

Impact analysis of the CAP reform on main agricultural commodities

EOP Report

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Summary

This study has been carried out for the European Commission's Joint Research Centre to analyze agricultural policies at Member State, EU15 and EU25 levels as well as for Bulgaria and Romania. The modelling tool allows for projections and policy analysis (up to a 10 year horizon) for the enlarged EU.

The objectives of this study were threefold:

- 1) to develop an agricultural sector model for the enlarged EU, implemented in standard computer software (GAMS and MS Excel) and make operational its preliminary version in the Commission's premises;
- 2) to provide market projections for the main European agricultural commodities based on the latest agricultural and trade policy developments and information available;
- 3) to assess the impacts of some scenarios on the main European agricultural commodities. In particular, these scenarios concern the introduction of decoupling and new direct payment schemes as well as the enlargement of the EU.

Projections and simulations were made for:

- 1) the individual EU Member States: Austria, Belgium (including Luxembourg), Denmark, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, Spain, Sweden, the United Kingdom, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, the Slovak Republic and Slovenia;
- 2) Bulgaria and Romania who acceded to the EU in January 2007;
- 3) EU15 as a whole (15 Member States to May 2004);
- 4) EU25 as a whole (25 Member States from May 2004);
- 5) EU27 as a whole (25 Member States from May 2004, Bulgaria and Romania from January 2007).

The emphasis of the projections was on supply, demand, trade and prices in all countries for the main agricultural commodities like cereals, oilseeds, livestock products and dairy products. The study provided the following outputs:

- 1) a modelling system for the agricultural sector in EU Member States, the integrated EU15 as a whole, Bulgaria, Romania and the aggregated EU25/27 as a whole;
- 2) reports with descriptions on research techniques developed, projection results, results of validation procedures, results and analysis of baseline and scenarios;
- 3) presentations in a workshop with agricultural sector experts from the member states to endorse the consistency of the model results presented;
- 4) participation in training sessions in the Commission premises in Seville, including practical courses and provision of user documentation.

The economic modelling tool developed in this study was built under the AGMEMOD

framework¹. AGMEMOD is a dynamic, partial, multi-country, multi-market equilibrium system, which provides significant details on the agricultural sector in each EU Member State as well as in the most recently acceded countries Bulgaria and Romania. The system has been largely econometrically estimated at the individual Member State level and produces results for the EU as a whole. The country models contain the behavioural responses of economic agents to changes in prices, policy instruments and other exogenous variables on the agricultural market. Commodity prices adjust so as to clear all markets considered. Projections have been generated for each year to a 10-year horizon. For each commodity modelled and in each country, the system generates the main domestic market variables such as production, food and feed demand, prices, trade and stocks. Agricultural income is calculated at the sector level. As all the policy relevant agricultural markets are covered, the econometrically modelled country specific agricultural markets also provide a sound basis for the analysis of the impacts of policy changes.

The modelling system is solved for the levels of prices that balance supplies and utilisation of each product at both Member State and EU25/27 levels taking into account the international trade and other commitments of the EU. Information from global models on world market prices, which are exogenous in AGMEMOD, is used to represent the influence of the rest of the world commodity markets on those of the EU.

To assure that the projections of the modelling system are coherent from an economic and policy perspective, projections have been validated by standard econometric methods and through consultation at Member State level with experts who are familiar with the specificities of the agricultural sectors in each country modelled.

The project has been carried out by 22 teams, representing the different EU Member State countries complemented with the currently acceded countries Romania and Bulgaria. All teams, belonging to the AGMEMOD Partnership, conducted the baseline and scenario analyses up to 2015. Market projections for the main agricultural commodities were provided based on the latest agricultural and trade policy developments and information available for each Member State and the aggregate EU25 and EU27. Regarding to the scenario analyses, the following scenarios were assessed:

- Further CAP Reform scenario, in which all direct payments are decoupled from 2007 and the rates of compulsory modulation are doubled to 10% from 2007 onwards.;
- Exchange Rate scenarios, which analyses three alternative paths of the US dollar versus the euro;
- Enlargement scenario, which examines the consequences of the accession to the EU of Bulgaria and Romania (from January 2007)

The key findings of this study regarding the baseline analyses are as follows:

- despite the decoupling measures of the 2003 CAP reform, the production of several EU crops (wheat, maize, rapeseed) will grow over the period 2005 to 2015;
- the decoupled payments will induce a further decline in beef and lamb production;

¹ AGMEMOD is the acronym for Agricultural sector in the EU old Member States and newly Associated States in Central and Eastern Europe: econometric Modelling for projections and analysis of EU policies on agriculture, forestry and the environment.

-
- pig meat and poultry production are largely unaffected by decoupling;
 - the dairy sector is negatively affected by declining prices, that occur largely as a consequence of the reductions in intervention prices for dairy, but quotas will be fulfilled;
 - there will be a shift away from butter and skimmed milk powder and growth in the production of cheese.

The key findings of this study regarding the scenario analyses are as follows:

- the Further CAP Reform scenario results fit with *a priori* expectations, in that the impact of the scenario is very limited due to the fact that many Member States had already chosen to largely decouple direct payments under their national level implementation of the Luxembourg Agreement;
- the Exchange Rate scenario projection results largely accord with a priori expectations. A decline (increase) in the value of the €/US dollar exchange rate compared with the baseline assumptions leads to higher (lower) internal EU market prices and consequent adjustments to production, domestic use, imports and exports;
- the 2007 enlargement of the EU with the accession of Romania and Bulgaria is not expected to change dramatically the situation on most key agricultural markets. There are increases projected for the production of EU sunflower oil, soft wheat and maize, but the accession is projected to have less of an impact on livestock and meat markets.

1 Introduction

1.1 Background

Within the study “Impact analysis of the CAP reform on main agricultural commodities” (contract 150267-2005-FIED-NL) a modelling system for EU Agriculture has been developed. This model captures (i) the dynamics of a large number of agricultural commodity markets and (ii) the impact on these markets of a diversity of applied policy instruments as implemented across each EU Member State, including Bulgaria and Romania. This is the Final Report in a series of reports relating to this study. The contents of the earlier reports are now summarized.

Report 1a: delivered in December 2005, described the techniques used by the AGMEMOD Partnership to:

- link the agricultural sector markets including flow chart examples;
- link the country level models and close the country and EU level models;
- implement the key prices in the solution of the models at country and EU levels;
- establish a link between EU Member States, Bulgaria and Romania;
- detail the source of exogenous variables like macro-economic variables, policy instruments and world market prices, and
- define a set of output variables to be simulated by the country level and EU level models like market balances, prices, and agricultural sector income.

Report 1b: delivered in March 2006, focused on:

- the description of the new research techniques that have been developed for the AGMEMOD system as requirements for the study carried out for IPTS;
- the structures of the country level commodity models, the stand-alone individual country model and the combined EU models;
- the implementation of additional commodities: templates for Rye and Other grains were derived;
- the implementation of the reformed CAP in the country models, representing the nationally differentiated Single Payment System’s implementation. Similar general methods have been developed to represent the implementation of the Single Area Payment Scheme in the new Member States;
- set up of a standardised approach to generate baseline projections for the main commodities, markets and sectoral incomes;
- the linkage of the old Member State models into an EU15 model;
- the analysis of policy and enlargement scenarios and;
- the design of the software.

Report 2: delivered in early June 2006, focused on:

- further development of the general procedures developed in Reports 1a and Report 1b to deal with specific country level differences in sector structures;
- resolution of data shortcomings; and
- incorporation of policy to reflect differences in policy implementation.

Therefore, Report 2 provided an amended approach to reflect the CAP reform and its implementation. It also specified the actual introduction of the new commodities into the AGMEMOD model based on the templates provided in Report 1b. Finally, it allowed the generation and evaluation of new baseline projections using the extended stand-alone versions of the country models. Areas for further improvement of the AGMEMOD model and its associated results, as well as some recommendations were based on the preliminary projections provided in Report 2.

Report 3: delivered in July 2006 delivered in early June 2006, focused on:

- further development of the general procedures developed in Reports 1a and Report 1b to deal with
- further development of the general procedures developed
- the details of the CAP reform scenarios;
- the exchange rate scenarios and EU enlargement scenarios to be analysed using the AGMEMOD Partnership model, (including macroeconomic and microeconomic assumptions);
- detailed scenario descriptions and policy assumptions.

Report 4: delivered in December 2006 contained:

- the assumptions underlying the Baseline and Scenario projections. Full details of the scenarios are available in Chapters 2, 3 and 4 of Report 3;
- Baseline and Scenario results for the EU25 together with the results of the EU Enlargement and Non-enlargement scenarios for Bulgaria and Romania;
- a discussion of the results, details some caveats in relation to the interpretation of these results and describes how some of these caveats might be addressed in order to further improve the results;
- the results of both the Baseline and Scenario simulations on a country by country basis. For each country, Baseline and Scenario projection results are presented together with commentary on the Baseline projections and the impact of the scenarios analysed. The set of scenarios analysed differed between EU Member State and accession countries. For Bulgaria and Romania the scenarios analysed are limited to the Enlargement and Non-Enlargement scenarios.

Section 1.2 of this report addresses the objectives of the study carried out for the IPTS, while

section 1.3 gives an overview of this report.

1.2 Objectives

This study had three main objectives:

- 1) to develop an agricultural sector model for the enlarged EU, implemented in standard computer software (GAMS and MS-Excel) and installed its preliminary version on the IPTS computers;
- 2) to provide market projections for the main European agricultural commodities;
- 3) to assess the impacts of various scenarios on the main European agricultural commodity markets. In particular, the scenarios analysed have to represent differential implementation of the CAP across Member States and the enlargement of the EU.

The model developed had to provide projections and simulations for:

- 1) the individual EU Member States: Austria, Belgium (including Luxembourg), Denmark, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, Spain, Sweden, the United Kingdom, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, the Slovak Republic and Slovenia;
- 2) the recently acceded countries Bulgaria and Romania from January 2007;
- 3) EU15 as a whole (15 Member States to May 2004);
- 4) EU25 as a whole (25 Member States from May 2004);
- 5) EU27 as a whole (25 Member States from May 2004, Bulgaria and Romania from January 2007).

Emphasis of the projections was on supply, demand, trade and prices in all countries for the following agricultural commodities:

- 1) soft wheat, durum wheat, barley, maize, rye, other grains;
- 2) rapeseed, sunflower seed, soybeans, vegetable oils and meals;
- 3) milk, butter, skimmed milk powder, cheese, whole milk powder;
- 4) beef and veal, pork, poultry, sheep and goats.

To gain quantitative insights into the impact of the 2003 CAP reforms, the EU enlargement and the likely impact of the further CAP reform, the use of an economic modelling tool was required. The fulfilment of the study objectives has been achieved by building on the AGMEMOD model².

1.3 Overview

The Final Report presents the results of the study “Impact analysis of the CAP reform on main agricultural commodities” (contract 150267-2005-FIED-NL) following the Work Package 1 up

² AGMEMOD is the acronym for Agricultural sector in the EU- old Member States and Newly Associated States in Central and Eastern Europe: econometric Modelling for projections and analysis of EU policies on agriculture, forestry and the environment.

to Work Package 7. The remainder of the report is comprised as follows. Chapter 2 describes the organisation of the project (WP1) in terms of project structure, work plan and communication tools. Chapter 3 summarises the characteristics of the developed modelling tool with special attention to the features implemented due to this project (WP2, WP3, WP4 and WP7). Chapter 4 presents the baseline and scenario results on the EU10, EU15, EU25 and EU27 levels (WP5 and WP6). Finally, Chapter 5 closes the report with conclusions regarding the outcomes of this study and addresses some discussion issues in respect to the developed tool that need further attention.

2 Organisation

Ways to manage and monitor this study:

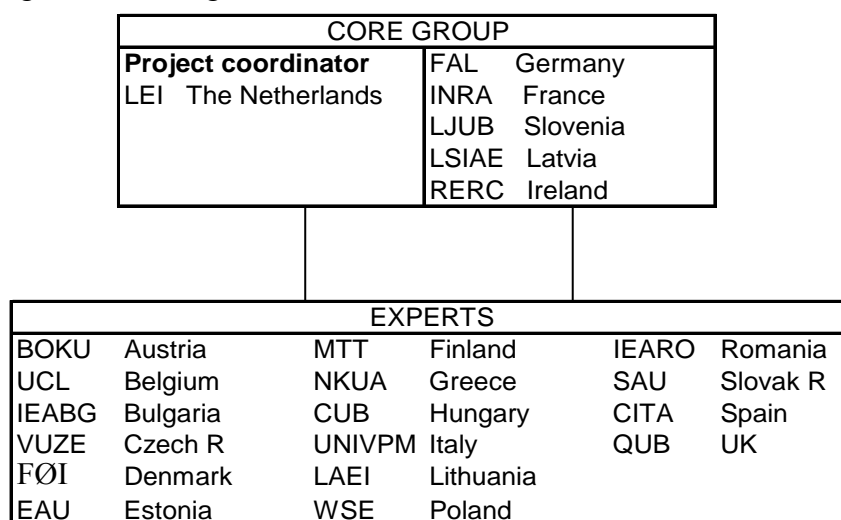
- organisation: to structure the responsibility level of participants;
- templates: to harmonize the work plan across participants;
- communication: to improve the information provision across participants.

This chapter describes the organisation of the study carried out for the IPTS. Section 2.1 presents the project structure that was created to manage the large number of teams involved in this study. Sections 2.2 and 2.3 summarises the work programme and the tools that were introduced to communicate between team members and the IPTS respectively.

2.1 Project structure

There were 22 partner organisations involved in this study, which all belong to the AGMEMOD Partnership. Each of them represents a respective Member States in the EU, complemented with partners from Romania and Bulgaria who recently acceded the EU in January 2007. Through previous projects these partners had already built up considerable experience in working as part of a large team and in sharing responsibility for the achievement of a set of objectives. In addition, the participants had experience in the area of agricultural policy modelling and policy analysis in general. Taking account of the time schedule and the available budget in this study, an organisation structure of core group and expert members has been introduced (Figure 2.1).

Figure 2.1 Management structure



The responsibilities and tasks of the actors in this organisation structure were appointed as follows.

Project co-ordinator

- responsible for communication with IPTS and partners;
- responsible for co-ordination the work with the AGMEMOD2020 study that the

- Partnership will conduct in the period 2006-2008 (6th FP project for DG-RTD);
- responsible for administrative matters;
- responsible for a timely delivery of reports, modelling tools, etc..

Core group

- responsible for monitoring and execution of tasks in this study and for co-ordinating with the AGMEMOD2020 tasks;
- responsibility go beyond the level of the individual country modelling;
- appointed as work package leaders;
- led by the overall project co-ordinator.

Expert group

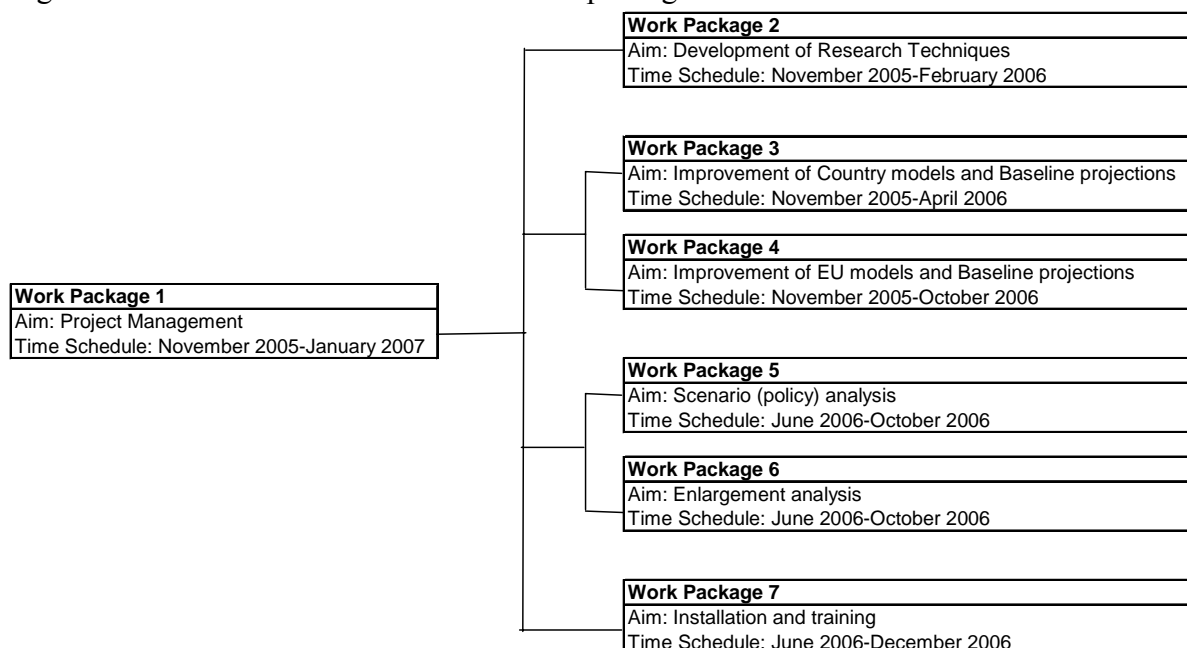
- will conduct country specific tasks;
- led by core group members.

Although the Portuguese and Swedish teams were not involved in this study, their country models were available for further development and could be handled by other partners due to the common templates used in the developed modelling system. In this study the core group members worked on the models for Portugal and Sweden.

2.2 Planning and timetable

The work programme of this study is described in detail in the technical annex of the corresponding contract and will be summarised in this section. The interdependent work packages, which were undertaken in an often simultaneous fashion, are illustrated in Figure 2.2.

Figure 2.2 Aims and time schedules of work packages



The core group members were appointed as work package leaders. In order to monitor the tasks of their work packages and to complete the study in a satisfactory way, the work package leaders

have developed templates. First, these templates were discussed and agreed upon at a management meeting (Ljubljana, 5-6 December 2005) with work package leaders from both the IPTS contract and the AGMEMOD2020 study. Second, the model templates were distributed over the partners and were followed by them.

