

**Aus dem Institut für Marktanalyse und
Agrarhandelspolitik**

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**GAPsi simulations updated baseline and EU
enlargement under the Mid-Term-Review scenario**

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Content

1	Introduction	1
2	Model description	3
2.1	Baseline scenario assumptions	5
2.2	Baseline Projections	9
3	EU-Enlargement scenario	17
3.1	Assumptions	17
3.2	Enlargement scenario projections	17
4	Concluding Remarks	21
	References	22

List of Figures

Figure 2.1:	Other cereals projected price development, 2000-2015 (€/ton)	12
Figure 2.2:	Per capita consumption of meat in the EU15 (2002= 100)	13
Figure 2.3:	Beef market prices in EU15 (€/ton) (partial decoupling from 2004) onwards	15
Figure 2.4:	Producer price index EU15, 2002-2015 (2002= 100)	15
Figure 2.5:	Beef production and demand in the EU15 – partial decoupling –	16
Figure 3.1:	EU livestock production development – enlargement scenario Production in EU15/EU25 (2002 = 100)	18

List of Tables

Table 2.1:	Model regions and regional aggregates	6
Table 2.2:	Population increase in GAPsi in the baseline scenario (1000 persons)	6
Table 2.3:	GAPsi model regions GDP annual growth rates (in percent)	7
Table 2.4:	GAPsi model regions annual rates of inflation (in percent)	7
Table 2.5:	Policy assumptions in GAPsi for baseline/EU-15 scenario (prices and payments in €/t; quotas in 1000 t)	8
Table 2.6:	Harvested area and yields, EU15	9
Table 2.7:	Crop production, EU15	10
Table 2.8:	Food and feed use of crops (EU15, 1000 tons)	10
Table 2.9:	EU prices of crops and sugar	11
Table 2.10:	Per capita consumption of dairy and meat in the EU15	12
Table 2.11:	Production and demand of livestock in EU15	13
Table 2.12:	Producer and market prices on dairy and livestock markets in EU15	14
Table 3.1:	Policy assumptions for acceding countries (1000 tons)	17
Table 3.2:	Effect of EU enlargement on area and livestock stocks and production	18
Table 3.3:	Changes between enlargement scenario and baseline projection for market and producer prices in percent	19

1 Introduction

In this working paper the GAPsi model in its updated version is used to compute a baseline projection as well as a policy scenario calculation based on the Mid-Term-Review (MTR) of the Common Agricultural Policy (CAP). It tackles the issues of decoupling of direct payments and the eastern enlargement of the Union. Those projections are made for the period 2001 – 2010.²

GAPsi is an international agricultural multi-market partial equilibrium model. It is conceived not so much as a forecast device but as a tool for policy simulation – i. e., effects of policy changes are projected in the future while holding other variables controlled. The acronym stands for Common Agricultural Policy simulation in German. Developed at the Institute of Market Analysis and Agricultural Trade Policy³ of the Federal Agricultural Research Centre (FAL-MA), the GAPsi model was used for various policy analysis projects. It also belongs to the “FAL Model Group” hosted and operated by the other two economic institutes⁴ at FAL. Within this network consisting of an global general equilibrium model focused on the agricultural sectors (GTAP), an international partial equilibrium agricultural market model (GAPsi), a regional (national) agricultural supply model (RAUMIS), and a single-farm model (BEMO), GAPsi covers the determination of equilibrium market prices which are exogenous to BEMO and RAUMIS (FRENZ and MANEGOLD, 1988, MANEGOLD, 1998).⁵

The current, updated version of GAPsi discerns three cereals: wheat, maize and other grains; provides for the transformation of oilseeds into vegetable oil and meal; includes the livestock sectors accounting for beef and veal, sheep meat, pig meat, poultry and eggs as well as dairy. Feeds (except roughage) are endogenously supplied either directly from the crop sectors of the model or in the form of by-products (crushed oilseeds). Root crops are separated in potatoes and sugar-beets. The regional coverage was defined to allow the analysis of eventual price and quantity effects of both an enlarged EU and agricultural policy measures made in a 15-year baseline projection.

² The paper is based on work done in a project financed by the German Ministry of Consumer Protection, Food and Agriculture (Project: ‘Agrarpolitik 2010’).

³ Former Institute of Agricultural Market Research.

⁴ The others are the Institute for Farm Economics and the Institute for Rural Areas – former Institute of Farm Economics and Rural Studies.

⁵ New developments within the model network are FARMIS at the farm level and AGMEMOD at the market level.

The present working paper is organised as follows: First, the general structure of the model and the main assumptions regarding overall economic and policy variables under the CAP are described. Second, a baseline projection incorporating the impacts of agreed upon MTR-proposals on cereal markets (reduction of intervention price), livestock (partial decoupling of direct payments) and dairy market (expansion of production quotas and reduction of intervention prices) on the agricultural markets of the old EU members (EU15) is presented. Third, a simulation is presented, following and based on that projection, that considers the effects of an enlarged Community.

A major objective of this working paper is to give an idea about how the updated version of GAPsi depicts and projects some of the proposed changes in the CAP for the former and the enlarged Community.

2 Model description

GAPsi is a non-linear and synthetic, recursive-dynamic, multi-product, partial equilibrium model. Basically, GAPsi consists of a number of price dependent behavioural equations representing regional supplies of and demand for agricultural (food) products, respectively. Price equations define the relations presumed to exist between prices of different products, trade levels or regions. Various policy restrictions may be inserted by means of exogenous parameters (e. g., institutional prices, price wedges, quotas) while the model is closed by balancing world supplies and demand (world net trade being zero). Changes in carry-over stocks are ruled out.

GAPsi is partial in so far as it is restricted to the agricultural sector. It includes 13 agricultural products cereals – wheat, maize, other cereals excluding rice, oilseeds, protein plants, potatoes, sugar (beets), dairy, beef, lamb, pork, poultry and eggs. Except for arable land, livestock numbers and feed, no other inputs (like energy, fertiliser, pesticides, etc.), and no labour and capital variables are included. Cereals and milk may be used either for human consumption or for feed. Oilseeds are transformed into oil and meal. Non-grain compound feed called “other feed” and supposed to represent tapioca in the first place completes the feed rations, while roughage is not taken into consideration.

Although the model deals with several regions it is a non-spatial model. International trade is represented by net trade, and world markets are modelled as pool markets, which means that there are no bilateral trade links. Instead, all exporting countries export to the pool and all importing countries import from there. The implication is that there are no explicit bilateral trade preferences, commodities are homogenous and regions cannot smoothly change their net trade position. Countries in the database are aggregated in 13 world regions for the current application. Six regions form the old EU⁶, three represent the EU applicant countries⁷ (the islands Cyprus and Malta are not included, nor are Bulgaria and Romania), three regions comprise main agricultural exporters, namely NorthAmerica (Canada, USA and Mexico), SouthAmerica (Argentina and Brazil) and Oceanic-countries (Australia and New Zealand), respectively. All other countries not previously mentioned make up for the so-called “Rest of the World”.

