8.2%
CEREALS	10133	10133	11616	10174	14.6%	0.4%
Common Wheat	5152	5152	5825	5045	13.1%	-2.1%
Durum Wheat	1117	1117	1240	1078	11.1%	-3.5%
Barley	1785	1785	2134	1813	19.6%	1.6%
Corn	1587	1587	1825	1693	15.0%	6.6%
Rice	356	356	429	405	20.5%	13.8%
Rye	136	136	162	140	19.7%	2.9%
PULSES	1683	1683	2047	1961	21.6%	16.5%
Chickpea	503	503	627	593	24.8%	18.0%
Drybean	317	317	380	364	20.0%	14.9%
Fresh Bean	587	587	686	676	16.9%	15.2%
Lentil	276	276	353	327	27.8%	18.6%
INDUSTRIAL CROPS	2875	2875	3489	3316	21.3%	15.3%
Tobacco	387	387	455	444	17.6%	14.8%
Sugarbeet	1219	1219	1532	1462	25.7%	19.9%
Cotton	1270	1270	1502	1410	18.3%	11.1%
OILSEEDS	1506	1506	2258	2050	50.0%	36.2%
Sesame	43	43	114	105	167.2%	146.8%
Sunflower	1182	1182	1600	1479	35.3%	25.1%
Groundnut	210	210	263	254	25.3%	21.0%
Soybean	70	70	281	211	298.5%	200.0%





Production (Million USD)	e (scenario n	rices)				
volume (2014-10 prices) and valu	BASE		SCENARIO		CHANGE	
	VALUE	VOLUME	VALUE	VOLUME	VALUE	VOLUME
TUBERS	2602	2602	3013	2968	15.8%	14.1%
Onion (Dry)	484	484	582	570	20.1%	17.6%
Potato	1798	1798	2050	2022	14.1%	12.5%
Onion (Fresh)	109	109	126	125	15.9%	14.3%
Garlic (Dry)	185	185	223	221	20.6%	19.3%
Garlic (Fresh)	26	26	31	31	20.5%	18.9%
VEGETABLES	3779	3779	4513	4426	19.4%	17.1%
Melon	539	539	651	640	20.8%	18.7%
Watermelon	427	427	505	489	18.3%	14.6%
Cucumber	128	128	159	152	23.8%	18.5%
Eggplant	113	113	139	134	23.0%	19.0%
Fresh Tomato	824	824	993	973	20.5%	18.1%
Processing Tomato	751	751	875	863	16.5%	14.9%
Green Pepper	185	185	227	219	23.1%	18.4%
Red Pepper	813	813	965	956	18.7%	17.7%
GREENHOUSE PRODUCTS	5188	5188	6792	5387	30.9%	3.8%
Fresh Bean	80	80	117	84	46.3%	5.3%
Melon	123	123	181	110	47.4%	-10.5%
Watermelon	297	297	427	239	43.5%	-19.8%
Cucumber	773	773	1054	850	36.3%	10.0%
Eggplant	129	129	182	116	41.2%	-10.1%
Tomato	3034	3034	3852	3190	27.0%	5.1%
Green Pepper	752	752	980	799	30.3%	6.1%





Production (Million LISD)						
Volume (2014-16 prices) and	Value (scenario p	rices)				
	BA	ASE	SCENARIO		CHANGE	
	VALUE	VOLUME	VALUE	VOLUME	VALUE	VOLUME
FRUITS AND NUTS	12478	12478	14398	13268	15.4%	6.3%
Apple	1226	1226	1478	1408	20.6%	14.9%
Apricot	521	521	563	541	8.0%	3.8%
Peach	421	421	529	506	25.6%	20.2%
Table Olive	650	650	810	709	24.7%	9.1%
Oil Olive	1517	1517	1939	1669	27.8%	10.0%
Orange	405	405	505	477	24.7%	17.9%
Grapefruit	47	47	50	47	7.6%	1.8%
Lemon	323	323	351	338	8.7%	4.7%
Mandarin	274	274	322	301	17.6%	10.0%
Pistachio	912	912	1115	1041	22.3%	14.1%
Hazelnut	2285	2285	2221	1966	-2.8%	-14.0%
Fig (Dry)	351	351	376	341	7.0%	-2.9%
Fig (Fresh)	86	86	101	99	17.7%	15.0%
Table Grape	1297	1297	1592	1505	22.8%	16.1%
Raisin Grape	477	477	437	401	-8.4%	-15.9%
Теа	806	806	985	946	22.2%	17.4%
Cherry	721	721	840	799	16.6%	10.8%
Pomegranate	161	161	184	172	14.6%	7.1%