2.3 Communication

As already mentioned, the AGMEMOD Partnership that conducted this study consisted of 22 teams from different countries in the EU27. In 2006, the participants gathered at two General Assembly meetings in Rennes and Ancona at which they agreed on work plans and discussed the progress of the study carried out for the IPTS. However, the main issue when working with such a large number of participants is to ensure the overall up-to-date project progress. To guard against the risks of poor interaction between the partners, a communication plan has been developed. In other words, to improve the information provision across the actors, the following communication arrangements were introduced:

- monthly Newsletter to the Partnership and the IPTS to inform on all kind of study-related issues regarding all the projects the Partnership worked on;
- monthly work progress report delivered by partners to the LEI;
- electronic country model versions were regularly uploaded to the AGMEMOD private website <http://www.agmodels.org/index.html>.

The main aim of these appointments, together with the agreements on organisation structure and the use of templates, was to ensure a certain level of transparency in the overall progress of the study.

3 AGMEMOD – the modelling tool

AGMEMOD model status at start of this study:

- country models of old Member States in GAMS, but some do not yet provide a feasible solution;
- country models of new Member States, Romania and Bulgaria in Excel only;
- EU9 combined model of old Member States that solves in GAMS.

AGMEMOD model status at end of this study:

- EU15 combined model of old Member States that solves in GAMS;
- country models of new Member States, Romania and Bulgaria in GAMS;
- new commodities Rye and Other Grains in countries of importance;
- Single Farm Payment system implemented in all country models.

This chapter describes the characteristics and research techniques that have been applied during the development of AGMEMOD so far. Section 3.1 summarises the work undertaken in the Fifth Framework project and herewith envisages the starting point of AGMEMOD at the start of this study. Section 3.2 lists the new elements that were added to the modelling framework through the work carried out for the IPTS.

3.1 Situation at the start

3.1.1 Old Member State models

In advance of this study, a group of EU partners (the AGMEMOD Partnership) already worked on developing dynamic multi-markets partial equilibrium country models for the markets of *crops, livestock products and dairy products*. This work was supported by public funds from the Commission under the Fifth Framework Programme over the period March 2001-July 2004. Under that research, the Partnership developed country models for the old Member States of the EU: *Austria, Belgium (including Luxembourg), Denmark, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, Spain, Sweden and the United Kingdom*. All these country models were largely econometrically estimated and were validated by experts from their respective countries.

For each individual country and for all the commodity markets mentioned in section 1.2, an operational dynamic multi-market partial equilibrium model was developed under the AGMEMOD Fifth Framework project. In general, in these models all important agricultural markets were presented by laying out supply, import, export, human and feed consumption, stocks and prices. The models also covered a detailed set of agricultural policy instruments in each country. Hence, the tools developed allow for the generation of projections and scenario simulation results for each individual country, assuming that variables endogenous to other countries models' are exogenously determined. The links between agricultural commodity markets in each country model and those of other Member States and the wider world market are captured via equations that reflect the influence of prices in other EU Member States and on the

world market prices on country prices in the country concerned. Agricultural prices, trade policies, transport costs, products differentiation, consumer preferences and market organizations may influence the extent and speed of the transmission of prices between the markets of EU Member States and between the EU and the world market. For each commodity, the market of a specific member state is seen as the *key market*, the market clearing price in the key market country is considered as the EU *key price*. To measure the influence of market imperfections on national commodity prices, the price linkage equations also incorporate product self-sufficiency rates (for the key market and the particular country) for the respective commodity as explanatory variables. Furthermore, these equations are related to the international market by net trade, prices and trade measures e.g. tariff rate quotas, export subsidies and others.

Each partner developed a functional representation of their commodity market sub-models that, when estimated with the annual time series data, formed the country level econometric models. These models sometimes deviated from the Country model template (Hanrahan, 2001) due to the following reasons:

- the need for estimated country level models to capture nationally distinct market features;
- unavailability of data with which to estimate the model in the precise form specified in the template.

The individual country models were solved as stand-alone models within a GAMS model environment (stand-alone mode). EU key prices and other variables relative to other countries were exogenously determined in these models. The theoretical basis for this approach is the assumption that prices in markets outside of the country are independent of developments in that country's market.

In stand-alone mode, the individual country models provided projections over a ten year time horizon up to 2010 for the main agricultural commodity markets and could analyse the impacts of policy reforms for each country and for the EU15 in aggregate. Excel spreadsheets were used to allow an easy access to the model results.

As a next step, the work on establishing a combination of the individual country models into a composite EU15 model was started. The EU15 combined model in AGMEMOD should establish a link of the old Member State models based on a methodology similar to that implemented at the country level. To combine individual country models, some variables that were exogenously determined when the models were simulated in a stand-alone mode needed to become endogenous variables. Examples of such variables are the self-sufficiency rates and the prices for the key markets.

As the country models do not represent closed economies, key price equations also take into account the impacts of the Rest of the World on EU agricultural sectors. For example, the EU soft wheat key price is modelled as a function of the world wheat price, the EU soft wheat intervention price, and the self-sufficiency rate for wheat in the EU, the sum of the tariff rate quotas of the EU as well as the quantitative limits of subsidized exports under the last WTO agreement.

When solving the EU15 combined model, a closure variable must be chosen to ensure that the supply and use identity holds for all markets. AGMEMOD does not consider the distinction

between intra EU and extra EU trade at the Member State level. This intra EU trade disappears at the EU level when summing supply and use identities over countries. This implies that the EU net export variable is used as the closure variable at the EU level. Hence, the dynamic multi-market multi-country EU15 combined model should allow for the generation of market projections and alternative scenario simulations for both the whole EU15 and its individual Member States at exogenous world prices. This organization of the EU15 model also should allow for the analysis of agricultural policy changes for a given subset of countries (or commodities) modelled, while considering the rest of the EU (or commodities) as exogenous.

Since the EU combined model determines the EU key prices endogenously, it captures the impact of market developments in each Member State on prices in a more thorough and economically insightful way.

The freedom to deviate from the country model template that was accorded to Partners in the 5th Framework project represents an important strength of the AGMEMOD model in that it incorporates country level knowledge and information. However, this freedom and the associated benefits came at a price in that deviations from the country level template sometimes hindered the combination of all country level models within the EU15 combined model environment. For that reason, only part of the country models was integrated into a coherent EU composite model at the end of the 5th FP project (Final Report QLRT-2001-02853, 2005).

3.1.2 New Member State models, Bulgaria and Romania

Under the same 5th Framework Programme project, the AGMEMOD Partnership also developed preliminary national models for the new Member States that joined the EU in May 2004³: *the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, the Slovak Republic and Slovenia*. Further, the countries that acceded the EU at 1 January 2007, *Bulgaria and Romania*, were modelled. The market models implemented for *crops, livestock products and dairy products* were calibrated and validated by country experts. However, modelling the newly introduced CAP instruments and the impact of CAP reform would require further research.

For each country and for all commodity markets considered, a recursive multi-market partial equilibrium model was developed. Hence, these modelling tools allowed for the generation of medium term projection of agricultural commodity supply and use and prices and for the simulation of the impacts of accession on each country. At the end of the 5th Framework project, the country models could be solved as stand-alone versions in a MS Excel system. Variables linked to the other old and new Member States were kept exogenous. So, as stand-alone versions, the models for the new Member States, Bulgaria and Romania provided 10-years projections up to 2010 for the main agricultural commodity markets.

3.1.3 Problems and actions

Table 3.1 summarises various aspects and problems relating to the country and EU modelling that required special attention in the study carried out for the IPTS in order to achieve the

³ Malta (that contributes 0.01% to GDP of EU25) is not considered, but that will not influence the results for EU as a whole. The agricultural production of Cyprus (0.1% of GDP in EU25) is captured by the Greek country model.

fulfilment of its objectives. The last column mentions the actions that were undertaken to iron out the problems and difficulties.

Table 3.1 AGMEMOD models at start of study

Country	Description of problem	Action
Old Member States	1) Technical problems in stand-alone GAMS versions. Infeasible solutions for e.g. Denmark, Spain, UK. 2) Different GAMS structure than other country models, which hampered the EU combining (Sweden).	Core group supported partners to improve their models.
EU15	1) Several technical problems revealed due to misspecification of mnemonics, different dimensions and specifications used for the same variable, etc.. 2) Danish and Swedish models were not capable to provide feasible solutions. 3) Projection period needed to be extended from 2010 to 2015. This sometimes resulted in outstanding values for variables in the old Member State models.	LEI developed the EU15 combined model. Partners provided country specific macro-economic projections up to 2015. Core group updated specific assumptions regarding world market prices, exchange rate and key prices up to 2015.
New Member States and Accession States	1) No GAMS experience. 2) Inconsistent commodity balances (sometimes unavailable). In several cases, just part of the commodity markets have been modelled. 3) Projection period must be extended from 2010 to 2015. This might result in outstanding values for particular variables in the Accession State models. 4) SAPS was modelled, not the SFP system.	GAMS Workshop and templates. Twin relationships between partners. Partners provided macro-economic projections up to 2015.
Romania	1) Only five commodities were modelled. 2) Bad quality of entire modelling system.	Big efforts were made by Core Group to improve the quality of the Romanian model. However, additional efforts are required.

3.2 Features of interest

The situation of the individual country models and the EU9 combined model at November 2005 formed the starting point of this study. These versions were adjusted and improved in the following ways:

- 1) models of new commodities were specified, estimated and implemented;
- 2) the decoupled payment system was implemented based on national choices across the Member States;
- 3) the old Member State models were combined into a EU15 model within a GAMS framework;
- 4) all models of the new Member States, Bulgaria and Romania were transformed into GAMS;
- 5) the stand-alone models for new Member States, Bulgaria and Romania were added to the EU15 combined model, which lead to EU25 and EU27 hybrid models;
- 6) design of the user-friendly software.

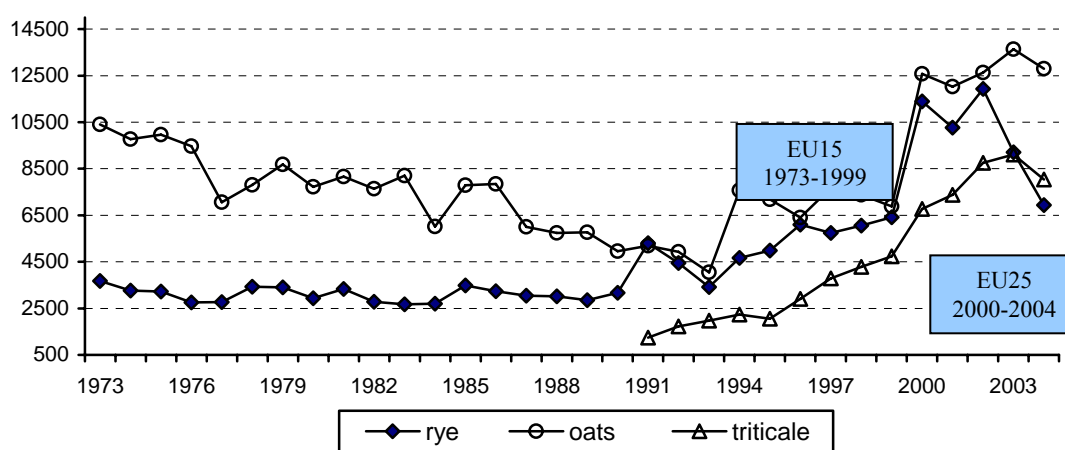
The focus of the remainder of this section is on the new features of AGMEMOD that were introduced in this study.

3.2.1 New commodities

At the start of this study, the commodity coverage for grains in AGMEMOD consisted of soft wheat, durum wheat, barley and maize. As a requirement for the IPTS, the model needed to be extended with two new crops, 'rye' and 'other grains' (which consists of 'triticale', 'oats and others') in the countries where these products are of significance. Figure 3.1 shows the production of these extra commodities in the EU15 (up to 2000) and the EU25 (from 2000). Planting rye has some agronomical advantages over other crops. Compared to other crops, rye is relatively winter hardy, can even produce economical yields on poor sandy soils and is less influenced by drought. In some countries, like Germany, rye is partly sold as bread cereal. But when rye is used as livestock feed it has a low feed value compared to other feed grains and is mixed only in small proportions in feed.

Since the unification of the intervention prices in the cereal sector in the mid nineties, rye production in the EU is in excess of demand and is purchased by the Commission in intervention stocks. From 2000, the decline in intervention prices has caused a drop in rye production (see Figure 3.1). In case of fertile soils, the alternatives for rye would include wheat, barley, oats, rapeseeds and sugar beet crops. However, as rye is mostly planted on less fertile soils, potatoes and triticale are options. But due to the special features of rye, in some areas there are no alternative crop choices at all so that these areas might become fallows.

Figure 3.1 Rye, oats and triticale production in the EU (1,000 ton)



Source: Eurostat

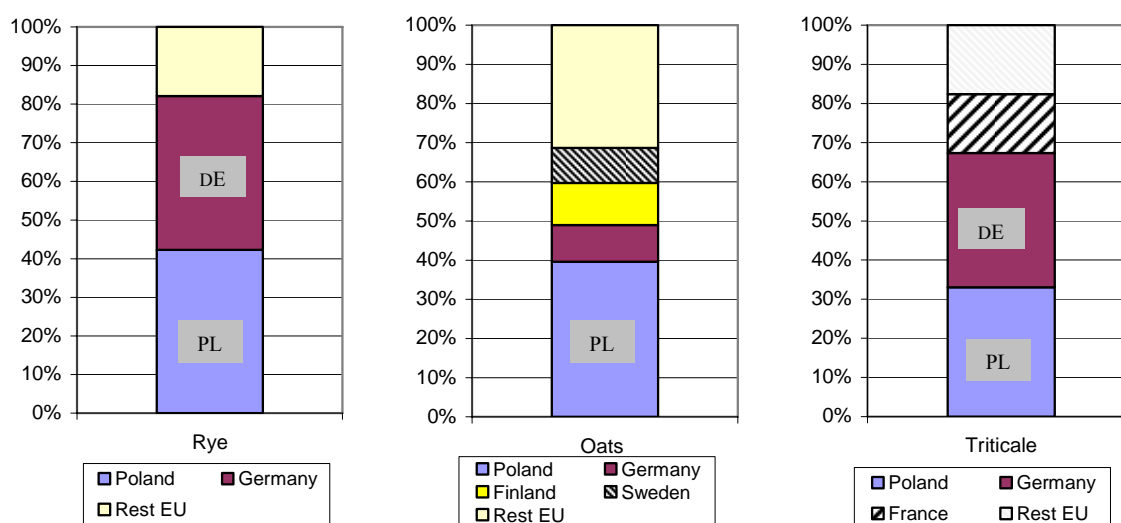
In 2004, Germany and Poland were the largest producers and contributed 80% to EU25 production. The CAP has helped to maintain Germany's level of rye production over time while consumption has decreased. Germany produces some 4.5 million tons of rye a year with an average yield of 5.5 tons per hectare. Although rye is inferior to the predominant cereal crops such as wheat and barley, rye remains the third most important crop in Germany. This reflects the advantage of dry-resistance of rye in the certain parts of Germany.

Rye is the second largest crop in Poland. In 2004, Poland produced an average of 5 million tons per year, slightly higher than in Germany. The average yield is 2.3 tons per hectare, which is about one third of the yield that Germany can achieve. In the 1960s and early 1970s, Polish rye production amounted to between 7 and 8 million tons, but has declined since the 1970s in response to market forces. Polish farmers see little or no profit from rye, and this is reflected in

the shift to other grains. As no intervention program for rye was offered at the time of Polish accession to the EU, production of rye could drop even further. However, the CAP incentives such as direct payments might stimulate Polish production again.

When the production of a particular commodity is concentrated in very few countries, the AGMEMOD Partnership pursues a strategy whereby commodity modelling will be implemented in the countries of greatest production significance (Germany and Poland for rye and other grains), whereas others may opt for it. Figure 3.2 shows the significant position of Germany and Poland for the EU25 production of rye, oats and triticale, whereas the remainder of the production is scattered over the other Member States.

Figure 3.2 Share of rye, oats and triticale production across important EU25 countries, 2004



Source: Eurostat

Intervention and direct payments are the policy instruments influencing rye production, whereas oats and triticale are only influenced by premium schemes. AGMEMOD takes account of the following policy issues:

- rye belonged to the cereals intervention system up to the 2004-2005 crop year, but the crop is removed from the system from 2005;
- unified intervention since 1993/94 (-34% compared to intervention price of feed cereals);
- 15% reduction of intervention price under Agenda 2000;
- introduction of direct payments for rye and other grains in 1993/94 to compensate for the reduced intervention price;
- increase of compensatory area payments for cereals under Agenda 2000 if these areas were participating in the set-aside scheme;
- from January 2005 onwards, compensatory area payments for cereals and other arable crops have been replaced by Single Farm Payments based on aid receipts of the period 2000-2002.

There is only a very limited international trade in rye and other cereals. The model takes account of the WTO export commitments and the tariff rate quotas with a minimum access of 21,000 tons for oats at a reduced rate and an additional preferential 10,000 tons at a zero rate.

For each commodity in AGMEMOD, the market of a specific Member State is seen as the key market, while its respective price is considered as the EU key price. Germany, as most important producer of rye and other grains in the old Member States⁴, delivers the key prices of these commodities. The German rye price has been specified by the domestic price for barley and the intervention price for rye, the trade instruments as well as by the supply and demand situation. The German other grains price will be determined by the domestic price, by the supply and demand situation and the trade instruments.

Land allocation

In the conventional crop models implemented in the AGMEMOD system, land allocation has been modelled as a two-stage decision in which producers first decide on how much area is needed to cultivate cereals and oilseeds. In the second stage, these total cereal and oilseed areas are allocated to specific commodities according to the country characteristics. Due to time constraints, this study used a simplification of this approach based on the barley market model. Thus, the parameters used to determine the area shares of rye and other grains are 'synthetic' values and there is no real substitution among the area devoted to these products and the other cereals and oilseeds originally presented in the model.