⁶ Depicted by Germany, France, North-West-Europe (Ireland and UK), Benelux (Belgium, Luxembourg and the Netherlands), France, Mediterranean (Italy, Spain, Greece and Portugal), Scandinavia (Denmark, Sweden, Finland) and Austria.

⁷ Poland, Hungary, Rest-of-middle-and-eastern-European-countries (Estonia, Latvia, Lithuania, Czech-Republic, Slovenia, Slovakia).

There are several elements which make the model non-linear. First, in dealing with crop production, harvested area and yield are considered separately thus leaving crop production to be determined by multiplication. Similarly, feed consumption is derived from feed input coefficients times animal production, both of which are endogenous variables. Moreover, there are certain model variants where quadratic equations are used for modelling, e. g., (non-quota) milk supplies.

Finally, the model is a synthetic one. All model parameters are taken either from literature, other models (e. g., SWOPSIM, GOLD)⁸ or modelling experience. Signs and sizes of those parameters always meet general theoretical requirements (especially concerning symmetry). Meat demand elasticities (with regard to own and cross prices) are calibrated using a maximum entropy approach.

Neglecting eventual changes in carry-over stocks, foreign trade or net export demand is defined as the difference between regional supply and regional domestic disappearance with the latter comprising human consumption plus (if applicable) feed use and seed. This definition may suggest foreign trade to be endogenous in the model. Nevertheless, net exports may be restricted by limits resulting from the international WTO agreement.

With regard to prices, GAPsi differentiates between price levels. Starting from a uniform world market price for each product, any region has its own border price (depending on the region's foreign trade status thought to be either a c.i.f. or a f.o.b. price). In conformity with the consideration of the EU as a unique foreign trade region, EU border prices are, however, identical for all EU countries. Moreover, there are domestic market prices, producer prices, and consumer prices. The price wedges always include transaction costs and may correct for quality differences (the general assumption concerning the homogeneity of products requires effective quality differences in traded products to be compensated for by certain modulation of the prices used in the model). Trade barriers, subsidies and taxes may cause further price differentials. All those price elements contained in the model are dealt with explicitly.

Since all regional prices are expressed in national currency, exchange rates are included in the model. Moreover, inflation is taken into consideration in order to distinguish nominal from real prices.

⁸ SWOPSIM is the Static World Policy Simulation Modelling Framework of the US-Department of agriculture and GOLD is the Grains-Oilseeds-Livestock-and-Dairy Model of the Food and Policy Research Institute – FAPRI (University of Missouri and Irish Agriculture, Food, and Rural Development Authority – Teagasc)

For model-regions, whole sets of behavioural equations are specified interrelating prices, demand and supply variables while endogenous trends (such as, e. g., long term changes in consumer behaviour or technical progress in production or processing) are represented by exogenous shift factors. Equilibrium on national/regional commodity markets is attained given that all markets must clear.

GAPsi is solved through an iterative process, which for each single year balances all product markets with respect to world supplies on the one hand, and is equal to world demand on the other hand. The iteration is given by model run t based upon the results from model run $t-1$, which makes the model recursive-dynamic.

Finally, the database on quantities is based on annual data for 2000 which were obtained from FAOStat. Prices and other indicators were obtained from FAO-ESC, OECD, USDA, CAP-Monitor, the German Statistical Office as well as from the Federal Ministry of Consumer Protection and Agriculture.⁹

2.1 Baseline scenario assumptions

For the baseline projections, it is assumed that all national and international agreements of the EU15 remain in place over the projection period, and that the Luxembourg-Agreement settings will reflect the agricultural policy assumptions. This is valid at least for the crop sector, as the detailed system of decoupled direct payments for livestock and dairy producers need some additional modelling due to different national implementation decisions (Agra-Europe, Aug.06 2004, EP/7).

Table 2.2, 2.3 and 2.4 give the underpinning values and assumed changes in population, annual Gross Domestic Product (GDP) change as well as inflation rates for specific countries and model regions that are part of the framework for the projections.

⁹ The authors want to thank Gerlinde Kubitzka for her support during the database updates.

Table 2.1: Model regions and regional aggregates

Model regions	Components
Germany	Germany
North-West-Europe	Ireland + UK
Benelux	(Belgium-Luxembourg) + Netherlands
France	France
Mediterranean	Portugal + Spain + Italy + Greece
Scandinavia + Austria	(Denmark + Sweden + Finland) + Austria
Poland	Poland
Hungary	Hungary
Other Middle-Eastern-Europe - OMEE	Estonia + Latvia + Lithuania + Czech-Rep. Slovak-Rep. + Slovenia
North America – NAM	Canada + USA + Mexico
South America – SAM	Argentina + Brazil
Oceania – OCA	Australia + New Zealand
Rest of the World – ROW	
Aggregates	
E15	Germany, North-West-Europe, Benelux, France Mediterranean, Scandinavia + Austria
E10	Acceding Eastern-European countries ¹⁾
EXC	Main agricultural exporting countries: NAM + SAM + OCA

1) Cyprus and Malta, although acceding countries, are not in the database. Nor are Bulgaria and Romania included.

Table 2.2: Population increase in GAPsi in the baseline scenario (1000 persons)

	EU-15	E10	North America	South America	Oceania	Rest of the World
2000	378.499	76.675	409.400	205.745	22.862	5.091.108
2001	379.365	76.974	413.873	207.652	23.061	5.169.336
2002	380.158	77.281	418.310	209.541	23.257	5.247.555
2003	380.885	77.595	422.714	211.408	23.448	5.325.777
2004	381.544	77.915	427.090	213.246	23.635	5.404.027
2005	382.122	78.236	431.443	215.048	23.818	5.482.289
2006	382.606	78.553	435.784	216.822	23.998	5.560.692
2007	382.998	78.863	440.125	218.577	24.176	5.639.365
2008	383.311	79.163	444.472	220.311	24.350	5.718.292
2009	383.554	79.450	448.827	222.017	24.523	5.797.494
2010	383.735	79.726	453.192	223.689	24.693	5.876.945
2011	383.857	79.985	457.566	225.344	24.863	5.956.916
2012	383.923	80.228	461.950	227.005	25.031	6.037.621
2013	383.941	80.453	466.340	228.671	25.198	6.118.857
2014	383.919	80.662	470.731	230.348	25.364	6.200.522
2015	383.859	80.856	475.115	232.036	25.528	6.282.589
<i>E abs.</i>	<i>5.360</i>	<i>4.181</i>	<i>65.715</i>	<i>26.291</i>	<i>2.666</i>	<i>1.191.481</i>
<i>Rel.</i>	<i>1,42%</i>	<i>5,45%</i>	<i>16,05%</i>	<i>12,78%</i>	<i>11,66%</i>	<i>23,40%</i>
<i>% p.a.</i>	<i>0,094%</i>	<i>0,355%</i>	<i>0,997%</i>	<i>0,805%</i>	<i>0,738%</i>	<i>1,412%</i>

Source: Based on data from FAO-ESC (2003).