Production (Million USD)						
Volume (2014-16 prices) and V	alue (scenario p	rices)				
	BA	ASE	SCE	NARIO	CH	ANGE
	VALUE	VOLUME	VALUE	VOLUME	VALUE	VOLUME
LIVESTOCK & POUL.	23041	23041	31367	24675	36.1%	7.1%
MEAT	9017	9017	12561	9862	39.3%	9.4%
Cow Meat	8012	8012	11175	8819	39.5%	10.1%
Sheep Meat	775	775	1071	824	38.3%	6.4%
Goat Meat	231	231	315	219	36.4%	-5.1%
MILK	8642	8642	11866	9426	37.3%	9.1%
Cow Milk	7385	7385	10166	8129	37.7%	10.1%
Sheep Milk	902	902	1228	960	36.1%	6.4%
Goat Milk	355	355	471	337	32.6%	-5.1%
POULTRY	5381	5381	6940	5386	29.0%	0.1%
Poultry Meat	3449	3449	4534	3452	31.5%	0.1%
Egg	1933	1933	2406	1934	24.5%	0.1%
TOTAL	63285	63285	79492	68224	25.6%	7.8%





Impacts on Prices





Prices of Selected Products	(USD/Ton)		
Laspeyres Index for Groups			
BASE=100	BASE	SCENARIO	CHANGE (%)
CROP PRODUCTS	100.0	111.1	11.1%
CEREALS	100.0	112.9	12.9%
Common Wheat	302	349	15.5%
Durum Wheat	304	350	15.0%
Barley	255	300	17.7%
Corn	254	274	7.8%
Rice	667	707	5.9%
Rye	252	293	16.3%
PULSES	100.0	104.4	4.4%
Chickpea	1,105	1,168	5.7%
Drybean	1,388	1,450	4.5%
Fresh Bean	918	932	1.5%
Lentil	774	834	7.8%
INDUSTRIAL CROPS	100.0	105.2	5.2%
Tobacco	5,457	5,590	2.4%
Sugarbeet	70	73	4.8%
Cotton	586	624	6.5%
OILSEEDS	100.0	117.3	17.3%
Sesame	2,298	2,487	8.2%
Sunflower	711	769	8.2%
Groundnut	1,447	1,498	3.5%
Soybean	444	590	32.8%





Prices of Selected Products	(USD/Ton)		
Laspeyres Index for Groups			
BASE=100	BASE	SCENARIO	CHANGE (%)
TUBERS	100.0	101.5	1.5%
Onion (Dry)	251	256	2.2%
Potato	394	399	1.4%
Onion (Fresh)	771	782	1.4%
Garlic (Dry)	1,885	1,906	1.1%
Garlic (Fresh)	1,025	1,038	1.3%
VEGETABLES	100.0	102.0	2.0%
Melon	270	275	1.8%
Watermelon	133	137	3.2%
Cucumber	176	184	4.5%
Eggplant	210	217	3.3%
Fresh Tomato	178	182	2.0%
Processing Tomato	182	184	1.4%
Green Pepper	219	228	3.9%
Red Pepper	742	748	0.9%
GREENHOUSE PRODUCTS	100.0	128.2	28.2%
Fresh Bean	1,744	2,423	38.9%
Melon	741	1,221	64.7%
Watermelon	424	759	78.9%
Cucumber	717	889	24.0%
Eggplant	442	694	57.1%
Tomato	843	1,018	20.8%
Green Pepper	1,252	1,537	22.7%





Prices of Selected Products	(USD/Ton)		
Laspeyres Index for Groups			
BASE=100	BASE	SCENARIO	CHANGE (%)
FRUITS AND NUTS	100.0	108.3	8.3%
Apple	461	484	5.0%
Apricot	931	968	4.0%
Peach	656	685	4.4%
Table Olive	1,537	1,758	14.4%
Oil Olive	1,158	1,346	16.2%
Orange	223	236	5.8%
Grapefruit	191	202	5.7%
Lemon	416	432	3.8%
Mandarin	232	248	6.9%
Pistachio	6,951	7,446	7.1%
Hazelnut	4,523	5,110	13.0%
Fig (Dry)	3,403	3,748	10.1%
Fig (Fresh)	1,096	1,121	2.3%
Table Grape	643	680	5.8%
Raisin Grape	1,517	1,653	9.0%
Теа	613	638	4.1%
Cherry	1,368	1,439	5.2%
Pomegranate	369	395	7.0%





Prices of Selected Products	(USD/Ton)		
Laspeyres Index for Groups			
BASE=100	BASE	SCENARIO	CHANGE (%)
LIVESTOCK & POUL.	100.0	127.2	27.2%
MEAT	100.0	127.4	27.4%
Cow Meat	8,138	10,312	26.7%
Sheep Meat	8,181	10,634	30.0%
Goat Meat	7,519	10,806	43.7%
MILK	100.0	126.0	26.0%
Cow Milk	437	547	25.1%
Sheep Milk	788	1,008	27.9%
Goat Milk	758	1,059	39.7%
POULTRY	100.0	129.0	29.0%
Poultry Meat	1,820	2,391	31.4%
Egg	1,787	2,223	24.4%
TOTAL	100.0	117.5	17.5%