Database

The database of AGMEMOD consists of balance sheets for all commodities built up from items as production, imports, exports, ending stocks and domestic usage. The same data set for rye and other grains has been assembled by all country teams based on the Eurostat sources *AgrIS* (Agricultural Information System) and *NewCronos*.

Report 2, delivered in June 2006, gave a detailed technical description of the implementation of rye and other grains in the countries where these products are of significance.

3.2.2 Decoupled Payment System

Even though direct aid payments have existed since 1993, the Single Farm Payments (SFP) enacted in 2005 is a novelty as it is paid independently of what type of agricultural production the farmer chooses to go into. Since the MacSharry Reform in 1993, the agricultural support to farmers has been shifted from price support measures to direct payments like arable land payment, the special beef and suckler cow premiums, the ewe premium payment, etc.. These payments remained in force until the end of 2004 and will continue to a lesser extent in some of the Member States under the new SFP, allowed for by the 'partial decoupling' provisions. Direct payments are thought as being more transparent and less distorting than the market support and intervention mechanisms. An important fact is that direct payments had been classified in the WTO's Green Box instead of the Blue Box like the former coupled premiums and thus are exempted from reduction commitments under the WTO rules.

The principle regulations are as follows: the SFP was enacted on 1 January 2005, but Member States could opt to delay the implementation up to 2007. The premium is payable to all eligible producers and is independent of the actual production. However, the receipt of the SFP is partly

⁴ Even though Poland is a bigger producer of rye than Germany, the German market is selected as key market. This is to avoid estimation problems arising from the accession process.

dependent on the fulfilment of certain environmental conditions, so-called "cross-compliances" and is based on premiums received by each farmer in the reference period 2000-2002. In the future, most direct payments will be independent of production. However, to address fears of abandoned land, some Member States have chosen to retain a link between subsidy receipts and production. The value of the SFP receipts is based on historical entitlements, regionalised schemes, gradual implementation and the different degrees to which premiums have remained linked to production in a particular country. This gives rise to a CAP that will be implemented within the permitted Member State preferences. Mostly, the SFP is calculated at a flat-rate regional level, at which the total aggregate entitlements in the reference period will be averaged out over the total number of eligible hectares or animals. Due to the lack of data, the regionalised schemes will be temporarily neglected.

Thus, with the implementation of the SFP most direct payments under the CAP have been decoupled from agricultural production and linked to agricultural land and made conditional on farmers' engagement in good farming practices and satisfaction of cross-compliance criteria. This raised two important points of concern to this study:

- despite the breaking of the link between the receipt of direct payments and agricultural production, there are established grounds for expecting receipts of the 'production decoupled' direct payments to continue partly to affect farm level production, although there will be shifts in the benefits of production;
- nationally, a differentiated implementation of the decoupling provisions of the Luxembourg Agreement has taken place across the EU. Accordingly, EU Member States have been allowed to maintain the link between certain direct payments and agricultural production.

Relatively little is known about the effect of decoupled payments on the farmers' production decisions. However, Hennessy and Thorne (2005) found that a significant number of Irish farmers choose to use their decoupled payments to subsidise unprofitable products. This motivated the implementation of the SFP scheme in the AGMEMOD model as one that explores supply inducing impacts. In other words, it is assumed that decoupled premiums are not really decoupled in AGMEMOD, but that they impact on farmers' exposure to economic risk, their access to capital and their decision on current and future levels of production.

SFP in old Member States and Slovenia

In the current version of the AGMEMOD Model for old Member State models (including Slovenia), the above mentioned concerns are addressed through the introduction of a set of country, commodity and time specific multipliers reflecting the redistribution of support. These $DEC(x,c,t)$ multipliers are used to derive synthetic premium level, $PREMS(x,c,t)$, that exogenously affect the level of agricultural production simulated in the AGMEMOD Member State models.

The derivation and calculation of the $DEC(x,c,t)$ multipliers and the associated $PREMS(x,c,t)$ variables are now described. The multiplier $DEC(x,c,t)$ is defined as

$$DEC(x,c,t) = CR(x,c,t) + (1 - CR(x,c,t)) * MULTI(x,c,t) * MULT2(c,t) * MULT3(c,t)$$

Where x is an index over the commodities modelled in the AGMEMOD model, c is an index

over the countries modelled and t is a time index.

The $DEC(x,c,t)$ multipliers consist of a coupled part of the historic direct premiums $CR(x,c,t)$ and a decoupled part of the historic direct premiums $(1 - CR(x,c,t)) * MULTI(x,c,t) * MULT2(c,t) * MULT3(c,t)$. Thus, the multipliers only affect the decoupled part of the historic direct premiums.

$CR(x,c,t)$ are commodity, country and time specific coupling coefficients that capture the degree to which a particular Member State has decoupled historic (Agenda 2000) direct payment instruments applying to the production of product x at time t . With full decoupling of a direct payment, $CR(x,c,t) = 0$. With partial decoupling where, for example, a Member State is allowed to retain 25% of the value of the historic direct payment coupled to production, then $CR(x,c,t) = 0.25$.

Now, the components of the $DEC(x,c,t)$ multipliers will be explained. $MULTI(x,c,t)$ is a commodity, country and time specific multiplier that reallocates the proportion of the historic direct payment that enter the SFP payment across all agricultural land. This reflects an assumption within the current AGMEMOD model that decoupled direct payments are paid on a flat rate across all agricultural land and not only the land on which the direct payment entitlements were established. Thus $MULTI(x,c,t)$ is defined as

$$MULTI(x,c,t) = CLA(c)/TOTLA(c)$$

where $CR(x,c,t)$ is as previously defined, $CLA(c)$ is the total land area on which direct payments were established and $TOTLA(c)$ is the total agricultural land area in country c , both measured in a reference period (2000 to 2002).

Since the area on which direct payments entitlements were established in all MEMBER STATES is less than the total agricultural area of the Member State, this ratio will always be less than one. The size of the ratio $CLA(c)/TOTLA(c)$ varies considerably across Member States (see second column of Table 3.2). This heterogeneity reflects the differing degrees to which the movement from coupled direct payments to a flat area payment SPS would lead to the redistribution of subsidy income. In Member States, (such as for example Ireland, where most agricultural land in the reference period was associated with the production of agricultural outputs with associated coupled direct payments) the $CLA(c)/TOTLA(c)$ ratio will be very close to 1. In Member States (such as for example Spain), with more diverse land use patterns, and with agricultural production activities, which in the reference period were not associated with the receipt of coupled direct payments, the ratio will diverge significantly from 1.

The country and time specific multiplier $MULT2(c,t)$ captures the impact of the compulsory modulation provisions of the Luxembourg Agreement, whereby all single farm payments in excess of € 5,000 were modulated or taxed. The multiplier also allows for the incorporation of the impact of the possibility of a Member State government implementing the voluntary modulation of the SFP paid to farmers in that Member State. The modulation payments are channelled into a new fund for rural development measures. Thus $MULT2$ is defined as

$$MULT2 = 1 - CMOD(c,t) - VMOD(c,t)$$

where $CMOD(c,t)$ is the rate of compulsory modulation under the Luxembourg Agreement and

$VMOD(c,t)$ is the rate of voluntary modulation introduced in country c .

The provisions of the Luxembourg Agreement do not allow for any differences in Member State's implementation of compulsory modulation. However, differences in the proportion of farmers in different Member States, that exceed the € 5,000 threshold, mean that the rate of compulsory modulation used in each AGMEMOD country model varies after accounting for the proportion of farmers that are not subject to compulsory modulation.⁵ The third column of Table 3.2 presents the reallocation of decoupled payments across the Member States according to the compulsory and voluntary modulation rates ($MULT2$ effect).

The final element of the $DEC(x,c,t)$ multiplier is the term $MULT3(x,c,t)$. This term attempts to capture the extent to which the decoupled payments received by farmers are not invested in agriculture. The motivations for the inclusion of the term $MULT3(x,c,t)$ are various and range from:

- the expected decrease in the proportion of land owned by farmer over time and the concomitant leaking of SFP via land rents to the non-agricultural economy;
- to the possibility that farmers may treat their decoupled payment receipts as totally unrelated to their ongoing agricultural production activities and thus use them for consumption purposes.

The rates used in the different stand alone AGMEMOD country models differ across commodities on the basis that the asset specificity of capital invested in different agricultural systems is not uniform. In general assets involved in the production of arable crops are considered more illiquid than those used in animal production systems. For all countries c , for all commodities x , and for all time periods t , $MULT3(x,c,t) \leq 1$.

The degree of variation in the value of $MULT3(x,c,t)$ across different Member States is limited. It has been expected that direct payments will disappear from the agricultural sector according to the assumption that annually 2.5% of the arable firms and 5% of the livestock firms will exit in the period 2006-2015. It must be remarked that the values of this multiplier in particular are rather arbitrary. On the other hand, they can be easily adjusted according to better expertise knowledge.

The fourth and fifth column of Table 3.2 presents the reallocation of decoupled payments across the Member States according to a shift of subsidies away from highly supported sectors to the general non-agricultural economy ($MULT3$ effect).

Thus the major source of heterogeneity in the $DEC(x,c,t)$ variables across old Member States arises from the degree to which Member States have chosen to be fully decoupled (as reflected in the $CR(x,c,t)$ variable) and the values of $MULT1(x,c,t)$ and $MULT2(x,c,t)$.

In calculating the synthetic premiums, $PREMS(x,c,t)$, that are used in the implementation of the 2003 CAP reform in the AGMEMOD model, the historic CAP direct payment rates per animal,

⁵ Henke and Storti (2004) present data from a European Council working party document that illustrates the wide variation in the proportion of farms subject to compulsory modulation across EU Member States. These data indicate that over 70 percent of Greek farms will not be subject to compulsory modulation while less than 15% of UK farms fall below the euro 5,000 threshold.

per hectare or other unit of production in the reference year, $PREMREF(x,c)$, are multiplied by the appropriate commodity multiplier $DEC(x,c,t)$.

$$\begin{aligned}
 PREMS(x,c,t) &= PREMREF(x,c) * DEC(x,c,t) \\
 &= PREMREF(x,c) * (CR(x,c,t) + MULT1(x,c,t) * MULT2(c,t) * MULT3(x,c,t)) \\
 &= PREMREF(x,c) * \left(CR(x,c,t) + \right. \\
 &\quad \left. (1 - CR(x,c,t)) * \left[\frac{CLA(c)}{TOTLA(c)} \right] * [1 - CMOD(c,t) - VMOD(c,t)] \right) \\
 &\quad * MULT3(x,c,t)
 \end{aligned}$$

If a particular direct payment, under the national level implementation of the Luxembourg Agreement, has remained fully coupled, then this term simplifies to $PREMREF(x,c)$. When the direct payment is fully decoupled the term simplifies to:

$$PREMS(x,c,t) = PREMREF(x,c) * \left(\left[\frac{CLA(c)}{TOTLA(c)} \right] * [1 - CMOD(c,t) - VMOD(c,t)] * MULT3(x,c,t) \right)$$

Table 3.2 Total supply inducing multiplier impacts of decoupled payments in old Member States and Slovenia, 2015

	Land re-allocation	Modulation in 2015	Exit from crop sectors	Exit from livestock sectors	Multiplier rate ¹⁾ for crops	Multiplier rate ¹⁾ for livestock
Austria	11%	25% ²⁾	60%	40%	27%	40%
Belgium	51%	3%	60%	40%	19%	29%
Denmark	18%	4%	60%	40%	31%	47%
Germany	11%	16%	60%	40%	30%	45%
Spain	36%	15%	60%	40%	22%	33%
Finland	30%	2%	60%	40%	27%	41%
France	8%	15%	60%	40%	31%	47%
Greece	8%	14%	60%	40%	32%	48%
Ireland	0%	5%	60%	40%	38%	57%
Italy	43%	15%	60%	40%	19%	29%
The Netherlands	8%	25%	60%	40%	28%	41%
Sweden	0%	15%	60%	40%	34%	51%
Portugal	20%	5%	60%	40%	30%	46%
Slovenia	11%	5%	60%	40%	34%	51%
UK	5%	5%	60%	40%	36%	54%

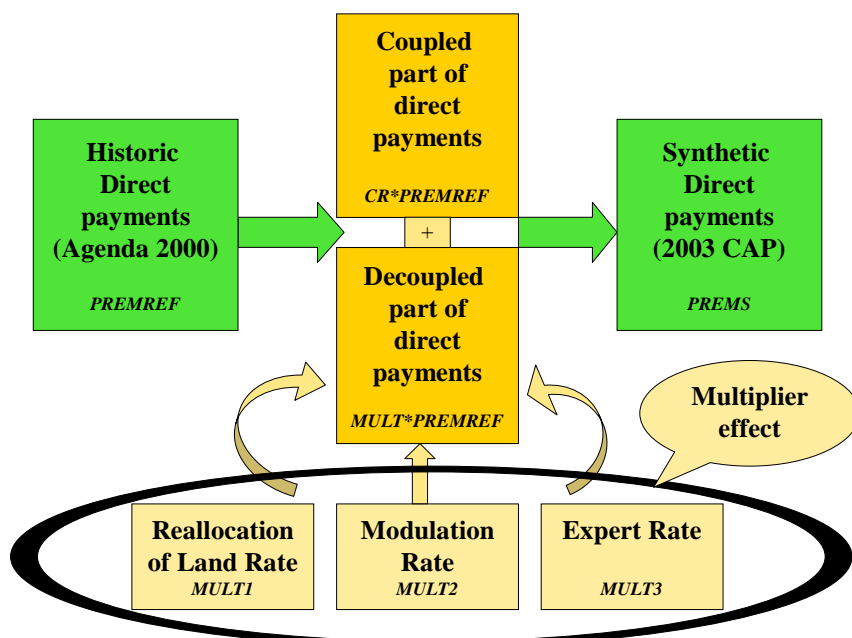
1) Multiplier rate = (1 - land reallocation rate)*(1 - modulation rate)*(1- exit rate); 2) there is no decision on the modulation rate level in Austria yet, but high rates are discussed.

Source: own calculations

The last two columns of Table 3.2 reflect the part of the historic direct premiums that remains ‘in the mind of the farmers’ when they determine their production plans in case of full decoupling. These so called supply inducing multipliers refer to crop sectors and livestock sectors respectively. Multiplier rates range from 29% for livestock sectors in Belgium (thus, Belgium farmers will behave as if they were in receipt of a premium of 61 €/bull - 0.29*210 €/bull - in 2015) to 38% for crop sectors in Ireland (thus, Irish farmers will behave as if they were in receipt of a premium of 24 €/ton grains - 0.38*63 €/ton grains - in 2015).

Finally, Figure 3.3 summarises the here described way in which the decoupled direct payments have been implemented in the current AGMEMOD version. From the linkage of the decoupled part of historic direct payments under Agenda 2000 with multipliers, towards the synthetic direct payments under the 2003 CAP reform.

Figure 3.3 Implementation of decoupled direct payments in AGMEMOD



SAPS and CNDP payments in new Member States

The Single Area Payment Scheme (SAPS) was maintained until 2007, and additional direct payments will be maintained until the end of 2008. The SAPS, which has been mostly decoupled from 2004 onwards, are based on the farm area and a flat rate aid payment on the national levels (including fruits and vegetables, potatoes, etc.). All subsidies are applied on a hectare basis. In the case of livestock, a specific mechanism could be adopted as a variation on the basic price mechanism. Calculations are either based on the proportion of Gross Agricultural Output represented by the commodity in the reference year (2001), or on the number of animals and livestock density. ‘SAPS per hectare’ quotients have been derived by dividing the financial budget from the EU (agreed in the accession negotiations) by the utilised agricultural area.

When the new Member States leave the SAPS, they are obliged to adopt the regionalised version of decoupling within the full EU SFP scheme, but countries are also permitted to apply partial decoupling. Also, there exist several options for implementing the CAP in the new Member States, which are designed to ease their transition to a market economy. In particular, the new decoupled direct payments will be gradually phased-in over the first ten years post-accession starting with 25% in 2004 and reaching 100% of the full old Member States’ payments in 2013. Cross-compliance criteria are not compulsorily applied in the new Member States, and they have the freedom to augment direct payments amounts with national funds.

Thus, for all new EU Member States, the SAPS will apply for a period following accession. Additional nationally financed complementary direct payments (CNDP) may also be paid in each

Member State as coupled or decoupled aid payments. Decoupled payments under the SAPS and CNDP schemes are modelled in quite a similar manner to which AGMEMOD deals with decoupled SFP. SAPS and CNDP payments (if decoupled) are also assumed to have some supply inducing impact on agricultural production, though this impact is less than the impact of coupled payments or prices. The supply inducing impact of different types of payments is captured by deriving synthetic premiums, which are added to the producer incentive prices (in euro per 100Kg) in the country models. Thus, producers' supply decisions are a function of market prices and synthetic premiums based on the SAPS and CNDP payments. Different multipliers are used to capture the possibly differing supply inducing impact of the SAPS and CNDP payments (if for example the latter are coupled to production).

The synthetic premiums for arable crops associated with the SAPS payments, in euro per 100Kg, denoted as $PREMSAPS_{i,c,t}$ are calculated in the following way.

$$PREMSAPS_{i,c,t} = \left(\frac{SAPS_{c,t}}{TOTLA_{c,REF}} \right) * \left(\frac{AHA_{i,c,REF}}{SPR_{i,c,REF} * 10^5} \right) * MULT4_{i,c,t}$$

Where $SAPS_{c,t}$ is the total projected SAPS expenditure in a new Member State c in year t , $TOTLA_{c,REF}$ is the total land area in that MEMBER STATES in the base year (2004), $AHA_{i,c,REF}$ is the total area harvested of the i^{th} crop in Member State c in the reference year, and $SPR_{i,c,REF}$ is the production of the i^{th} crop in the reference year in the Member State concerned. The volume of production (expressed in thousands of tonnes) is scaled up so as to generate the premium per 100Kg that can be added to the producer incentive prices that are expressed per 100kg in the AGMEMOD country models. As in the calculation of the synthetic premiums in the old Member State country models, country, product and time specific multipliers ($MULT4_{i,c,t}$) are used to account for the supply inducing impact of the synthetic SAPS premiums on agricultural production. As in the old Member State country models the value of these multipliers are based on the expert judgements of the country modelling teams, for all countries and for all commodities the value of $MULT4_{i,c,t} < 1$.