Table 2.3: GAPsi model regions GDP annual growth rates (in percent)

	Germany	North-West-Europe	Bene-lux	France	Medi-terra-nean	Scan-dina-via	Po-land	Hun-gary	OMEE	North America	South America	Ocea-nia	Rest of the World
2000	1.71	2.65	2.12	1.64	1.71	2.15	3.00	3.00	3.00	2.51	2.51	2.51	2.20
2001	1.71	2.65	2.12	1.64	1.71	2.15	3.00	3.00	3.00	2.51	2.51	2.51	2.20
...
2015	1.71	2.65	2.12	1.64	1.71	2.15	3.00	3.00	3.00	2.51	2.51	2.51	2.20
<i>Cumul,</i> 2000-15	1.31	1.52	1.40	1.30	1.31	1.41	1.60	1.60	1.60	1.49	1.49	1.49	1.42

Source: Own assumptions.

Table 2.4: GAPsi model regions annual rates of inflation (in percent)

	Germany	North-West-Europe	Bene-lux	France	Medi-terra-nean	Scan-dina-via	Po-land	Hun-gary	OMEE	North America	South America	Oceania	Rest of the World
2000	2.00	2.00	2.00	2.00	2.00	2.00	5.20	5.20	5.20	2.90	2.90	2.90	3.50
2001	2.30	2.30	2.30	2.30	2.30	2.30	4.00	4.00	4.00	3.10	3.10	3.10	3.15
...
2015	1.80	1.80	1.80	1.80	1.80	1.80	2.65	2.65	2.65	2.35	2.35	2.35	3.00
<i>Cumul,</i> 2000-15	1.34	1.34	1.34	1.34	1.34	1.34	1.59	1.59	1.59	1.48	1.48	1.48	1.62

Source: Own assumptions.

The CAP-instruments considered in the calculations, and the assumptions regarding their development, are summarized in Table 2.5. Main points are, first, the change in the compensatory payments for cereals and oilseeds to a uniform level of 63 €/t and the constancy of the cereal intervention price at the 2001 level. Second, the expansion of the milk quotas (2005-8) accompanied by a decrease in the intervention prices for butter and skimmed milk powder was decided.¹⁰ Third, with regard to the beef sector, the reduction of the intervention price and the increase of the aggregate level of direct payments was taken into consideration. Further modifications regarding the levels of beef premiums and the degrees of de-coupling envisaged at national levels are, however, not yet implemented. An overall rate of decoupling direct payments from production of 50 % was assumed as an initial approach to this issue.

¹⁰ This leads to a corresponding decrease of the Intervention-Milk-Price-Equivalent (IMPE).

Table 2.5: Policy assumptions in GAPsi for baseline/EU-15 scenario (prices and payments in €/t; quotas in 1000 t)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
EU Crop Sector																
Common wheat intervention pr.	110.25	101.30	101.30	101.30	101.30	101.30	101.30	101.30	101.30	101.30	101.30	101.30	101.30	101.30	101.30	101.30
Maize intervention pr.	110.25	101.30	101.30	101.30	101.30	101.30	101.30	101.30	101.30	101.30	101.30	101.30	101.30	101.30	101.30	101.30
Other cereals intervention pr.	110.25	101.30	101.30	101.30	101.30	101.30	101.30	101.30	101.30	101.30	101.30	101.30	101.30	101.30	101.30	101.30
White sugar intervention pr.	631.90	631.90	631.90	631.90	631.90	631.90	631.90	631.90	631.90	631.90	631.90	631.90	631.90	631.90	631.90	631.90
Sugar quotas(A+B)	14,592	14,592	14,482	14,482	14,482	14,482	14,482	14,482	14,482	14,482	14,482	14,482	14,482	14,482	14,482	14,482
EU Livestock Sector																
Beef intervention pr.	2,593.60	2,410.40	2,224.00	2,224.00	2,224.00	2,224.00	2,224.00	2,224.00	2,224.00	2,224.00	2,224.00	2,224.00	2,224.00	2,224.00	2,224.00	2,224.00
IMPE ¹⁾	284.14	284.14	284.14	284.14	265.67	247.28	228.83	223.61	223.61	223.61	223.61	223.61	223.61	223.61	223.61	223.61
Butter intervention pr.	3,282.00	3,282.00	3,282.00	3,282.00	3,052.23	2,824.40	2,595.20	2,463.90	2,463.90	2,463.90	2,463.90	2,463.90	2,463.90	2,463.90	2,463.90	2,463.90
SMP intervention pr.	2,055.20	2,055.20	2,055.20	2,055.20	1,952.40	1,849.70	1,746.90	1,746.90	1,746.90	1,746.90	1,746.90	1,746.90	1,746.90	1,746.90	1,746.90	1,746.90
milk quota	118.391	118.892	118.892	118.892	118.892	118.892	119.374	119.854	120.326	120.326	120.326	120.326	120.326	120.326	120.326	120.326
Payments																
Wheat	58.50	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00
Corn	58.50	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00
Other Cereals	58.50	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00
Pulses	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50	69.50
Seeds	82.94	74.47	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00	63.00
Beef ²⁾	530.00	640.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
Dairy-premium ³⁾	8.15	8.15	8.15	8.15	8.15	16.31	24.49									

1) Intervention-Milk-Price-Equivalent.

2) Beef payments 50% decoupled.

3) Dairy payments 100% decoupled from 2000.

Source: GAPsi database based on CAP-MONITOR (2004), FAO-ESC (2004), ZMP (2003).

2.2 Baseline Projections

This section summarises the baseline projections for grains, oilseeds, livestock and dairy markets over the period 2001-2015. Projections have been made under the given set of policy assumptions, population growth and overall economic variables.

Crops generally show increasing yields over the 13-year projection period (cf. Table 2.6). Relatively small or no yield increases are assumed for potatoes and pulses as little improvement in productivity is expected, according to the econometric analysis performed by VON LEDEBUR and SALAMON (2003) and LEEUWEN and TABEAU (2003). The specific supply conditions for sugar under the quota system are roughly modelled by adjusting the sugar beet area to increasing productivity under the output restrictions dictated by the Sugar Market Organisation.