Regional Impacts





Production Changes				
		CH	ANGE	
	Coastal	Central	Eastern	GAP
CROP PRODUCTS				
Common Wheat	-5%	-4%	0%	11%
Durum Wheat	-29%	1%	0%	-3%
Barley	-28%	15%	0%	-24%
Corn	-15%	27%	2%	36%
Rice	11%	48%	-1%	-27%
Rye	-28%	19%	1%	73%
PULSES				
Chickpea	-30%	45%	2%	12%
Drybean	-29%	24%	1%	-29%
Fresh Bean	22%	-1%	1%	-28%
Lentil	-30%	52%	2%	18%
INDUSTRIAL CROPS				
Tobacco	-14%	97%	9%	100%
Sugarbeet	-29%	24%	2%	106%
Cotton	45%	-18%	2%	-13%
OILSEEDS				
Sesame	157%	113%	6%	43%
Sunflower	30%	18%	1%	-29%
Groundnut	22%	-16%		64%
Sovbean	200%	200%		200%





Production Changes				
		CH	ANGE	
	Coastal	Central	Eastern	GAP
TUBERS				
Onion (Dry)	-29%	45%	0%	-28%
Potato	-29%	27%	2%	-29%
Onion (Fresh)	-30%	73%	3%	-29%
Garlic (Dry)	-30%	27%	2%	117%
Garlic (Fresh)	-29%	-28%	0%	107%
VEGETABLES				
Melon	-30%	58%	10%	64%
Watermelon	42%	-30%	2%	-28%
Cucumber	-5%	68%	6%	-14%
Eggplant	10%	16%	1%	58%
Fresh Tomato	40%	-6%	1%	-29%
Processing Tomato	22%	-30%	-1%	-29%
Green Pepper	32%	-2%	2%	-30%
Red Pepper	46%	-28%	1%	-30%
GREENHOUSE PRODUCTS				
Fresh Bean	5%	-29%		
Melon	-11%			
Watermelon	-20%			
Cucumber	14%	-30%	-30%	6%
Eggplant	-10%			-29%
Tomato	4%	21%	60%	
Green Pepper	6%	-29%		





	CH	ANGE	
Coastal	Central	Eastern	GAP
46%	-29%	66%	-30%
78%	-30%	-29%	-3%
22%	-29%	200%	81%
10%	-28%		1%
10%	-29%		10%
18%	-29%		
2%			
5%	-29%		
10%	-28%		
200%	-28%	200%	6%
-29%	82%	200%	
-3%			
17%	31%	200%	-29%
35%	-28%	70%	-16%
-12%	-28%	-29%	-29%
17%			
-10%	28%	200%	8%
13%	-28%	200%	-30%
	Coastal 46% 78% 22% 10% 10% 22% 10% 20% 5% 10% 2% 5% 10% 2% 5% 10% 2% 5% 10% 2% 5% 10% 200% -29% -3% 17% 35% -12% 17% 13%	Characteries Coastal Central Coastal Central 46% -29% 78% -30% 22% -29% 10% -28% 10% -29% 10% -29% 22% -29% 10% -29% 20% -29% 2% -29% 10% -29% 200% -28% 200% -28% 10% -28% 35% -28% 17% 31% 35% -28% 17% 28% 17% 28% 13% -28%	Change Coastal Central Eastern 46% -29% 66% 78% -30% -29% 22% -29% 200% 10% -28% 200% 10% -29% 200% 10% -29% 200% 10% -29% 200% 10% -29% 200% 10% -29% 200% 10% -29% 200% 200% -28% 200% 200% -28% 200% 10% -28% 200% 200% -28% 200% 10% -28% 200% 200% -28% 200% 17% 31% 200% 17% -28% -29% 17% 28% 200% 17% 28% 200% 13% -28% 200%



TAGRIS POLICY SIMULATIONS

Table 19: Selective list of TASM/TAGRIS policy parameters and impacts



Dellin: Demonstern	Turnente	Impact Level				
Policy Parameters	Impacts	Activity	Product	Region	Nation	
Fortilizor Drico/Subsidy	Consumer Welfare				Х	
Fuel Drice / Tay / Subsidy	Producer Welfare				Х	
Maga	Production	Х	Х	Х	Х	
Vvage Sood Drice (Subsidies	Consumption		Х	Х	Х	
Seed Price/Subsidies	Resource Use	Х	Х	Х	Х	
Motor Drice/Subsidy	Land Rents			Х	Х	
Water Price/Subsidy	Producer Prices				Х	
	Exports		Х		Х	
Irrigated Land	Imports		Х		Х	
Land availability	Seed/By Product Production	Х	Х	Х	Х	
Yields	Feed Production	Х	Х	Х	Х	
Technology	Value of Output		Х	Х	Х	
Tariffs/Subsidies	Crop Pattern	Х	Х	Х	Х	
Consumer Demand	Net Trade				Х	
Price Elasticities	Self Sufficiency		Х	Х	Х	
Income Elasticities	Food Consumption			Х	Х	