Table 3.3 presents the hypothetical EU SAPS premia that remain 'in the mind of the farmer' across new Member State countries (MULT4 effect).

Table 3.3 Total supply inducing multiplier impacts of SAPS payments in new Member States, 2015

	SAP scheme (2004-08)		SPS scheme (2009-15)	
	Crops	Livestock	Crops	Livestock
Bulgaria	50%	50%	50%	50%
Czech Republic	97%	97%	84%	84%
Estonia	100%	100%	84%	84%
Hungary	60%	10%-60% ^{a)}	60%	10%-60% ^{a)}
Latvia	30%	100%	30%	100%
Lithuania	30%	30%	30%	30%
Poland	30%	30%	30%	30%
Romania	50%	50%	50%	50%
Slovak Republic	15%	15%	15%	15%

a) 60% for suckler cows; 10% for cattle

Source: own calculations

The calculation of the SAPS synthetic premiums that apply to meat products are arrived at in a slightly different way to those for arable crops. The share of total livestock units in the reference year associated with the i^{th} meat product, multiplied by total grassland area in the reference year ($PA_{c, REF}$), is used together with the average per hectare SAPS premium and total production of the meat in question, to generate the synthetic SAPS premium per 100Kg of meat.

$$PREMSAPS_{i,c,t} = \left(\frac{SAPS_{c,t}}{TOTLA_{c,REF}} \right) * \left(\frac{\left(\frac{LU_{i,c,REF}}{\sum_j LU_{j,c,REF}} \right) * PA_{c,REF}}{SPR_{i,c,REF} * 10^5} \right) * MULT4_{i,c,t}$$

Complementary national direct payments (CNDP) are allowed in the new Member States in the transition process during which farm income support payments in the new Member States are increased to the levels pertaining in the old Member States. These CNDP can be coupled to production or decoupled from production. The method of calculating the per 100Kg synthetic premiums ($PREMCNDP_{i,c,t}$) that are associated with the CNDP is the same as that used in the calculation of the premiums associated with SAPS payments except that the multiplier ($MULT5_{i,c,t}$) differs to account for the possibility that the CNDP may be fully coupled to production. The degree to which new Member States have chosen to introduce coupled and decoupled CNDP varies by Member States and between different commodities within each new Member State.

$$PREMCNDP_{i,c,t} = \left(\frac{CNDP_{c,t}}{TOTLA_{c,REF}} \right) * \left(\frac{AHA_{i,c,REF}}{SPR_{i,c,REF} * 10^5} \right) * MULT5_{i,c,t}$$

$$PREMCNDP_{i,c,t} = \left(\frac{CNDP_{c,t}}{TOTLA_{c,REF}} \right) * \left(\frac{\left(\frac{LU_{i,c,REF}}{\sum_j LU_{j,c,REF}} \right) * PA_{c,REF}}{SPR_{i,c,REF} * 10^5} \right) * MULT5_{i,c,t}$$

In the current new Member State models, just a few different multiplier levels are used in order to assess the impact of direct support on production. Table 3.4 presents the hypothetical national CNDP premiums that remain ‘in the mind of the farmers’ across new Member State countries (MULT5 effect).

Table 3.2 Total supply inducing multiplier impacts of CNDP payments in new Member States, 2015

	SAP scheme (2004-08)		SPS scheme (2009-15)	
	Crops	Livestock	Crops	Livestock
Bulgaria	50%	50%	50%	50%
Czech Republic	100%	100%	100%	100%
Estonia	100%	100%	84%	84%
Hungary	10%	10%	100%	100%
Latvia	60%-100% ^{a)}	100%	30%	100%
Lithuania	80%	100%	30%	30%
Poland	60%	60%	60%	60%
Romania	50%	50%	50%	50%
Slovak Republic	15%-50% ^{b)}	15%-50% ^{b)}	15%-50% ^{b)}	15%-50% ^{b)}

a) 60% for fodder; 100% other crops; b) 15% for decoupled payments; 50% for coupled payments

Source: own calculation

The synthetic premiums (per 100kg) associated with the SAPS and CNDP are added to the producer incentive prices which drive the supply side of the new Member State agricultural commodity models.

Under the *Further CAP Reform* scenario of this study, all direct payments (including CNDP) are fully decoupled from production and are incorporated in the SFP and SAPS payment. For the new Member State models this effectively means that the distinction between CNDP and the fully decoupled SAPS and SFP disappears, i.e. $MULT5_{i,t} = MULT4_{i,t}$. With the adoption of the SFP scheme under the Further CAP Reform scenario, the freedom to introduce coupled direct payments is removed.

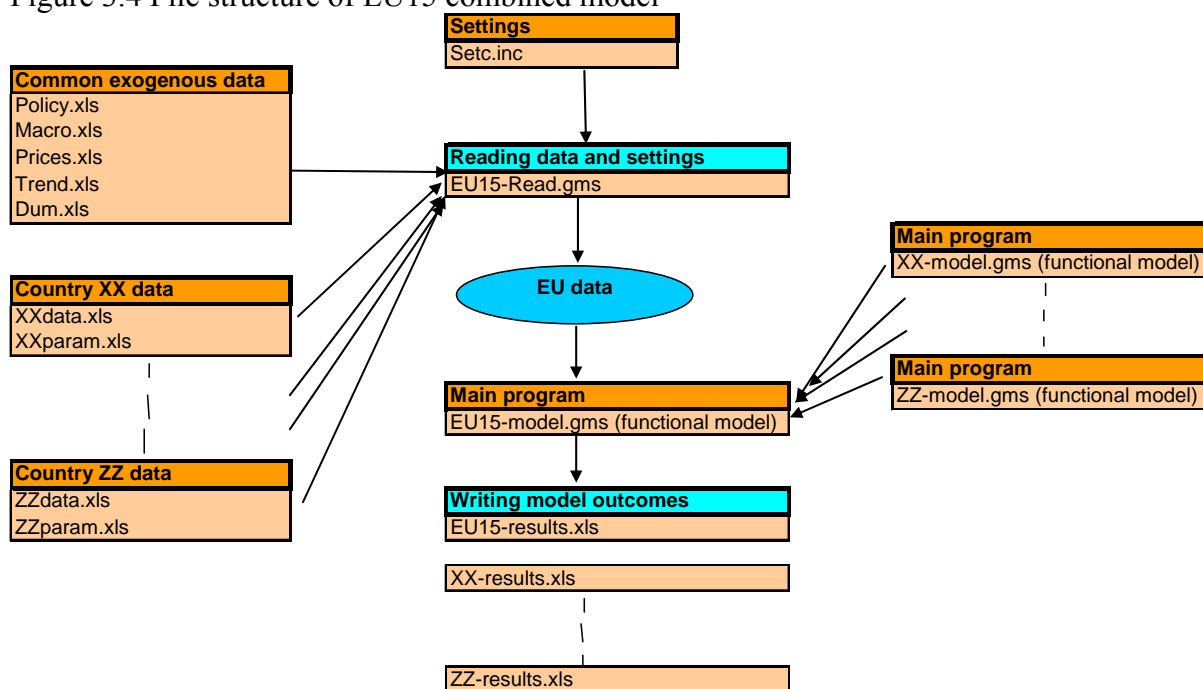
In addition to the decoupling provisions of the scenario, from 2013 all new Member States will have completed the transition process under which the value of EU funded agricultural supports will have been increased. With the end of the transition process the non-application in the new Member States of the modulation provisions of the 2003 CAP reform will end. Thus from 2013 the multiplier MULT4 will also incorporate the effective rate of compulsory modulation. As in the models for other Member States, the applied modulation factor will be adjusted to reflect the extent to which farmers, in the Member States concerned, on average receive SFP in excess of

the € 5,000 franchise. This can be expected to vary widely between new Member States, see Henke and Storti (2004).

3.2.3 EU models

AGMEMOD is an econometric, dynamic, multi-product partial equilibrium model wherein a bottom-up approach is used. Based on a common country model template, country level models, with country specific characteristics were developed to reflect the specific situation of their agriculture and to be subsequently combined in a composite EU model. This approach captures the inherent heterogeneity of the agricultural systems existing across the EU while still maintaining analytical consistency across the country models via as close as possible adherence to template. The maintenance of analytical consistency across the country models is essential for the aggregation and also facilitates the comparison of the impact of a policy across different Member States. One of the aims of this study is to integrate the old Member State models into a EU15 combined model. Figure 3.4 presents the developed file structure of the EU15 combined model. It covers the old Member State models, indicated by country XX to country ZZ.

Figure 3.4 File structure of EU15 combined model



The procedure applied to solve and simulate this EU15 model follows that of the individual country models in GAMS. First, all common exogenous data, the specific country XX to country ZZ data and the sets are read into GAMS to create a complete EU dataset used to solve the EU combined model. Second, this EU data file is combined with the estimated old Member State country models XX through ZZ expressed in GAMS code. If the GAMS solver finds feasible solutions for all markets, in all time periods and for all countries, the results are exported to the country level Excel files. These country specific result files (XX-results.xls) capture the projections of agricultural activity levels (areas harvested, livestock numbers), supply and use balances (production, domestic use, imports, exports and ending stocks) and prices on the country level. Also, a EU15 specific result file (EU-results.xls) with agricultural activity levels

(areas harvested, livestock numbers), supply and use balances (production, domestic use, net exports and ending stocks) and market clearing prices for the EU15 is produced.

A next aim of the AGMEMOD Partnership will be to develop a combined model version of the EU25. This is planned for early 2008 as part of the AGMEMOD2020 project. As this task lies beyond the scope of this study, the market projections and scenario simulations of the EU25 have been conducted in a practical way at this time. The new Member State models are solved as stand-alone GAMS versions and added to the EU15 combined model. The result is the so called *EU25 hybrid model*: it is a summation of the integrated EU15 model of the old Member States (with endogenous key price formation) and the stand-alone new Member State models (solved with exogenous key prices delivered by the EU15 combined model).

In addition, the Bulgarian and Romanian models are solved as stand-alone version and added to the EU25 hybrid model. This provides the so called *EU27 hybrid model*.

Figure 3.5 presents the conceptual framework to generate the link between the EU15 combined model and the new Member State models, which generates the EU25 hybrid model. Figure 3.6 shows the linkage of the EU25 hybrid model with the Bulgarian and Romanian models, which generates the EU27 hybrid model version of AGMEMOD.

Figure 3.5 EU25 hybrid model structure of AGMEMOD

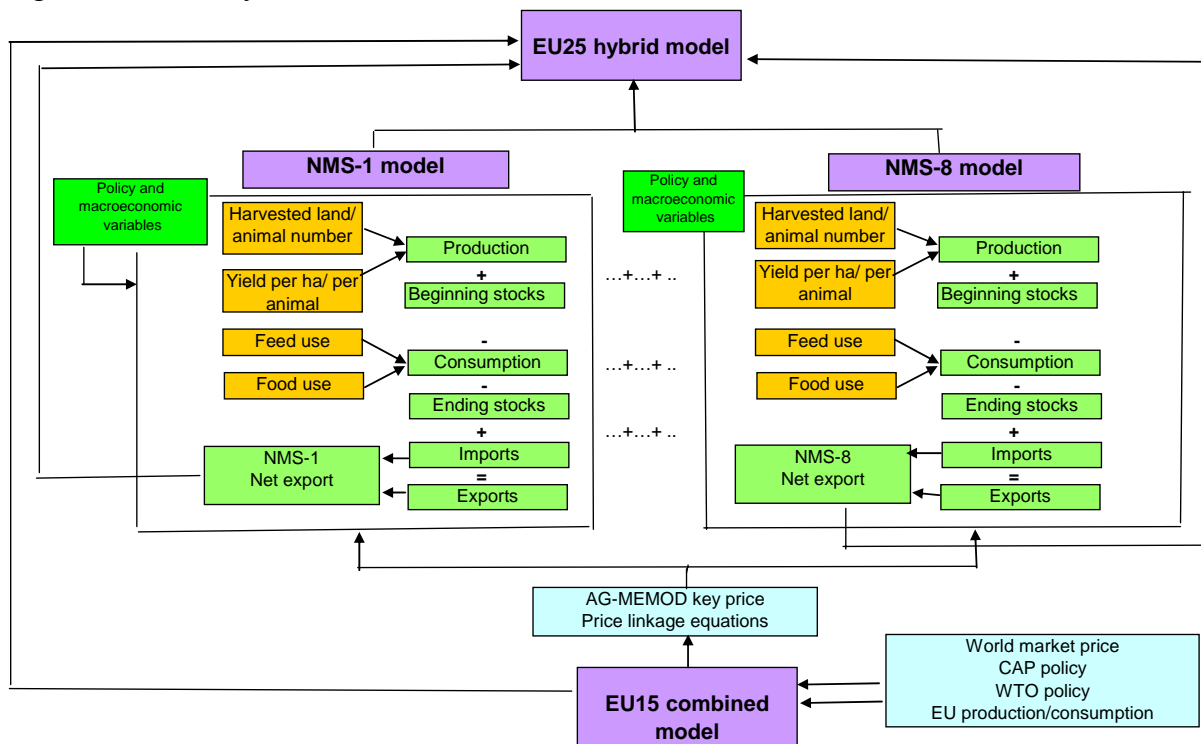
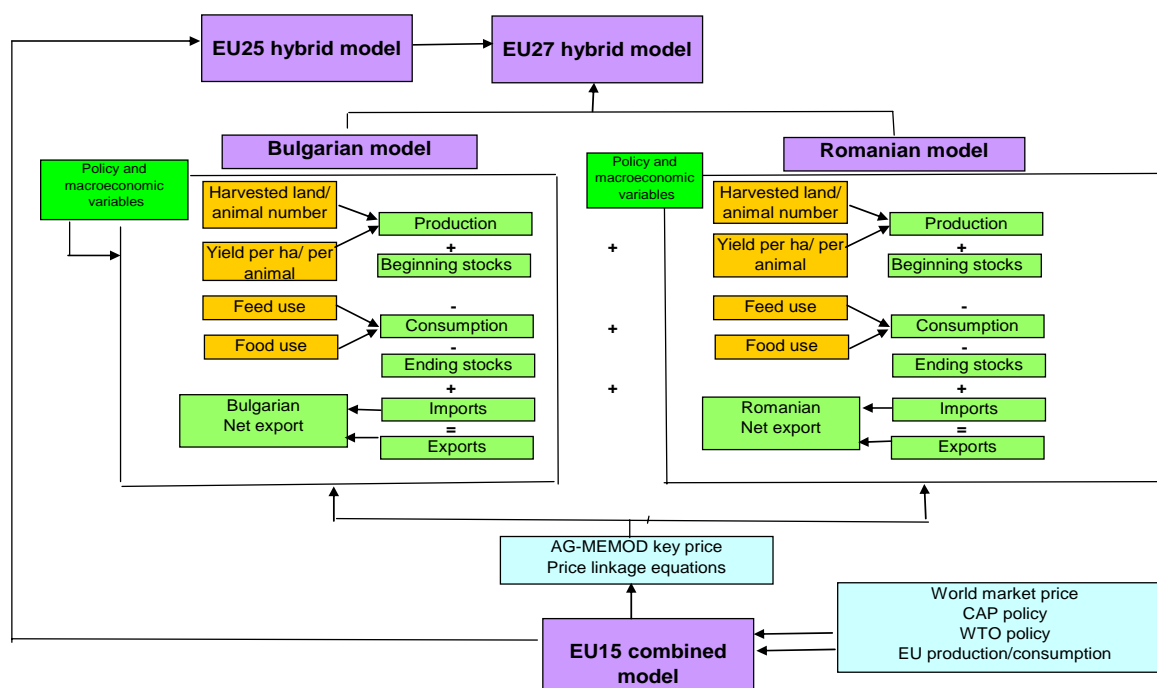


Figure 3.6 EU27 hybrid model structure of AGMEMOD



The endogenous EU key prices calculated with the EU15 combined model are used as exogenous EU key prices to run the stand-alone models of the new Member States, Bulgaria and Romania. Its results capture projections of agricultural activity levels (areas harvested, livestock numbers), supply and use balances (production, domestic use, imports, exports and ending stocks) and prices up to 2015 for the EU25 and EU27.

When solving the EU models, just as in the individual country level models, all commodity markets modelled must close to ensure that the supply and use identity for all commodities and all time periods exactly holds. This general condition concerns all EU model versions (EU15, EU25 and EU27 levels). Within the country level models the distinction between intra and extra EU imports and exports is not maintained, but implicitly the total EU intra export of all country models is equal to the total EU intra import of all country models. Consequently, the European net export variable (aggregation of the net exports of all countries) can be used as closure at the European level to ensure that the supply and use identity always holds.

3.2.4 User-friendly interface

During the last decades it has become clear that building models and the writing of related software can give rise to considerable problems. If software is developed in a poor way several problems could emerge in the sense that it will easily become unreadable for less familiar users. After several revisions and extensions of the initial version this can even be true in the case of the person who wrote the original software. Poorly structured and poorly documented software has a very low degree of flexibility, of extendibility and can hardly be passed on to other developers. Making changes is tedious and error prone and therefore consumes a lot of time. After many changes the software program deteriorates and eventually it collapses. The above is true for professional software developers, and it is even more the case for researchers who spend

only part of their time on software development. The situation of software developed for simulation models is even worse as these tend to change very rapidly during their lifetime. Normally, models need to be adjusted for each research project in order to answer new research questions. Newer model versions are made or new scenarios are run. In turn this leads to a continuous alteration of code and it will become unclear what the computer models actually do. The consistency between conceptual models and actual computer models might be lost. This classic approach to the model building process in applied research work might cause problems.