Apart from sugar, and in spite of the overall reduction of farm land, the expected expansion in production over the projection period is explained by increasing yields. In addition to the fact that the productivity increase is normally inversely proportional to an increase in area, and vice versa, one has to consider the effects of technological progress in farming. The total crop area is expected to remain nearly unchanged – although opposite developments due to relative price modifications across member countries for some products may occur. With the exemption of wheat, all area inputs are expected to be reduced due to the expected increase of wheat prices against the other crops. The potato area is expected to show the strongest reduction, i. e., by more than 3 % in the period.

Table 2.6: Harvested area and yields, EU15

	2002	2015		2002	2015	
	Area harvested (1000 ha)		Change in percent	Yield (ton/ha)		Change in percent
Wheat	19.41	19.65	1.2	5.70	7.00	22.7
Maize	4.55	4.44	-2.4	8.72	10.41	19.4
Other cereals	17.90	17.42	-2.7	4.09	4.82	17.9
Total cereals	41.86	41.51	-0.8			
Pulses	3.00	2.93	-2.4	1.41	1.42	0.8
Oilseeds	6.11	6.02	-1.6	2.31	2.75	19.2
Potatoes	1.52	1.47	-3.3	33.32	36.19	8.6

Source: GAPsi calculations.

Within the group of grains, the projected change in production (Table 2.7) varies from a decrease in pulses by about 1.5 % to increases by 24 %, 16 %, 15 % for wheat, corn and other cereals, respectively, in 2015. The oilseed (rape, soy and sunflower) production is expected to increase over the period by 17 %, and for potatoes an increase of only 3 % is

projected. The unchanged figures for sugar are due to the (interim) assumption of no change in the quantity regulation within this market organisation.

Table 2.7: Crop production, EU15

	2002	2015	Change in percent
	Production (1000 ton)		
Wheat	110.24	136.91	24.19
Maize	39.71	46.20	16.33
Other cereals	73.15	84.51	15.53
Total cereals	223.10	267.61	19.95
Pulses	4.25	4.18	-1.57
Oilseeds	13.97	16.50	18.10
Potatoes	50.29	51.83	3.08
Sugar	16.12	16.12	0.00

Source: GAPsi calculations.

Human consumption of cereals, sugar and potatoes is projected to develop moderately, with no prominent increase over the period.

Feed use of cereals and oilseed (Table 2.8) will be stimulated through the expansion of pork and poultry production. The usage of oilseed meal is also expected to grow, thereby pushing seed imports for crushing. Among the crops used as feed, different levels of usage may occur due to regional price differences. Time series analysis by product for Germany suggest, e.g., that rape seed in particular might maintain its strong increase of usage rate.¹¹

Table 2.8: Food and feed use of crops (EU15, 1000 tons)

	2002	2015	Change in percent	2002	2015	Change in percent
	Food use (1000 ton)			Feed use (1000 ton)		
Wheat	43.78	44.22	1.01	38.97	43.27	11.04
Maize	8.77	8.87	1.18	31.52	32.83	4.18
Other cereals	11.31	11.41	0.90	48.06	49.16	2.27
Potatoes	47.10	48.08	2.07			
Sugar	11.54	11.79	2.17			
Oilseeds (crushing)				39.26	65.71	67.37
Meals				34.06	36.81	8.08

Source: GAPsi calculations.

¹¹ The same econometric analysis indicate that the domestic use of soybean and sunflower seed and the demand for crushing is also expected to rise over the projection period.

Projection results also indicate a strong increase in the EU15 seed crushing demand (Table 2.8). This increase comes in line with the increase in projected seed imports, leading to an inversion of the net-trade status in the meal market of the EU15 that is to affect the export of meals from 2011 onwards.

EU demand for sugar will remain almost stable depending on population, income and prices specially as no change in the sugar market organisation is assumed. It must be noted that several elements of the sugar market organisation like the ‘A’ and ‘B’ quotas and the ‘C’ amount of sugar are roughly modelled in GAPsi.

Table 2.9 presents the development of market prices for crops in the EU15 over the projection period. The development of wheat and maize prices follows the world market price pattern with increases of 22 %, and 12 %, respectively, on the producer price level. Prices of other cereals instead increase over the projection period by about 28 %. Oilseed prices are projected to decrease by around 6 % during the period while the potato price increases by less than 3 % over the period. As no changes in the demand pattern are implemented nor specific assumptions on the future sugar market policy made, no price change can be observed for sugar.

Table 2.9: EU prices of crops and sugar

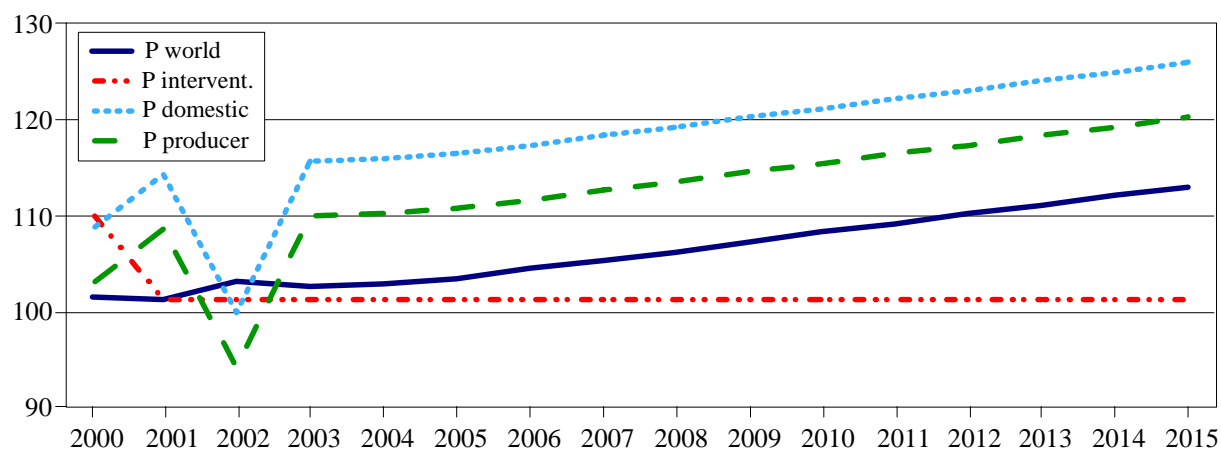
	2002	2015	Change in	2002	2015	Change in
	Production price (€/ton)		percent	Dom. market price (€/ton)		percent
Wheat	140.68	171.17	21.67	1,226.39	1,256.88	2.49
Maize	121.19	135.65	11.93	1,206.90	1,221.36	1.20
Other cereals	94.09	120.01	27.54	1,179.80	1,205.72	2.20
Seed	229.53	214.81	-6.42	2,850.34	2,835.62	-0.52
Potatoes	92.39	95.05	2.88	752.87	755.53	0.35
Sugar	599.60	599.60	0.00	3,744.40	3,744.40	0.00

Source: GAPsi calculations.