Therefore, IPTS sought a way to make the modelling framework developed in this study more accessible for end-users and researchers in a separate contract. The GSE interface, which stands for GAMS Simulation Environment, was considered as appropriate tool to ensure that AGMEMOD would become accessible in the most efficient and sustainable way. A main advantage of GSE is that it keeps the original GAMS code of the model intact. Extension of the user-interface functionality is done separately from the model development. Not only the project planning will become easier, but also the quality of the model can be improved. A package such as GSE is expected to strengthen the existence of AGMEMOD and to result in the following advantages:

- more transparency of (model) links;
- more accessible and more widely used model results securing that corporate knowledge will improve the continuity of the AGMEMOD model;
- a data viewer to overview and analyse data, including a Geographical Information System;
- a tool for version control;
- a scenario analyser to compare, print and depict outcomes;
- to link AGMEMOD to organisations instead to persons.

In order to fulfil the requirements of the user-interface and to ensure the most efficient and sustainable access to AGMEMOD, GSE interface has been implemented to the EU15 combined model and to some of the stand-alone new Member State models. For stand-alone models this was only possible where these models could run and solve in GAMS and were consistent with the structure of the old Member State GAMS models (in respect to their codes for input and output variables).

Philosophy of GSE

Simulation models tend to change very rapidly during their lifetime. New model versions and new scenarios are developed for each new project, which could endanger the consistency between conceptual model and the actual computer model. Therefore, both model building scientists and IT-scientists have thought about demands on modern model building and its use in the field of applied research. The main aspects of these demands are:

- models should meet the requirements of customers, and provide the outcomes in time;
- models should be part of corporate knowledge (database experts, economists, ICT people);
- other researchers than the model builders must be able to use the model for their research project;
- model results should be reliable and their set-up should be clear;
- models should be flexible to meet requirements of various research projects, making

-
- different versions of the models;
 - model results should be reproducible both from a scientific point of view as well because of future demands of customers;
 - peers should review models in order to enhance the overall quality;
 - models should be built in a way they can be easily connected to other models.

Most of these qualities are also applicable to the work of the AGMEMOD Partnership regarding its development of a projection and simulation tool for the agricultural sector in the EU and its Member States. Its members wish to be able to change the model when new policy reforms make this necessary. This implies that several people need to know how the model works, what its assumptions are, how to use it to perform scenario analysis etc. This means that companies need to invest in people and in the model, which will only be useful if there are ways to make the knowledge of the model *corporate (shared) knowledge*. However, without good protocols and tools, the transforming of knowledge into corporate knowledge is costly and impossible. GSE can be seen as an attempt to corporate the AGMEMOD model knowledge, by introducing a general concept on how to build GAMS models and user interfaces. Model knowledge should be specified in a mathematical form and this will lead to a:

- more general and extendable model structures;
- higher all round quality of projections;
- better understanding of the model for peers and colleagues.

As the extension of the user-interface functionality has been done separately from the model development, model builders can spend more of their working on the quality of the model. This means not only that project planning can be done much better, but that also a considerable improvement of the quality of the model can be achieved. In this way, a package such as GSE will strengthen the existence of the AGMEMOD Partnership.

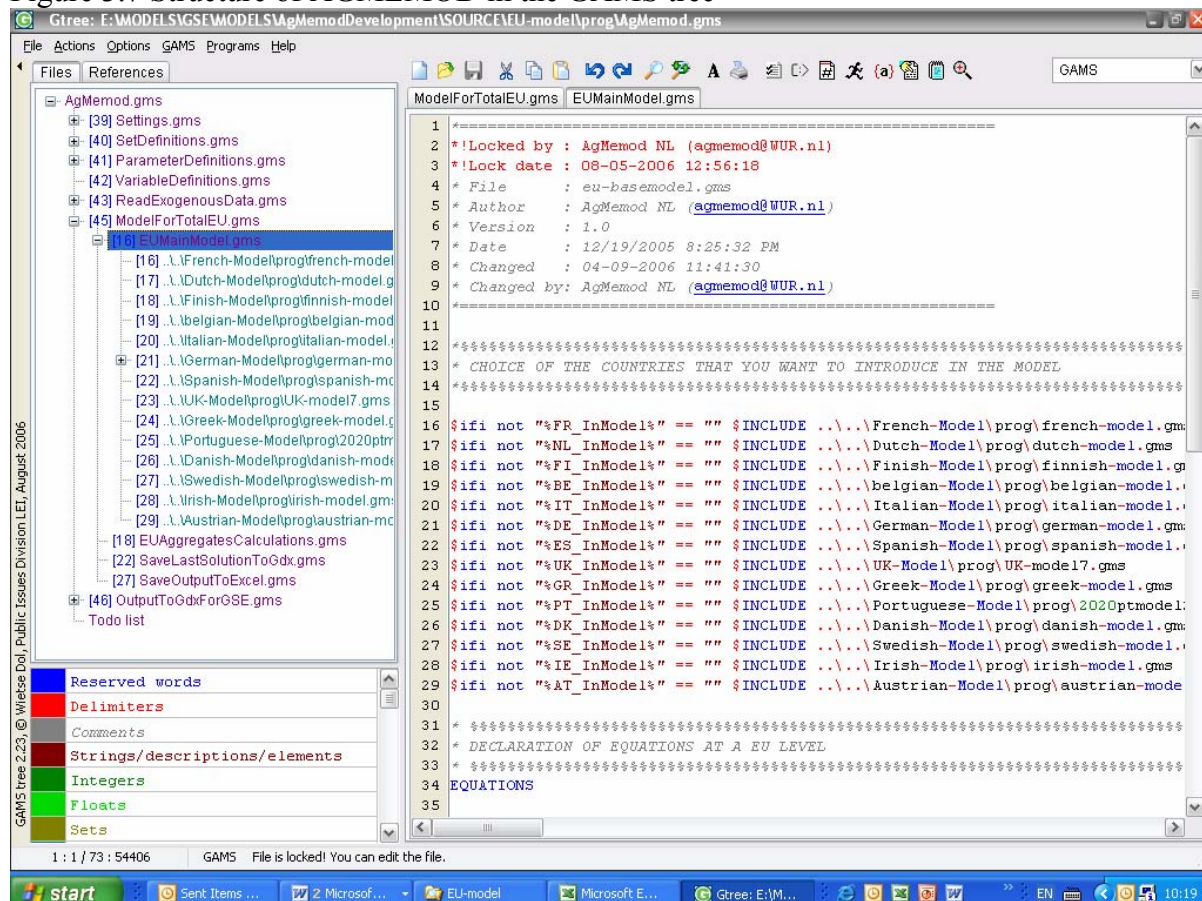
Implementation of GSE to AGMEMOD

Using GSE means that the mathematical formulation of the model must be put in GAMS code in the implementation phase of the model building process. The model building protocol from context analysis, conceptualisation, information analysis, mathematic modelling to the GAMS implementations has been followed. There was no need to build the AGMEMOD model from scratch: the old Member State AGMEMOD models were already available in GAMS code (GAMS-IDE), whereas the models for new Member States, Bulgaria and Romania have been put in GAMS as part of this study. So far, each country model has been migrated from Excel to GAMS, equation by equation. That means, that the EU15 model could be seen as a sequence of the complete set of country equations without considering the adjustment of (parts of) the commodity models into a more generic structure. Over the longer term, however, this is expected to become a severe problem when the EU25 combined model is developed.

To make AGMEMOD more transparent and better accessible, a restructure of the technical program code of the model was needed. A two step procedure has been followed here. First, the model was restructured using the *Gtree* tool, which stands for *GAMS tree* and can be considered as an alternative of the GAMS-IDE (Dol, 2006). The left column of Figure 3.7 shows the break down of AGMEMOD in sub-files for settings, parameter and variable definitions, data reading, model calculations and output savings.

Second, the Gtree version of the model has been prepared to implement it to the user-friendly GSE tool. In practice, this will enable the AGMEMOD user to run (several) scenarios, to save their outcomes, to examine scenario inputs and outputs and to examine the scenario outcomes in a GSE environment. An explanation of the toolbar and the various function buttons can be found in the GSE Quick reference guide (Dol, 2006).

Figure 3.7 Structure of AGMEMOD in the GAMS tree



4 Baseline and Scenarios

Baseline:

- for main agricultural commodities in Member States and EU25/27 up to 2015;
- 2003 CAP reforms implemented.

Scenarios:

- Further CAP Reform;
- USD/euro Exchange Rate shocks;
- Enlargement of EU25 with Bulgaria and Romania;
- impacts analysed compared to Baseline projections.

This chapter describes the baseline and scenarios projections generated by the AGMEMOD version developed in this study. The focus of section 4.1 is on describing the narratives and main assumptions underlying the baseline and the scenarios conducted. Then, sections 4.2 and 4.3 provide the most important results of the baseline projections and pay attention to each of the scenario impacts for the EU25 and EU27 respectively.

4.1 Descriptions and assumptions

A main objective of this study is to assess the impact of various scenarios on the main European agricultural commodities. In particular, the scenarios represent the differential implementation of the CAP across Member States and the enlargement of the EU. The first step in this respect is to generate baseline projections on the basis of the latest agricultural policy developments (Luxembourg Agreement) and other information available. In general all baseline and scenario analyses for the EU15 old Member States have been conducted using the combined model, while baseline and scenario analyses for the new Member States and the accession countries have been conducted using the stand-alone AGMEMOD country level models. The impact of all of the scenarios analysed on the main agricultural commodities in the countries will be examined by comparing their results with the baseline projections on the country level.

4.1.1 *Baseline*

This section outlines the assumptions concerning agricultural and trade policy, macro economy and world market prices underlying the baseline analysis.

Agricultural policy

The essential part of the baseline projections comprises the definition of the agricultural policy implementation in the AGMEMOD country level models. The baseline policy of the old Member State models reflects the 2003 CAP reform, which covers the additional milk quotas, the cut of intervention prices and the implementation of the Single Farm Payment scheme. The operation of the 2003 CAP reform was not immediate, but is staggered over the period 2005 to 2007 depending on the Member States concerned. Also, Member States chose different schemes as was foreseen in relevant regulations decided on in the Luxembourg Agreement and their choices

have been reflected in the AGMEMOD country level models.

Following the Accession Agreement negotiated at the Copenhagen EU Summit in 2002, the new Member States joined the EU on May 1st 2004. The AGMEMOD new Member State country models have simulated the impacts of the accession on their domestic agricultural markets on the basis of the adoption of the SAPS (in 2004-2008 period) and the regional version - uniform payments per hectare - of the SFP scheme (from 2009).

The baseline for Bulgaria and Romania, which joined the EU on January 1st 2007, reflects a continuation of the pre-accession agricultural policy up to 2015. The support policy mechanisms used in Bulgaria in the period up to 2004 consist mainly of credit subsidies (lower interest rate credits for long and short terms credits provided via the State “Agriculture” Fund) as well as of small direct payments per hectare/animal. These direct payments were introduced in 2002 and increased on a per hectare basis up to 2004, but remained at a much lower rate compared to such payments in the EU. The agricultural support in Romania during the pre-accession period consisted of three main instruments: price support for wheat, milk and pork, subsidised credit for investments and - since 1997 - a general support for agricultural land owners. The price support for products has varied greatly during the pre-accession period and has been granted only for a part of the output. Also, the direct payments are rather low when compared with EU payments levels. The policy in the pre-accession period was structured along the lines of the CAP payments in order to allow estimation of the policy impact on supply. This was achieved in the Bulgarian and Romanian model on the basis of the OECD PSE methodology (total support for the product considered by elements according to direct support, indirect support and market price support) and appropriate multipliers.

Reports 2 and 4 presented detailed information on the adoption of the SFP in the Member State models and on the rates of nationally funded support to agriculture permitted under the Accession Agreement in the models of new Member States, Bulgaria and Romania.

Trade policy

Regarding the trade policy, the baseline makes no assumptions concerning the outcome of the Doha Development Round of the WTO. As no probable quantitative outcome is available so far, the impact of the Doha Round on European Union’s agriculture would be speculative. Hence, the Uruguay Round Agreement on Agriculture is assumed to prevail for the whole projection period.

Tables 4.1 and 4.2 contain the policy dataset for respectively crops and livestock (products) that has been used by AGMEMOD to generate its baseline projections. After the introduction of the 2003 CAP reform, the direct hectare and animal payments mentioned in the tables, have been decoupled from production and will enter the country models with adjusted ‘synthetic’ values (according to the method described in Section 3.2.2). Thus, the compensations for cereals, oilseeds and durum wheat (Table 4.1) as well as the premiums for suckler cows, bulls and ewes (Table 4.2) will be reduced depending on the decoupling rates and multiplier rates used across the Member States.

Table 4.1 Crop related policy instruments used in AGMEMOD

Agricultural Policy	Unit	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2015
Common wheat intervention price	euro/tonne	110.3	101.3	101.3	101.3	101.3	101.3	101.3	101.3	101.3	101.3	101.3	101.3
Barley intervention price	euro/tonne	110.3	101.3	101.3	101.3	101.3	101.3	101.3	101.3	101.3	101.3	101.3	101.3
Maize intervention price	euro/tonne	101.3	101.3	101.3	101.3	101.3	101.3	101.3	101.3	101.3	101.3	101.3	101.3
Rye intervention price	euro/tonne	101.3	101.3	101.3	101.3	101.3	101.3						
Cereal compensation	euro/tonne	59	63	63	63	63	63	63	63	63	63	63	63
Oilseed compensation	euro/tonne	82	72	63	63	63	63	63	63	63	63	63	63
Durum wheat- traditional	euro/tonne	88	88	88	88	88	88	88	88	88	88	88	88
Durum wheat-not traditional	euro/tonne	36	36	36	36	36	36	36	36	36	36	36	36
Cereal set-aside rate	percentage	10	10	10	10	10	10	10	10	10	10	10	10

Source: Agra Europe (EC)

Table 4.2 Livestock and livestock products related policy instruments used in AGMEMOD

Agricultural Policy	Unit	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2015
Milk quota total applied	1,000 tonne	118,392	118,894	118,894	118,894	118,894	119,370	119,845	120,320	120,320	120,320	120,320	120320
Beef intervention price	euro/100 kg	324	301	278	243	243	243	243	243	243	243	243	243
Butter intervention price	euro/100kg	328	328	328	328	305	282	260	246	246	246	246	246
SMP intervention price	euro/100kg	206	206	206	206	206	195	185	175	175	175	175	175
Suckler cow premium	euro/head	163	182	200	200	200	200	200	200	200	200	200	200
Male bovine premium	euro/head	160	185	210	210	210	210	210	210	210	210	210	210
Butter consumption subsidy	euro/100kg	40	40	40	40	40	32	24	16	16	16	16	16
SMP feed subsidy	euro/100kg	75	75	75	75	75	60	45	30	30	30	30	30
Ewe premium	euro/head	18	12	19	21	20	20	21	21	21	21	21	21
Milk quota (applied)	1,000 tonne	118,392	118,894	118,894	118,894	118,894	119,370	119,845	120,320	120,320	120,320	120,320	120320
Suckler cow quota	1,000 head	10,824	10,824	10,824	10,824	10,824	10,824	10,824	10,824	10,824	10,824	10,824	10824

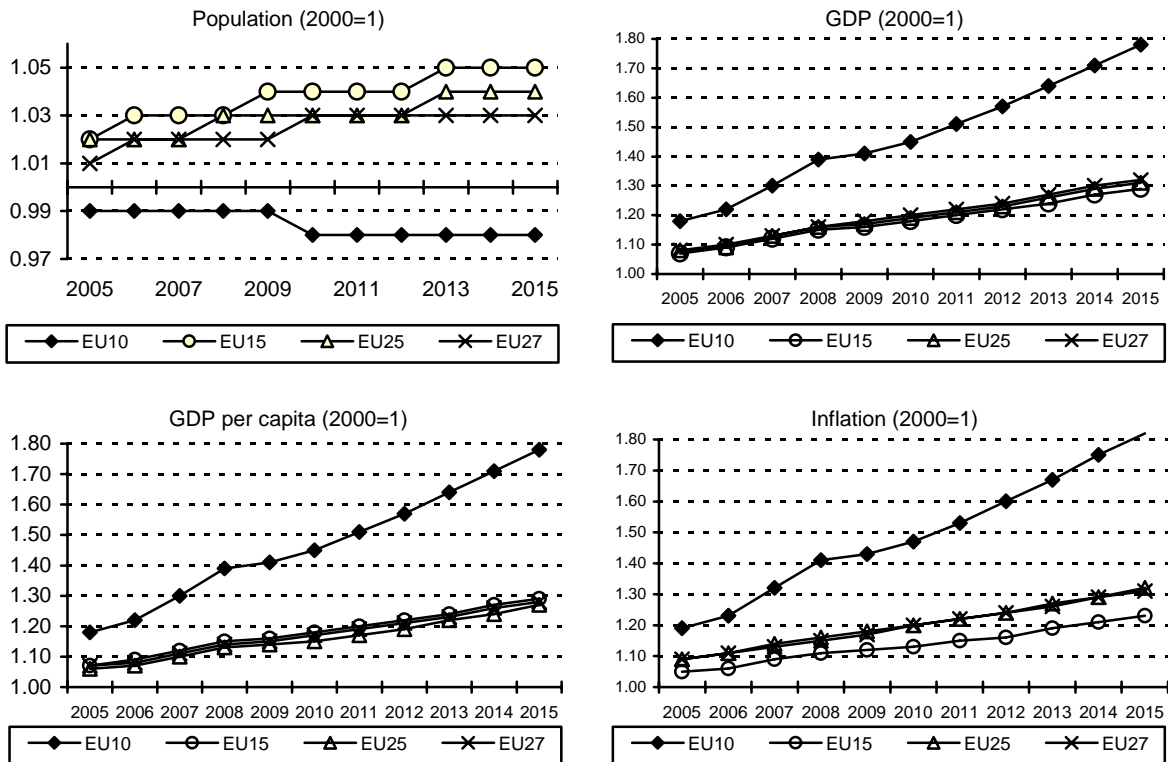
Trade Policy	Unit	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2015
Beef export subsidy limit	1,000 tonne	822	822	822	822	822	822	822	822	822	822	822	822
Pig meat export subsidy limit	1,000 tonne	444	444	444	444	444	444	444	444	444	444	444	444
Poultry export subsidy limit	1,000 tonne	286	286	286	286	286	286	286	286	286	286	286	286
Cheese export subsidy limit	1,000 tonne	321	321	321	321	321	321	321	321	321	321	321	321
Butter export subsidy limit	1,000 tonne	399	399	399	399	399	399	399	399	399	399	399	399
SMP export subsidy limit	1,000 tonne	273	273	273	273	273	273	273	273	273	273	273	273
Other dairy export subsidy limit	1,000 tonne	958	958	958	958	958	958	958	958	958	958	958	958
Beef tariff rate quote	1,000 tonne	144	144	144	144	144	144	144	144	144	144	144	144
Pig meat tariff rate quote	1,000 tonne	76	76	76	76	76	76	76	76	76	76	76	76
Poultry tariff rate quote	1,000 tonne	30	30	30	30	30	30	30	30	30	30	30	30
Sheep meat tariff rate quote	1,000 tonne	280	280	280	280	280	280	280	280	280	280	280	280
Cheese tariff rate quote	1,000 tonne	102	102	102	102	102	102	102	102	102	102	102	102
Butter tariff rate quote	1,000 tonne	87	87	87	87	87	87	87	87	87	87	87	87
SMP tariff rate quote	1,000 tonne	68	68	68	68	68	68	68	68	68	68	68	68

Source: Agra Europe (EC)

Macro economy

Macroeconomic data are needed to generate baseline projections for the main agricultural commodities in the EU Member States. Historical data on macroeconomic variables like population, inflation, per capita economic growth and currency exchange rates have been assembled at the country level. In order to conduct simulations and to generate projections to a ten year horizon, exogenous projections for the development of the macroeconomic variables were also needed. In general these macroeconomic projections were obtained from the national statistical services in the Member States. Figure 4.1 summarises the baseline assumptions for the key macroeconomic aggregates for the EU10, EU15, EU25 and EU27 groups of the Member States regarding population rate, GDP, inflation rate and economic growth per capita. Full details of the macroeconomic assumptions for each AGMEMOD country model were reported in Report 4.