This stronger increase in the other cereals producer price is due to the development illustrated in Figure 2.1. Here it can be seen that even with the reduction of the intervention price (P_{int}) for cereals under the Agenda Reform in 2001, the world market price (P_w) was not yet high enough when compared to the intervention price (P_{int}) to determine the EU domestic market (P_{dom}) and the EU producer (P_{pr}) prices. While the model suggests that there is an initial period of ‘uncertainty’ in finding a proper equilibrium price (symbolized by heavy fluctuations of market and producer prices) it is only from 2003/4 onwards that the world market leads a continuous increase in the European price. Thereby according to the model projection, after 2004, the European

market equilibrium price is no longer influenced by the intervention price, but depends on the world market price.¹²

Figure 2.1: Other cereals projected price development, 2000-2015 (€/ton)



Source: GAPsi calculations

Concerning the European (EU15) livestock and dairy sectors, the main findings can be summarised as follow (cf. Table 2.10). Per capita consumption in the baseline projections will increase moderately for most commodities in the livestock group. The only decrease can be noted for beef meat. But with regard to total per capita meat consumption, the increases in poultry lamb and pig meat nearly compensate for the decrease in beef meat (cf. Figure 2.2).

Table 2.10: Per capita consumption of dairy and meat in the EU15

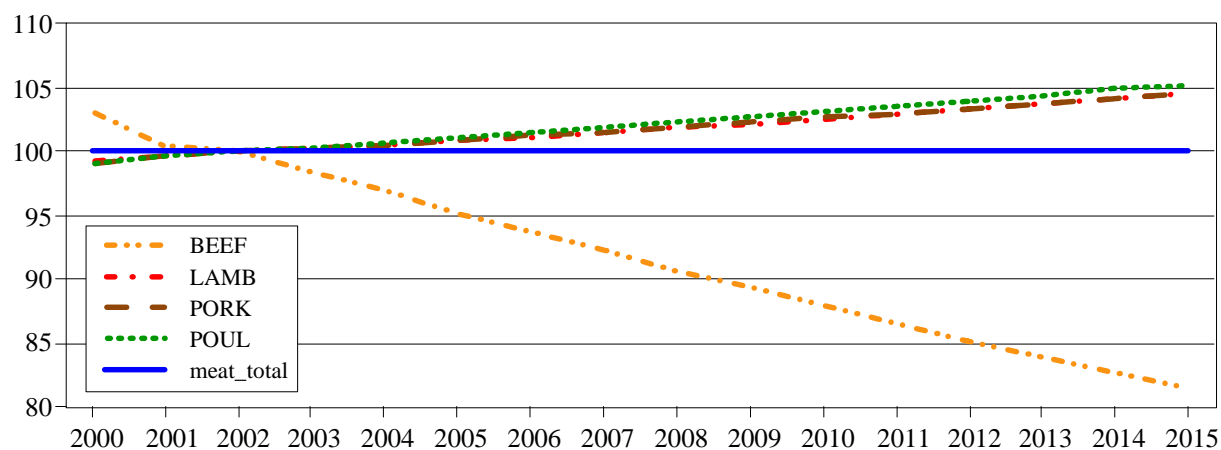
	2002	2015	Change in percent
	Production price (kg/cap.)		
Dairy	308.21	308.92	0.23
Beef	18.44	15.03	-18.51
Lamb	3.66	3.83	4.45
Pork	44.37	46.36	4.49
Poultry	21.08	22.20	5.32
Eggs	12.38	12.51	1.03

Source: GAPsi calculations.

¹² Newest, for these calculations not considered, developments in worldwide yields and stock changes altered this price development.

While in 2002 the EU per capita consumption of beef, lamb, pork and poultry meat was 87.5 kg, the model projects an overall meat consumption in 2015 of 87.4kg.

Figure 2.2: Per capita consumption of meat in the EU15 (2002= 100)



Source: GAPsi calculations

Regarding the production figures, the baseline projection (cf. Table 2.11) indicate an increase in the dairy aggregate production, induced basically by the implemented milk quota expansion. On the other hand, aggregate demand for dairy products is expected to increase accompanying the development in average market prices (-21 %) due to the reduction of the dairy intervention prices (cf. Table 2.12).

Table 2.11: Production and demand of livestock in EU15

	2002	2015	Change in percent	2002	2015	Change in percent	2002	2015
	Production (1000 t)			Demand (1000 t)			<i>Self-sufficiency</i>	
Dairy	126.44	127.88	1.14	116.92	118.60	1.44	1.08	1.08
Beef	7.23	5.76	-20.34	6.99	5.77	-17.53	1.03	1.00
Lamb	1.15	1.19	4.19	1.39	1.47	5.70	0.82	0.81
Pork	18.04	20.71	14.82	16.83	17.80	5.75	1.07	1.16
Poultry	9.05	10.86	20.03	8.00	8.52	6.58	1.13	1.27
Eggs	5.23	5.31	1.63	4.70	4.80	2.24	1.11	1.11

Source: GAPsi calculations.

Production of pig, poultry and sheep meat is likely to increase over the considered period, while production of beef is expected to decrease accompanying the negative trend in per capita consumption. From Table 2.11 it can be derived that in 2015 at the end of the projection period the EU15 is supposed to remain a net exporter in all meat markets except for lamb. The model projects decreases in the self-sufficiency rates for dairy

products and eggs¹³, while the beef is projected to end the projection period close to self-sufficiency increases in self-sufficiency are projected for pig and broiler meat.¹⁴

Finally, Table 2.12 shows prices for the animal products. The aggregate producer price for dairy products is expected to decrease most strongly as the intervention prices for butter and skimmed milk (both represented here by the comprehensive IMPE¹⁵) are reduced and as the milk quota is augmented under the Luxembourg-Agreement: The direct payments introduced at the same time are supposed to be fully decoupled from production (cf. Table 2.5) and are part of the single-farm-payment (SFP) – its income impact is on farmers' budgets and its influence on production decisions is therefore not modelled in GAPsi.

Table 2.12: Producer and market prices on dairy and livestock markets in EU15

	2002	2015	Change in	2002	2015	Change in
	Producer incentive		percent	Market price		percent
	price (€/ton)			(€/ton)		
Dairy	283.14	222.61	-21.38	283.64	223.11	-21.34
Beef	2,466.69	1,985.22	-19.52	1,771.69	1,665.22	-6.01
Lamb	3,986.77	3,845.02	-3.56	4,136.29	3,994.54	-3.43
Pork	1,253.74	1,220.13	-2.68	1,292.04	1,258.43	-2.60
Poultry	580.47	534.79	-7.87	615.47	569.79	-7.42
Eggs	554.47	554.41	-0.01	575.19	575.13	-0.01

1) The producer incentive price is inclusive premiums.