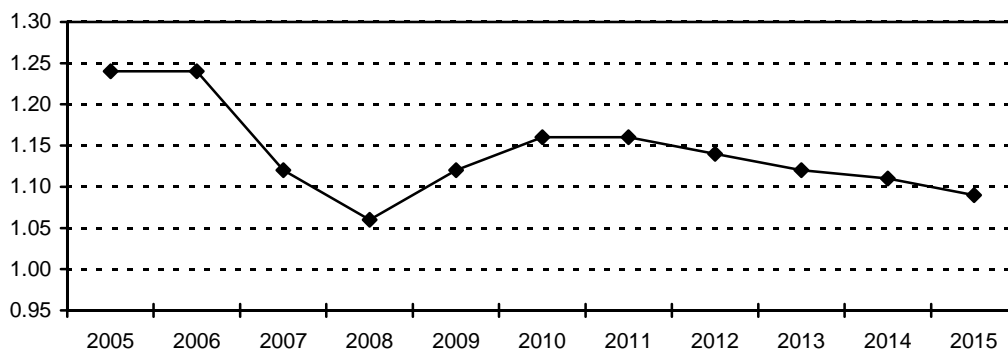
Figure 4.1 Macroeconomic projections for EU groups



Source: EU Member State national services

Further, the exchange rate between the euro and the US dollar is a key macroeconomic factor, since it influences the euro value of the exogenous world prices used in the AGMEMOD model. For the euro zone countries, the baseline projections concerning the evolution of the euro/US dollar exchange rate is illustrated in Figure 4.2.

Figure 4.2 US dollar/Euro exchange rate projection



Source: FAPRI 2006 US and World Agricultural Outlook (www.fapri.org and www.fapri.missouri.edu)

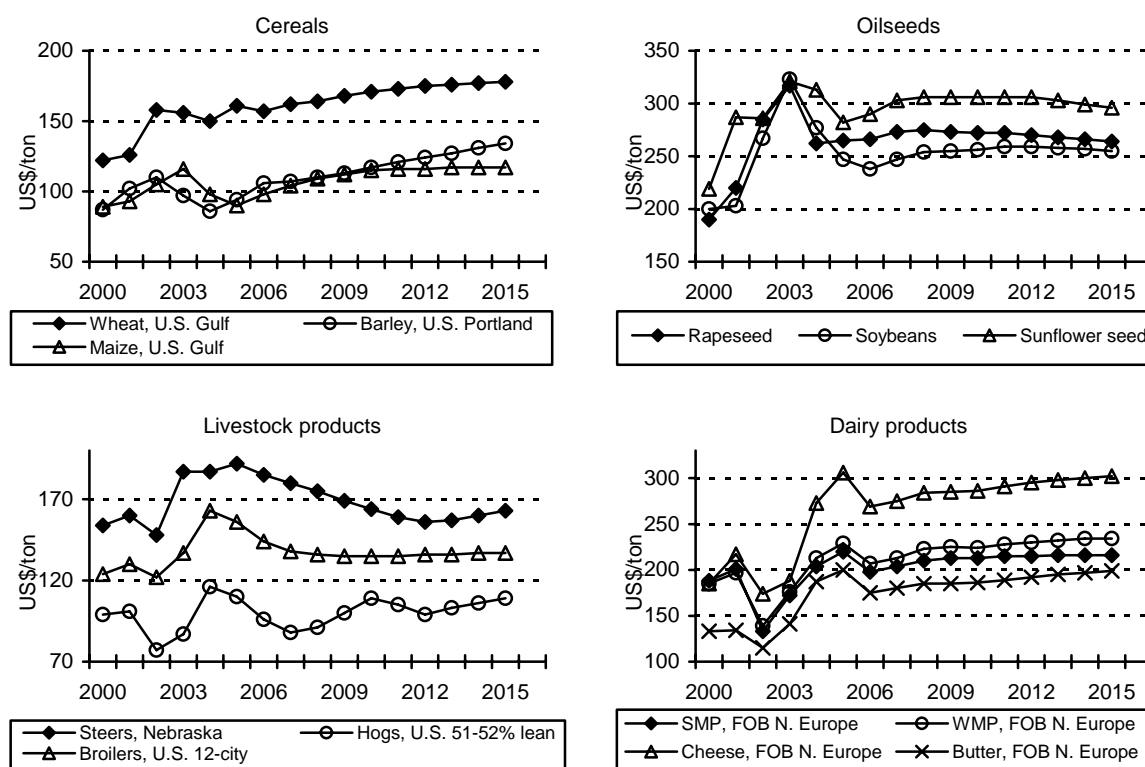
Since AGMEMOD does not have a capacity in this area, this exchange rate projection is sourced from internationally recognised macroeconomic forecasters. For non-euro zone countries, the exchange rate between these national currencies and the US dollar is derived from their exchange rate with the euro and the baseline US dollar/euro exchange rate, so that projected exchanges rates are consistent with the absence of possibilities for triangular arbitrage. The assumptions on

the evolution of the US dollar/euro exchange rate are based on the observed exchange rate for 2005 and the percentage change in this exchange rate that are published in the *FAPRI 2006 US and World Agricultural Outlook*.

World market prices

The last dataset required to generate baseline and scenario projections concerns the world market prices of the commodities included in the model. The price projections have, in general, been taken from the *FAPRI 2006 US and World Agricultural Outlook*. The world livestock and grain prices are market prices from the US. Dairy commodity prices and oilseed, oilseed meal and oil prices are generally northern European prices. The world market prices are specially induced in the key price equations to capture the effects of the world on the EU. For all simulations (baseline and scenarios) the world agricultural commodity price projections are assumed to be unchanged (in US dollars) from the baseline levels. This reflects the current structure of the AGMEMOD model, where developments on EU markets are not assumed to have any impact on the level of world prices. This assumption is a feature of the AGMEMOD model which will be revised as part of the research programme of another project. The developments of the world market prices are presented in Figure 4.3.

Figure 4.3 World market prices projections used in baseline and scenarios



Source: FAPRI 2006 US and World Agricultural Outlook

4.1.2 Scenarios

Three sets of scenarios, which have been agreed in conjunction with IPTS, were analysed as part of this study. These scenarios are briefly described here and are termed “Further CAP reform”,

“Exchange Rate Change” and “EU Enlargement”. The scenario analyses have been undertaken with a time horizon to 2015, for each EU Member State, Bulgaria and Romania, as well as in aggregate for the EU25 and EU27. The results of the scenarios analysed have been compared with the AGMEMOD baseline projections. Table 4.3 provides a summary of each scenario’s key elements.

Table 4.3 Summary of scenarios to be analysed

	Baseline	Further CAP Reform	Exchange Rate Change	EU Enlargement‡
EU15†	CAP with national implementation of Luxembourg Agreement Single Payment Scheme. Includes possibility for continuation of coupled direct payments as allowed for under the Luxembourg Agreement	From 2007 full decoupling of all remaining coupled direct payments allowed under Luxembourg Agreement. Compulsory modulation rate doubled from 2007	National currency versus US\$ exchange rate change scenarios from 2007 Euro = USD 1.0 Euro = USD 1.3 Euro = USD 1.4	As baseline with Romanian and Bulgarian accession
EU10	CAP with SAPS to 2008. SPS from 2009. Complementary National Direct Payments until 2013. With the adoption of the SFP system in 2009 coupled direct payments can be introduced. CNDP may also be coupled	From 2007 all direct payments fully decoupled from production. This includes coupled CNDP and coupled payments allowed on adoption of SFP system. Modulation rate doubled from 2013 onwards	As per old Member State with national currency exchange rates versus the euro assumed fixed	As baseline with Romanian and Bulgarian accession
Bulgaria and Romania	n.a.	n.a.	As per EU Member State with the exchange rate between the national currencies and the euro assumed fixed	On Accession in 2007 SAPS implemented with no adoption of the SFP System before 2015

Source: Report 3 of the IPTS Contract no 150267-2005-FIED-NL

† For purposes of analysis conducted in this study the EU15 aggregate includes Slovenia. Slovenia has chosen to adopt the classical CAP and SPS system and will not be utilising SAPS.

‡ A non-enlargement scenario will also be analysed. In this scenario, the non-accession policy for Bulgaria and Romania will continue for the whole projection period.

Further CAP Reform scenario

The Luxembourg Agreement of June 2003 introduced decoupled direct payments to EU farmers, but allowed for the differential implementation of these payments across EU Member States (e.g. countries were allowed to retain certain direct payments as coupled payments). In addition, the CAP payments system that applies in most of the Member States that acceded to the EU in May 2004 differs from those that apply in the old Member States. Under the Further CAP Reform scenario, all direct payments will be decoupled from 2007. Along with this, the rates of compulsory modulation, which currently apply under the Luxembourg Agreement, will be doubled to 10% from 2007 onwards. The existing € 5,000 franchise, under which the modulation provision does not apply, will be retained.

Exchange Rate Change scenario

The exchange rate between the US dollar and the euro is an important factor in determining the influence of world prices of agricultural commodities on EU agricultural markets and the competitiveness of EU agricultural exports to world markets. Thus, using the AGMEMOD model, it is important to evaluate the impact of changes to the US dollar versus euro exchange rate which could emerge over the 10 year projection period of the tool.

Under the baseline, the evolution of this exchange rate follows the path illustrated in Figure 4.2. In evaluating the impact of changes in this key macroeconomic assumption, three alternative paths of the US dollar versus the euro have been analysed. Two of these exchange rate projections involve a depreciation of the US dollar versus the euro to US\$1.30 and US\$ 1.40 per euro in 2007. The third alternative exchange rate projection examined is one under which the euro depreciates versus the dollar with the exchange rate in 2007 to a parity exchange rate of US\$ 1.00 per euro. The motivation for these scenarios arises from the expectation that external imbalances of the US economy could in the future lead to large changes in the US dollar/euro exchange rate and hence would influence EU agriculture.

EU Enlargement scenario

The EU Enlargement scenario has examined the consequences of the accession to the EU of Bulgaria and Romania (that took place on 1 January 2007) on agricultural markets in these two countries and the impact of the accession on the agricultural markets of an expanded EU. The counterfactual scenario of non-enlargement has been based on a continuation of pre-accession agricultural policy (defined as policy in 2004) in Bulgaria and Romania over the projection period (i.e. to 2015). This Non-enlargement scenario analysed enables the estimation of the impact of accession on Romanian and Bulgarian agriculture.

The Enlargement scenario is based on a set of policy and price assumptions. On accession, Bulgaria and Romania adopted the SAP Scheme. This scheme provides a flat-rate per-hectare payment to farmers paid once per year, irrespective of the crops produced or even whether any crops at all are produced. These payments per hectare unit are calculated in the same way as in other Member States operating the SAPS. I.e. the total amount of direct payment funds available for the given Member State is divided by the total amount of eligible agricultural area.

Within specific defined limits, Bulgaria and Romania (like the other new Member States) have the option to "top-up" EU funded direct payments with national subsidies. The Enlargement scenario analysed took into account the gradual increase in the value of direct payments following accession and the possibility of nationally funded top up CNDP. It is assumed that the

2003 CAP reform will not be implemented in Bulgaria and Romania following their accession, but that their agricultural policy will be determined by SAPS up to 2015 with the possible addition of nationally financed complementary direct payment aids.

Under the Enlargement scenario, prices for most Bulgarian and Romanian agricultural products are assumed to converge to the EU level of prices by the end of the projection period. Generally, the producer price levels in these countries are significantly lower than the price level in the EU. However, this situation differs somewhat from sector to sector. Bulgarian country experts predict different price convergence patterns among the commodities modelled. For most products an immediate price increase is projected to occur following accession to the EU. Under the Enlargement scenario the most substantial increase projected to occur is in Bulgarian milk prices, which are assumed to increase by almost 25%. This large increase exceeds that projected for barley and wheat prices by 17% and 10% respectively. For all other analysed products, with the exception of beef, the projected increase in Bulgarian prices is less than or equal to 5%. The Bulgarian beef price is currently substantially lower than the EU key price and it is projected that the price transmission between EU and Bulgarian prices will be such that by the end of the projection period (2015) the existing price gap between EU and Bulgarian prices is assumed to be eliminated.

Following accession, most agricultural producer prices in Romania are assumed to increase too. With 28%, the most substantial price increase is for milk compared to the baseline of non-enlargement. This is followed in magnitude by price increases that are projected to occur for pork (9%) and wheat (6%). On the other hand, prices for sunflower and beef in Romania following accession are projected to decline by 5% and 7% respectively. According to Romanian expert opinions, only beef prices are expected to remain well below EU price levels.

4.2 EU25 baseline and scenarios projections

In this section, the results under the baseline, the Further CAP Reform and the Exchange Rate Change scenarios for the EU25 are presented. As noted earlier all of the individual EU15 country results were generated using the current AGMEMOD combined model. However, the results for new Member States are still based on stand-alone country models and consequently the EU25 results should be interpreted as representing the output of the EU25 hybrid model. Although not all 25 country models have been fully integrated yet, the aggregated hybrid results provide some insights into the general developments under both the baseline and the scenario impacts. This section also gives insight in the decomposition of the EU25 aggregates into results of the old Member State group (EU15) and the new Member State group (EU10⁶) respectively.

4.2.1 Crops

EU25 results

The projections for the cereal markets of the EU25, after the implementation of the measures of the Luxembourg Agreement (the baseline), suggest that cereal production in the EU will expand at a very moderate path. Due to world price and macroeconomic factors, the level of prices is

⁶ Although AGMEMOD only captures eight new Member States (Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovak Republic and Slovenia), the group of new Member States is mentioned 'EU10' in this Final Report.

projected to increase from 2005 onwards. This increase in prices, when combined with somewhat reduced feed demand for grains from the European livestock sectors, reduces overall domestic use of cereals in the EU25 over the period 2005 to 2015. On the one hand, domestic use of soft wheat and durum wheat would expand under the baseline despite increases in prices. On the other hand, domestic use of barley and maize would reduce (Figure 4.4).

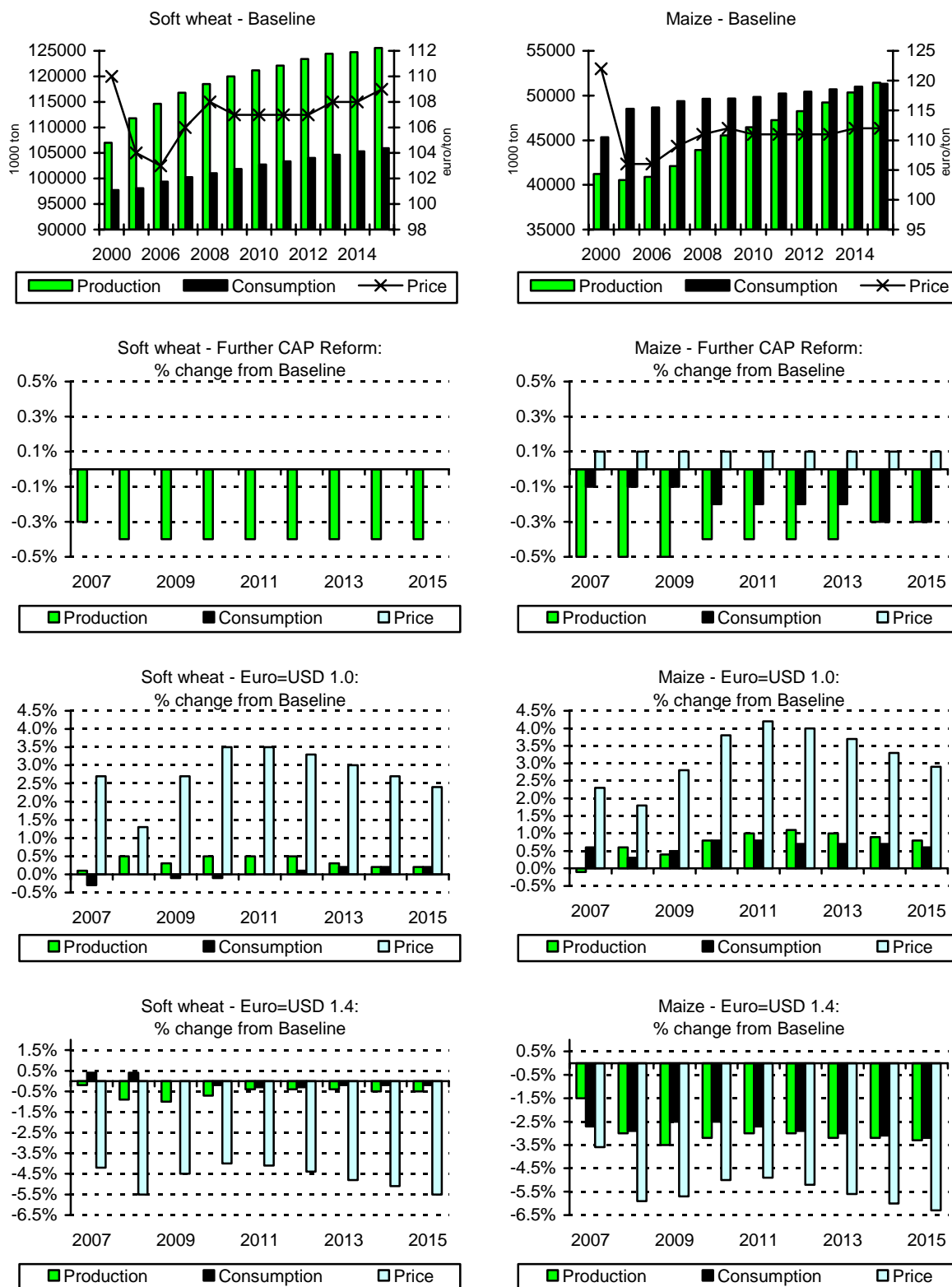
The degree to which arable aid payments were coupled under the baseline was the lowest across all of commodity organisations of the CAP that had direct payments under the CAP prior to the Luxembourg Agreement. Thus, a priori the expectation is that the Further CAP Reform scenario should only have minor impacts on the supply and use balance for cereals and oilseeds in the EU25 and that price impacts when compared to the baseline should also be minimal. Figure 4.4 shows that the production of cereals under the Further CAP Reform scenario indeed only changes marginally when compared to the baseline. On the one hand, rye and durum wheat production decreases, while maize production counter-intuitively increases on the other hand. This result may be due to the fact that arable land previously used to grow durum wheat is shifting into maize.

Under the baseline, oilseed production and domestic use in the EU25 is projected to expand strongly over the period 2005 to 2015. By 22%, domestic use of rapeseed grows the most, with its production projected to increase by over 20 percent. Despite higher prices, domestic use would increase remarkably. Here, the growing demand for oil for bio energy plays a role. The rising world price of soybeans and sunflower leads to a moderate growth in demand for these oilseeds and their associated meals and oils (see Figure 4.5).

The full decoupling of arable aid payments would be expected to lead, *ceteris paribus*, to lower production of oilseeds. Both figures show that the production of oilseeds under the Further CAP Reform scenario only changes marginally when compared to the baseline.

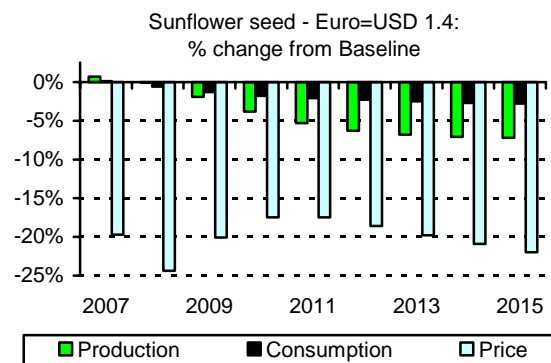
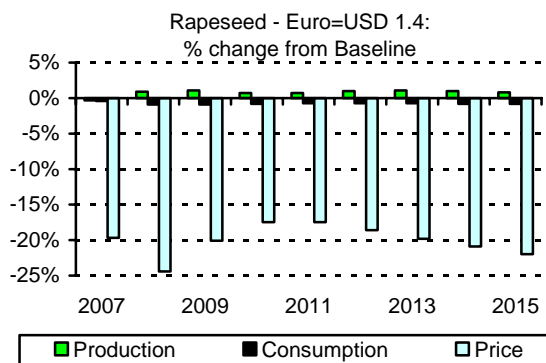
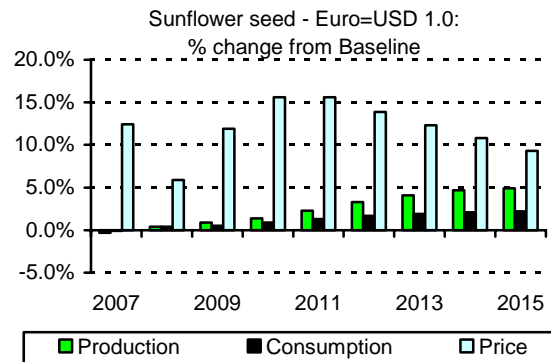
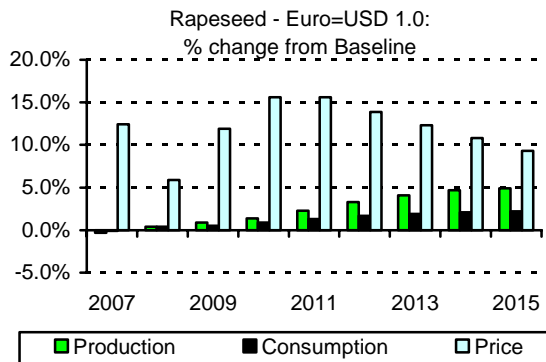
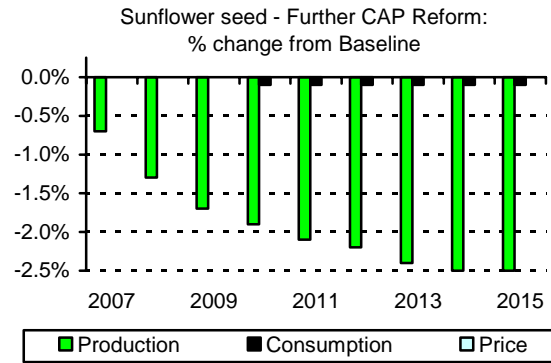
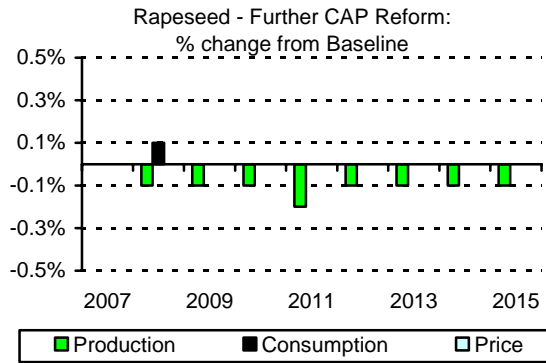
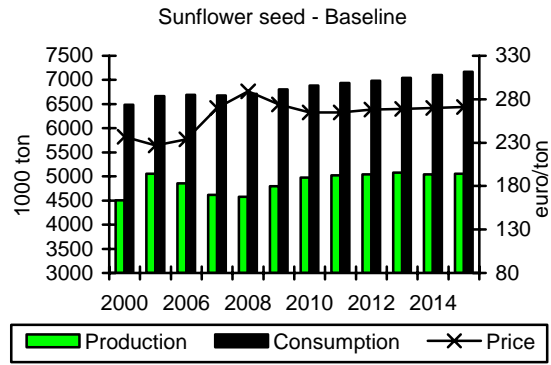
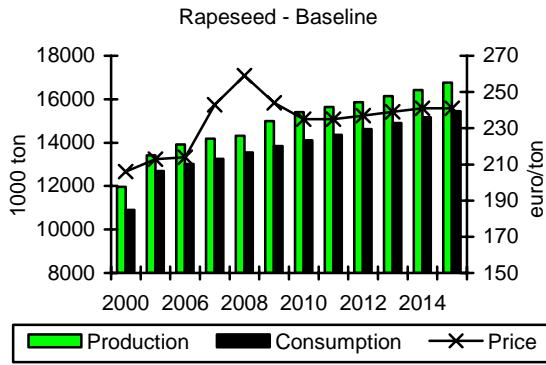
Since prices of oilseeds and their associated meal and oils are exogenous to the AGMEMOD model, it would be expected that the Exchange Rate shocks examined in the scenarios would have a bigger projected impact on the oilseed sectors than on the EU cereal sector where prices are endogenous, i.e. where EU25 supply, demand and prices adjust so as to ensure market clearance in the EU in the event of an exogenous change in the exchange rate. The results of the scenario simulations fit with these a priori expectations as to how prices, production and uses of cereals and oilseeds would adjust in the event of such a change occurring. As expected, due to the current structure of the AGMEMOD model, the price impact and consequently the supply (production and imports) and use (domestic use and exports) impacts of the change are larger for the oilseed and oilseed meal and oil markets.

Figure 4.4 EU25 soft wheat and maize projections under baseline and scenarios



Source: AGMEMOD Country Models (2006)

Figure 4.5 EU25 rapeseed and sunflower seed projections under baseline and scenarios



Source: AGMEMOD Country Models (2006)

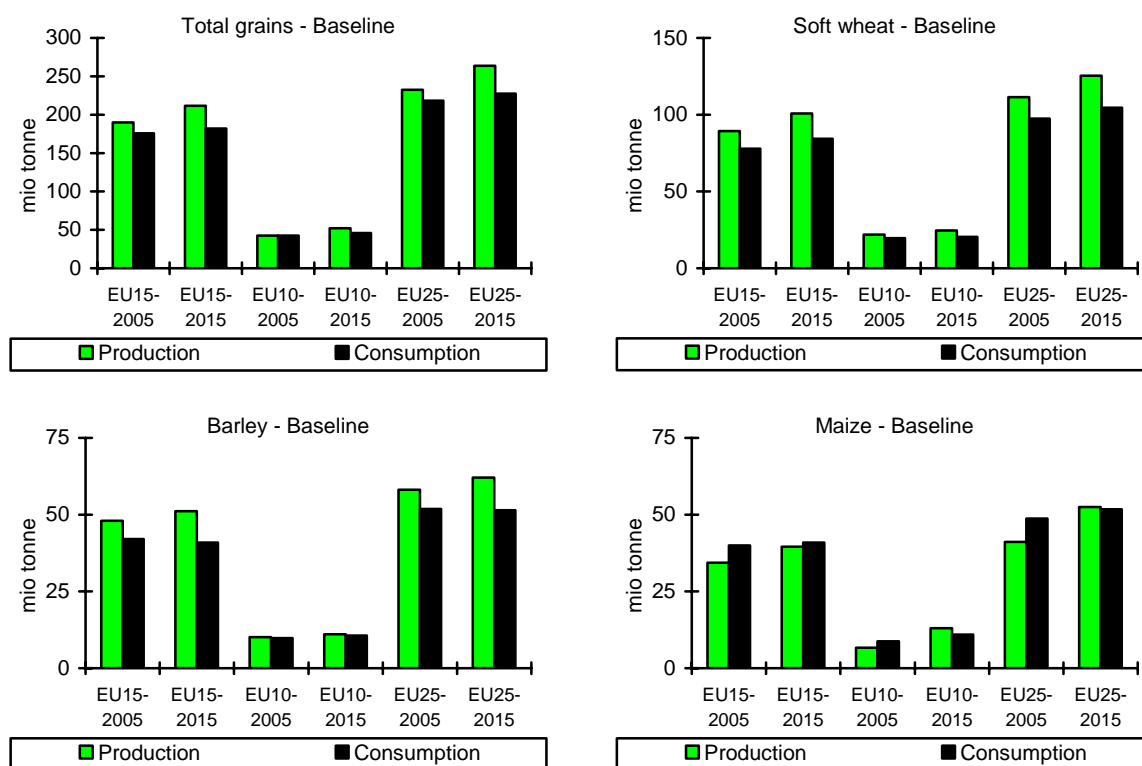
Under the Euro=USD1.0 scenario all crop product prices are higher than under the baseline and these are associated with greater production of all cereals and oilseeds when compared with the baseline. As expected, the percentage change in oilseed prices under the Euro=USD1.0 scenario

is greater than the changes in other crops' market prices. Under the Euro=USD1.4 scenario the euro appreciates against the US dollar, which results to lower crop prices compared to the baseline. Again, the magnitude of the oilseed price changes projected is greater than the changes for cereals. In response to the lower prices, production of all crops in the EU25 aggregate is lower than under the baseline.

EU15 and EU10 results

Figure 4.6 decomposes the EU25 projections for the grain production and consumption under the baseline into results for the EU15 (old Member States) and the EU10 (new Member States) respectively. Between 2000 and 2015, the share of the EU15 in the EU25 production and consumption would fall. In particular, the production in Hungary and Poland will grow due to yield developments following accession. The EU25 net export position increases for soft wheat and barley, while it's situation for maize changes from a net importer to a net exporter. Table 4.4 shows the development of the self-sufficiency rates for the considered grain types.

Figure 4.6 Grain production and consumption in EU15, EU10 and EU25 under baseline



Source: AGMEMOD Country Models (2006)

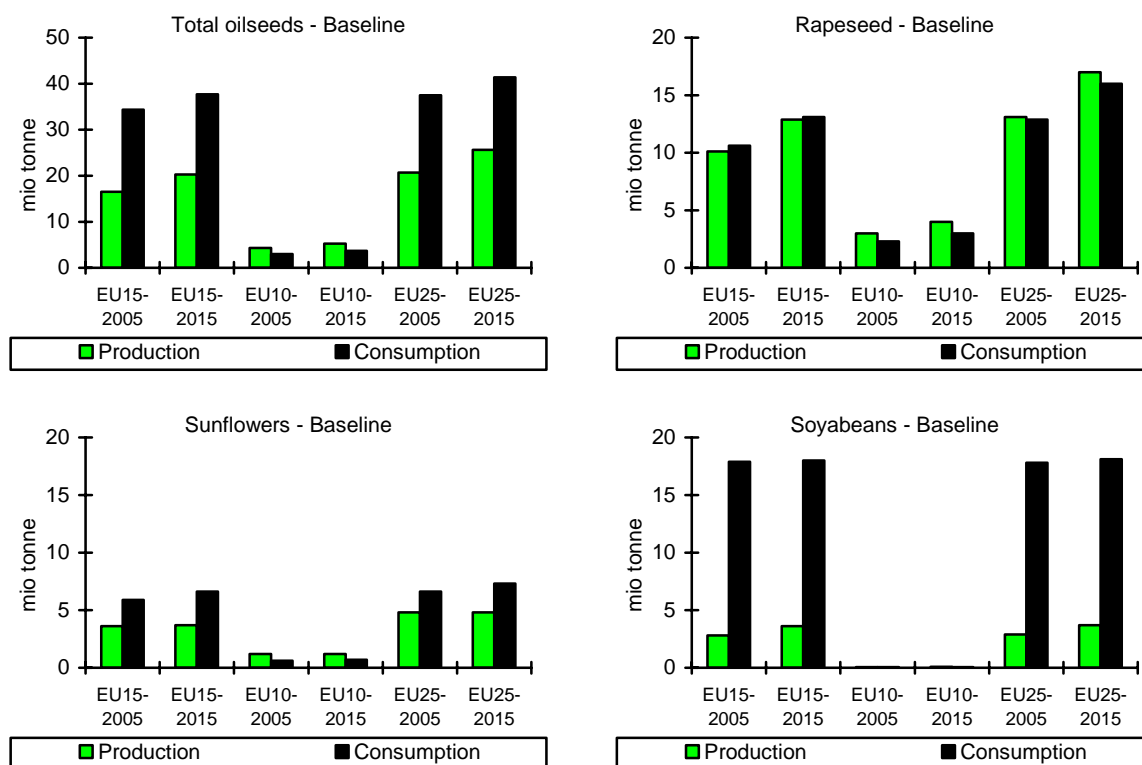
Table 4.4 Self-sufficiency rates for grains in EU15, EU10 and EU25 under Baseline

Self-sufficiency rate	Group	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total grains	EU15	1.07	1.08	1.09	1.10	1.11	1.09	1.12	1.13	1.14	1.15	1.15	1.16
	EU10	0.94	1.01	1.01	1.04	1.07	1.09	1.10	1.11	1.12	1.14	1.13	1.14
	EU25	1.05	1.07	1.07	1.09	1.10	1.08	1.12	1.13	1.14	1.14	1.15	1.16
Soft wheat	EU15	1.12	1.15	1.16	1.16	1.18	1.18	1.18	1.18	1.18	1.19	1.19	1.20
	EU10	0.99	1.12	1.13	1.17	1.17	1.19	1.21	1.23	1.24	1.24	1.21	1.21
	EU25	1.09	1.14	1.15	1.17	1.17	1.18	1.18	1.19	1.19	1.20	1.20	1.20
Barley	EU15	1.12	1.14	1.15	1.15	1.16	1.18	1.18	1.19	1.21	1.22	1.23	1.25
	EU10	0.87	1.03	1.07	1.07	1.07	1.07	1.07	1.06	1.07	1.06	1.04	1.04
	EU25	1.08	1.12	1.13	1.14	1.14	1.16	1.16	1.17	1.18	1.19	1.19	1.21
Maize	EU15	0.90	0.86	0.88	0.88	0.89	0.91	0.92	0.93	0.96	0.95	0.96	0.97
	EU10	0.92	0.77	0.75	0.80	0.92	0.99	1.01	1.02	1.06	1.11	1.16	1.19
	EU25	0.90	0.84	0.85	0.86	0.90	0.93	0.94	0.95	0.98	0.98	1.00	1.01

Source: AGMEMOD Country Models (2006)

Figure 4.7 decomposes the EU25 projections for oilseed production and consumption under the baseline into the EU15 and EU10 groups. Despite a significant production growth in Italy, France and Germany, the share of the EU15 in the EU25 production is projected to fall somewhat. The EU15 self-sufficiency rate of oilseeds is expected to increase over the period 2000 to 2015, but the old Member State group will remain a net importer. On the other hand, the EU10 is a net exporter of oilseeds in 2000 and its self-sufficiency rates will expand up to 2015. The whole EU25 remains a net importer of sunflower and soybeans and a net exporter of rapeseeds. Table 4.5 shows the development of the self-sufficiency rates for the considered oilseed types.