Source: GAPsi calculation.

In the context of the present projections, the beef sector is on the one hand clearly influenced by the reduction of the intervention (respectively after 2002 the basic) price and the (compensatory) increase in premiums (cf. Table 2.5). Because these direct payments are modelled as part of the producer 'incentive' price in GAPsi the producer price is higher than the correspondent market price. On the other hand, these payments are assumed to be decoupled from production by a factor of 0.5, leaving 50 % of the direct payments from 2004 on to affect the price-quantity relationship. At least the level of protection and the trends in demand continue to influence the shape of the projections. Figure 2.3 gives the anticipated development of the prices in the beef market. One should

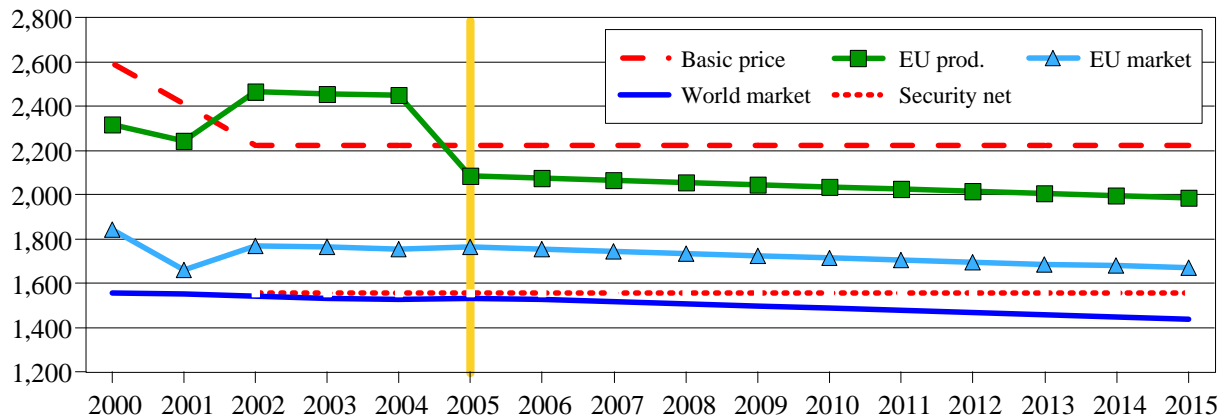
¹³ No special assumptions for the eggs market were made

¹⁴ The SSF absolute changes, in parenthesis, within the period are projected to be for dairy from 1.08 to 1.08 (-0.00), beef from 1.05 to 1.20 (+0.15), lamb from 0.82 to 0.81 (-0.01), pork from 1.07 to 1.15 (+0.09), poultry 1.13 to 1.26 (+0.13), eggs from 1.11 to 1.10 (-0.02).

¹⁵ Details to the determination of the IMPE (Intervention-Milk-Price-Equivalent) see CAP-Monitor, Chapter 5-2-7.

be aware that the initial level of the basic price has already been affected by repeated reductions of the administered price.

Figure 2.3: Beef market prices in EU15 (€/ton)
(partial decoupling from 2004) onwards

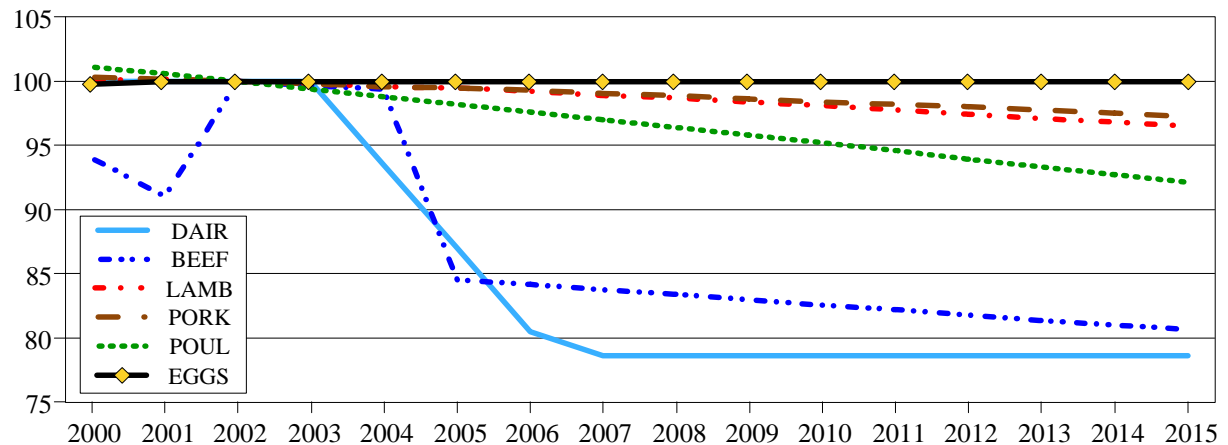


Source: GAPsi calculations

Furthermore, it must be kept in mind that the (compensatory) direct payments, that in the past caused an increase of the producer (incentive) price, are assumed here to be partially decoupled. This is to result in lower producer (incentive) prices – as part of the premiums are then directly transferred to farmers’ income and no longer to be classified as proper ‘incentives’ to production.

As Figure 2.4 shows the politically induced price reduction in the livestock and dairy sectors due to decoupling, dairy product quota expansion and intervention price reduction.

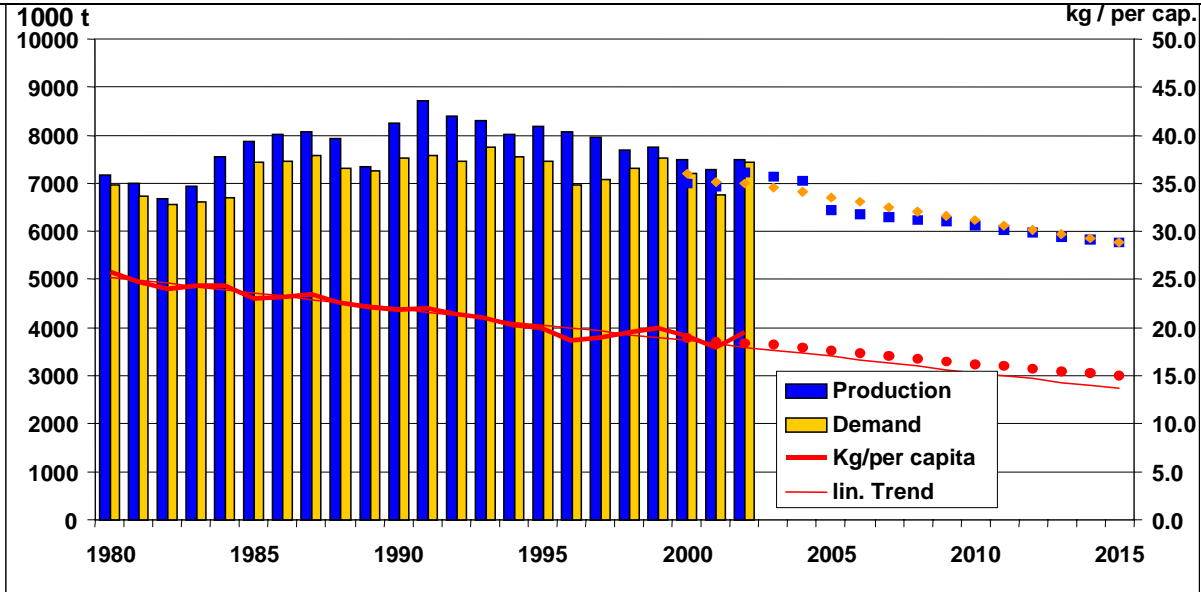
Figure 2.4: Producer price index EU15, 2002-2015 (2002= 100)



Source: GAPsi calculation

Figure 2.5 shows as indicated before that as a result of these combined effects the market will, in the case of beef, no longer be seriously oversupplied. In light of the developments of the WTO negotiations in the Doha-Round, this is to be seen as a desirable result because export subsidies are one of the key issues in the pending agricultural negotiations.

Figure 2.5: Beef production and demand in the EU15 – partial decoupling –



Source: GAPsi calculations and model database.

3 EU-Enlargement scenario

3.1 Assumptions

In the following, the behaviour of GAPsi is examined under the assumption of EU enlargement (by switching from EU15 to EU25) from (May) 2004 on meaning the application of CAP-instruments to the group of acceding countries (cf. Table 2.1). For GAPsi, the enlargement will start to be visible in 2004. That means that the acceding countries are treated, in terms of trade, from 2004 on as members of the customs union of the EU – although it might be argued that with the official enlargement starting in the spring of 2004, agricultural production decisions might not be relevant for the 2004/5 crop year.

The relevant overall economic variables and price related CAP-instruments considered for these countries by GAPsi are as depicted in section 2. Table 3.1 shows the specific quantitative restrictions (quotas) on production implemented for the relevant model regions.

Table 3.1: Policy assumptions for acceding countries (1000 tons)

	2005	2006	...	2015
Milk-quotas				
Poland	8,964	8,964		8,964
Hungary	1,947	1,947		1,947
OMEE	8,258	8,258		8,258
Sugar-quotas				
Poland	1,671,930	1,671,930		1,671,930
Hungary	401,680	401,680		401,680
OMEE	884,780	884,780		884,780

Source: CAP-Monitor (2003).

3.2 Enlargement scenario projections

The most obvious result from the EU enlargement is the physical one. Results show that the production basis measured in terms of area and livestock numbers expands as expected (on average by around 20 %). A particular increase in the cultivated area seems to occur in the case of potatoes, where GAPsi indicates a steep increase that nearly corresponds to a duplication (+95 %) of the harvested area. A negligible increase is indicated in the case of pulses and lamb (Table 3.2).

Table 3.2: Effect of EU enlargement on area and livestock stocks and production

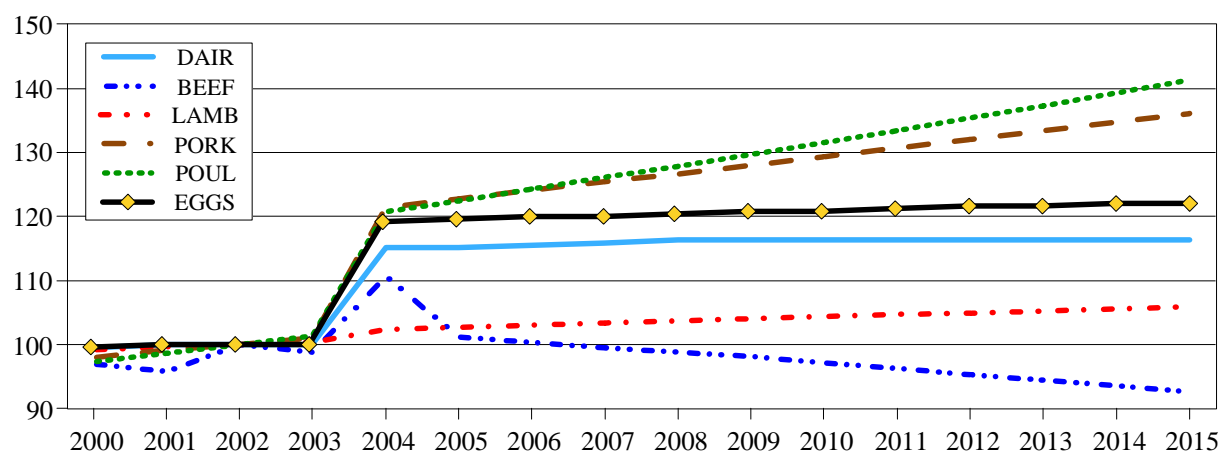
	Area and livestock stocks (1000 ha, 1000 animals)				Production (1000 t)			
	2000	2003	2005	2007	2000	2003	2005	2007
Wheat	19.43	23.78	4.36	22.43	112.26	135.12	22.86	20.36
Maize	4.54	6.30	1.75	38.59	40.15	48.04	7.89	19.65
Other cereals	17.87	23.98	6.11	34.21	73.77	95.04	21.27	28.83
Seed	6.10	7.47	1.36	22.34	14.18	17.62	3.44	24.26
Potatoes	1.51	2.95	1.44	95.18	50.42	82.06	31.64	62.75
Sugar	1.68	2.05	0.36	21.54	16.12	19.08	2.96	18.36
Dairy	22.37	26.96	4.59	20.50	126.44	145.61	19.17	15.16
Beef	26.49	32.05	5.56	21.01	7.146	7.994	0.848	11.870
Lamb	74.61	75.39	0.78	1.05	1.15	1.17	0.02	1.74
Pork	215.23	258.03	42.80	19.89	18.23	21.90	3.67	20.13
Poultry	0.09	0.11	0.02	18.40	9.17	10.92	1.75	19.08
Eggs	0.33	0.42	0.09	25.80	5.24	6.24	1.00	19.08

Source: GAPsi calculations.

Confirming previous observations, as well as findings from other studies, the total cereal and oilseed area harvested in the former EU15 is relatively inelastic and remains at the same level as in the baseline.

Production changes measured by the indexes shown in Figure 3.1 give an idea about the developments in the livestock sector. Especially beef production will pass through an important process of contraction.

Figure 3.1: EU livestock production development – enlargement scenario
Production in EU15/EU25 (2002 = 100)



Source: GAPsi calculations

Table 3.3: Changes between enlargement scenario and baseline projection for market and producer prices in percent

Pdom_	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
WHEA	0.00	0.00	0.00	0.00	-0.28	-0.28	-0.27	-0.27	-0.27	-0.26	-0.26	-0.25	-0.25	-0.25	-0.24	-0.24
CORN	0.00	0.00	0.00	0.00	-0.25	-0.25	-0.25	-0.25	-0.24	-0.24	-0.24	-0.24	-0.24	-0.24	-0.24	-0.24
OCER	0.00	0.00	0.00	0.00	-0.46	-0.45	-0.45	-0.45	-0.45	-0.45	-0.44	-0.44	-0.44	-0.44	-0.44	-0.44
PULS	0.00	0.00	0.00	0.00	-0.34	-0.33	-0.33	-0.33	-0.33	-0.33	-0.33	-0.33	-0.33	-0.33	-0.33	-0.33
SEED	0.00	0.00	0.00	0.00	-0.52	-0.52	-0.53	-0.53	-0.54	-0.54	-0.55	-0.55	-0.56	-0.57	-0.58	-0.58
OILS	0.00	0.00	0.00	0.00	-0.09	-0.09	-0.09	-0.08	-0.08	-0.08	-0.07	-0.07	-0.07	-0.07	-0.07	-0.06
MEAL	0.00	0.00	0.00	0.00	-0.14	-0.13	-0.12	-0.12	-0.12	-0.11	-0.11	-0.11	-0.11	-0.10	-0.10	-0.10
POTA	0.00	0.00	0.00	0.00	-4.14	-4.15	-4.16	-4.17	-4.18	-4.19	-4.20	-4.21	-4.23	-4.24	-4.25	-4.27
SUGR	0.00	0.00	0.00	0.00	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
DAIR	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
BEEF	0.00	0.00	0.00	0.00	-0.32	-0.32	-0.33	-0.33	-0.34	-0.35	-0.36	-0.36	-0.37	-0.38	-0.39	-0.40
LAMB	0.00	0.00	0.00	0.00	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.36	-0.36	-0.36	-0.36
PORK	0.00	0.00	0.00	0.00	1.75	1.75	1.76	1.76	1.76	1.76	1.76	1.76	1.76	1.77	1.77	1.77
POUL	0.00	0.00	0.00	0.00	12.62	12.70	12.79	12.88	12.97	13.07	13.16	13.26	13.36	13.46	13.56	13.66
EGGS	0.00	0.00	0.00	0.00	4.33	4.36	4.40	4.44	4.48	4.52	4.56	4.60	4.64	4.68	4.73	4.77
Ppr_	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
WHEA	0.00	0.00	0.00	0.00	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.08	-0.07	-0.07	-0.07	-0.07
CORN	0.00	0.00	0.00	0.00	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07	-0.07
OCER	0.00	0.00	0.00	0.00	-0.14	-0.14	-0.14	-0.14	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13	-0.13
PULS	0.00	0.00	0.00	0.00	-0.19	-0.19	-0.19	-0.19	-0.19	-0.19	-0.18	-0.18	-0.18	-0.18	-0.18	-0.18
SEED	0.00	0.00	0.00	0.00	-0.29	-0.29	-0.29	-0.30	-0.30	-0.30	-0.31	-0.31	-0.31	-0.32	-0.32	-0.33
OILS	0.00	0.00	0.00	0.00	-0.04	-0.04	-0.04	-0.04	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
MEAL	0.00	0.00	0.00	0.00	-0.08	-0.07	-0.07	-0.07	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06
POTA	0.00	0.00	0.00	0.00	-3.91	-3.92	-3.93	-3.94	-3.94	-3.95	-3.97	-3.98	-3.99	-4.00	-4.02	-4.03
SUGR	0.00	0.00	0.00	0.00	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
DAIR	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
BEEF	0.00	0.00	0.00	0.00	-0.13	-0.16	-0.16	-0.16	-0.17	-0.17	-0.17	-0.18	-0.18	-0.18	-0.19	-0.19
LAMB	0.00	0.00	0.00	0.00	-0.34	-0.34	-0.34	-0.34	-0.34	-0.34	-0.34	-0.35	-0.35	-0.35	-0.35	-0.35
PORK	0.00	0.00	0.00	0.00	1.61	1.61	1.61	1.61	1.62	1.62	1.62	1.62	1.62	1.62	1.62	1.63
POUL	0.00	0.00	0.00	0.00	13.46	13.55	13.65	13.75	13.85	13.96	14.07	14.17	14.28	14.40	14.51	14.62
EGGS	0.00	0.00	0.00	0.00	4.31	4.34	4.38	4.42	4.46	4.50	4.54	4.58	4.62	4.66	4.71	4.75

Source: GAPsi calculations.

As Table 3.3 shows neither EU prices are going to react very much to the enlargement as long as supply and demand conditions remain as proposed in the model – one main reason is that since the shares of the acceding countries are rather low compared to EU and world levels they can hardly affect the bigger markets (cf. Table 3.3). Furthermore the period of pre-accession allowed for a smooth transition diminishing the probability of market disruptions. Poultry prices show a strong increase for the projection due to enlargement. Doubts on this specific result are justified as the technical progress has until now not only always matched the world-wide expansion of demand but also allowed for continuous price decreases.

4 Concluding Remarks

This report is a first documentation of the state of new work on GAPsi. The system was updated regarding its database and is ready to start analysis of EU enlargement effects. Provisions for the implementation of policy relevant scenarios have been made. Changes in exchange rate relations can be taken into account and different assumptions on the impact of decoupled direct payments on livestock products may be accessed.

No influence on herd management is considered in GAPsi. That means that policies or changes in relative prices that in practice eventually may influence stock levels are not considered in the model. Depending on the implementation and likely reactions of practitioners to policy instruments in the course of de-coupling of direct payments from production, the present model formulation may still produce some problematic projections for the livestock sector markets.

Moreover, and as a matter of fact, the type of model chosen for GAPsi (cf. Section 1) is bound to cause some basic inconveniences. Due to its structure in the implementation of trade flows, the model is not able to react on specific bilateral trade agreements or provisions. The analysis of decoupling subsidies from production can also be only tackled partially as GAPsi is sensitive only to policy measures or instruments that affect product prices and quantities ('real' product markets).

However, in order to tackle the presently important issues related to possible impacts of decoupling premiums on farm incomes and on the environment through cross-compliance targets, GAPsi can fruitfully be used in the broader framework of the FAL-model-network. Within this network model interconnection is possible and allows for the transmission of impacts of policy changes from the product market level to farm and regional levels and vice versa.

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