Figure 4.7 Oilseeds production and consumption in EU15, EU10 and EU25 under baseline



Source: AGMEMOD Country Models (2006)

Table 4.5 Self-sufficiency rates for oilseeds in EU15, EU10 and EU25 under Baseline

Self-sufficiency rate	Group	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total oilseeds	EU15	0.48	0.48	0.49	0.49	0.48	0.50	0.51	0.51	0.52	0.53	0.53	0.54
	EU10	1.20	1.40	1.38	1.37	1.37	1.40	1.42	1.42	1.42	1.43	1.43	1.43
	EU25	0.54	0.55	0.56	0.56	0.56	0.57	0.59	0.59	0.60	0.61	0.61	0.62
Rapeseeds	EU15	1.07	0.95	0.98	0.97	0.94	0.96	0.97	0.98	0.99	0.99	0.99	0.99
	EU10	1.17	1.31	1.30	1.31	1.32	1.34	1.36	1.35	1.35	1.35	1.36	1.37
	EU25	1.08	1.02	1.04	1.03	1.01	1.03	1.04	1.05	1.05	1.05	1.06	1.06
Sunflowers	EU15	0.63	0.61	0.59	0.58	0.57	0.56	0.56	0.56	0.56	0.56	0.56	0.56
	EU10	1.37	1.69	1.68	1.59	1.55	1.59	1.64	1.68	1.71	1.72	1.69	1.65
	EU25	0.69	0.72	0.70	0.68	0.67	0.67	0.67	0.68	0.68	0.68	0.67	0.67
Soyabeans	EU15	0.12	0.16	0.16	0.16	0.16	0.17	0.17	0.18	0.19	0.19	0.20	0.20
	EU10	0.97	1.32	1.34	1.32	1.38	1.47	1.50	1.49	1.49	1.50	1.50	1.50
	EU25	0.12	0.16	0.16	0.16	0.17	0.17	0.18	0.18	0.19	0.19	0.20	0.21

Source: AGMEMOD Country Models (2006)

Appendix 1 presents figures with baseline results and scenario simulation impacts of crops in the EU15 and EU10 respectively.

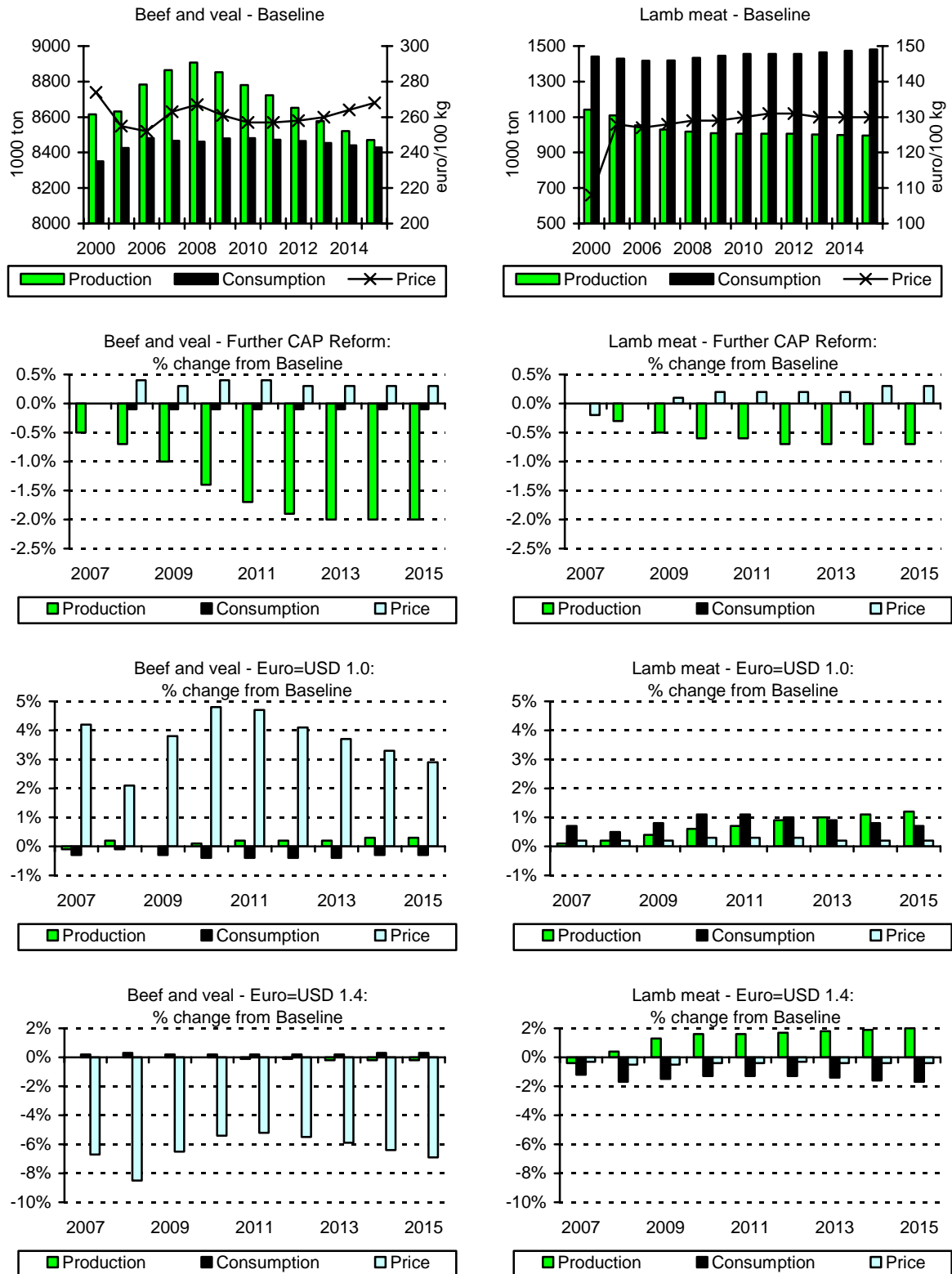
4.2.2 Livestock and dairy products

EU25 results

Under the baseline, the national level implementation of the Luxembourg Agreement that has occurred to date is assumed to continue unchanged until 2015. Member States have significant freedom with respect to the degree to which direct payments are fully or partially decoupled from production. Most Member States have chosen to retain at least some of their Agenda 2000 livestock direct payments in their production coupled form. EU25 beef production is projected to decline by 2 percent in 2015 when compared with the level in 2005, while EU25 prices increase by 5 percent as a result of this contraction in supply. With higher prices, the beef domestic use will remain stable. EU lamb production also declines over the baseline projection period by almost 10 percent compared to 2005, with a moderate increase of prices. Domestic use of pig meat and poultry meat are projected to increase due to the higher prices of beef and lamb. Further, in response to projected higher prices, pig meat production increases by 16 percent between 2005 and 2015. Prices of poultry meat are projected to continue to decline due to the continued strong technology driven expansion of poultry production, which over the period 2005 and 2015 increase by 12 percent (see Figures 4.8 and 4.9).

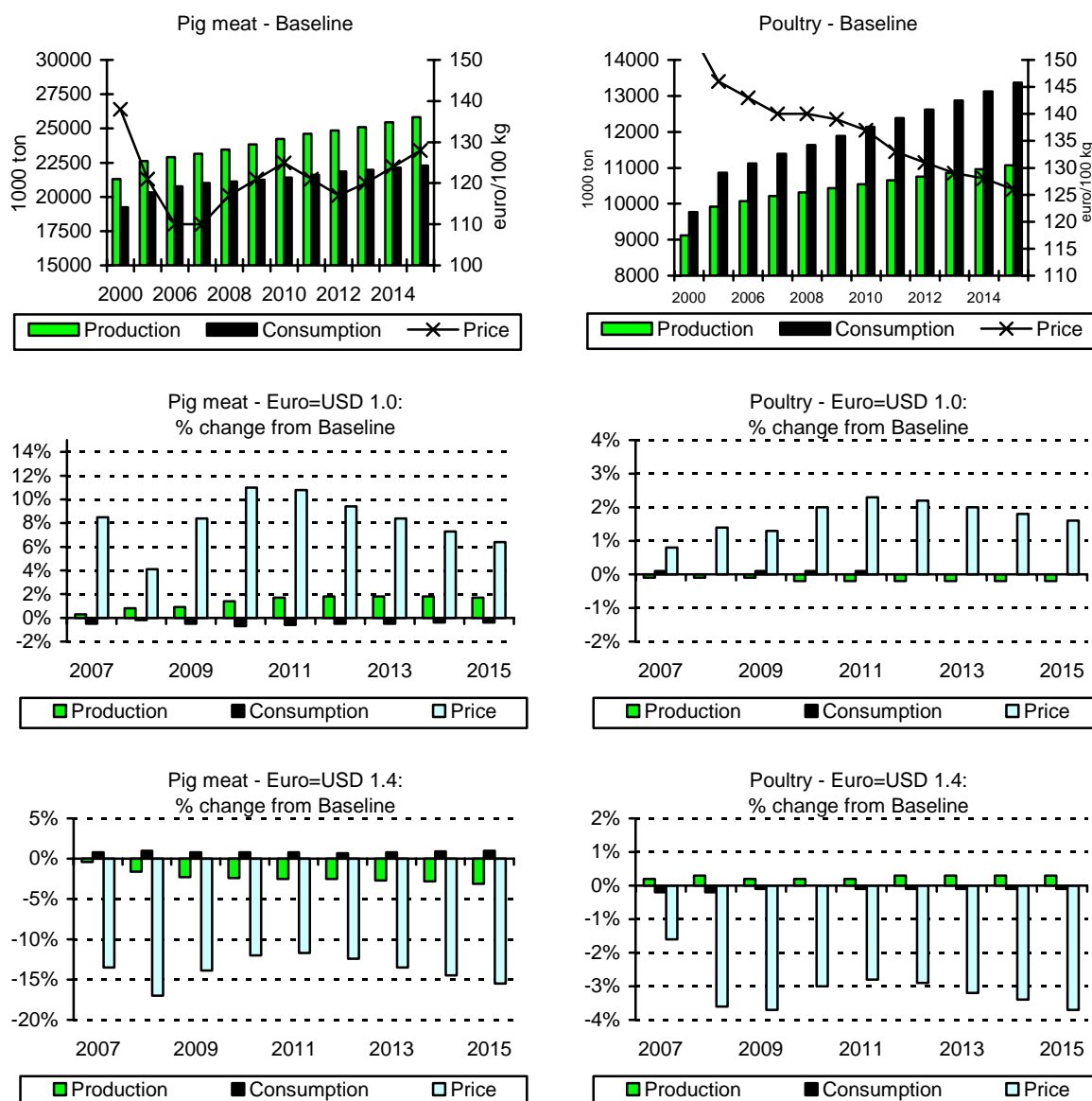
Most Member States chose to retain some direct payments as coupled to production but the preponderance of livestock direct payments were decoupled. Thus, the impact of the Further CAP Reform scenario can be expected to be of limited magnitude. With the full decoupling of direct payments, that had under the Luxembourg Agreement remained coupled to production, beef production in the EU25 is projected to decline relative to the baseline from 2007 onwards. With EU25 prices also projected to be increased relative to the baseline (increased imports moderate the price impact of the projected indigenous supply contraction), total domestic use of beef in the EU25 is projected to be marginally lower. Given the absence of any change in policy with respect to the pig and poultry sectors, changes in these markets are negligible. Hence, these commodities are not included in Figure 4.9.

Figure 4.8 EU25 beef and lamb meat projections under baseline and scenarios



Source: AGMEMOD Country Models (2006)

Figure 4.9 EU25 pig meat and poultry projections under baseline and scenarios



Source: AGMEMOD Country Models (2006)

The results for livestock and livestock product markets of the Exchange Rate Change scenario simulations fit with a priori expectations as to how prices, production and uses of meats would adjust in the event of such exogenous macroeconomic changes occurring. Under the Euro=USD1.0 scenario all meat product prices are higher than under the baseline from 2007 onwards. The higher EU prices under this scenario are in general associated with greater production and lower domestic of all use of meats. For some commodities cross price effects lead to small increases in domestic use when compared with the baseline. This is the case for example for sheep meat due to the large increase of beef prices. As would be expected a priori all meat prices under the Euro=USD1.4 scenario are lower than under the baseline. In response to these lower prices, the production of all meats in the EU25 aggregate is lower than under the baseline and all domestic uses of meats are higher.

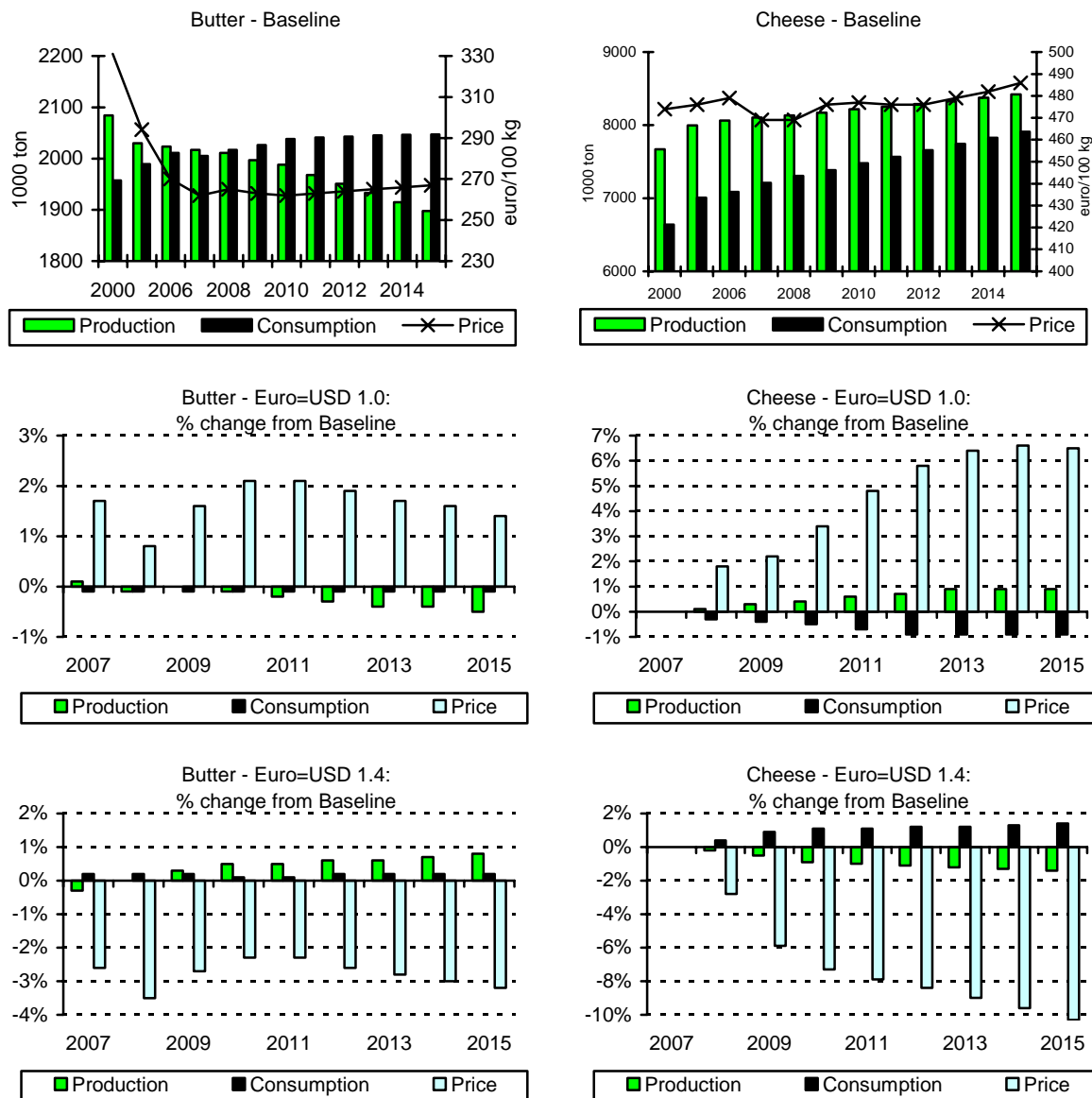
The Luxembourg Agreement contained measures that affected the EU25 dairy sector in a number of ways: intervention prices of skim milk powder and butter were reduced, milk quota increased and the dairy premiums induced and decoupled via inclusion in the SFP. Due to the fact that the price difference between the domestic EU market and the world markets for skim milk powder is small, the projected price decline under the baseline is only reflected to a partial degree in EU25 market prices (minus 7 percent). With a larger price differential between EU and world market prices for butter, the reduction in the intervention price is more or less completely reflected in lower domestic prices of butter (minus 10 percent in the period 2005 to 2015).

With lower butter prices, milk is reallocated in EU dairy processing industries from butter towards cheese production. At the EU25 level, butter production is projected to be 6 percent lower in 2015 than in 2005, whereas cheese production will be expanded by about 8 percent. Over the same period the reallocation of milk protein necessary to facilitate this increase in cheese production affects skim milk powder production: EU25 skim milk powder production declines by over 28 percent. In addition to the impact of cuts in intervention on the allocation of milk fats and proteins, changed prices also have an impact on EU25 consumption of dairy products. Lower EU butter prices increases the EU25 butter domestic use by almost 2 percent. Cheese consumption in the EU25 increases by almost 15 percent in the period 2005 to 2015. Although all dairy prices (with the exception of cheese) fall under the baseline, and as a consequence the producer prices for milk, the raw milk production will continue to be at quota levels. Figures 4.10 and 4.11 present the developments of the dairy commodity markets in AGMEMOD.

The Further CAP Reform scenario has no specific reforms to dairy commodity market organisations and as a consequence the impact of the reforms on dairy markets is negligible.

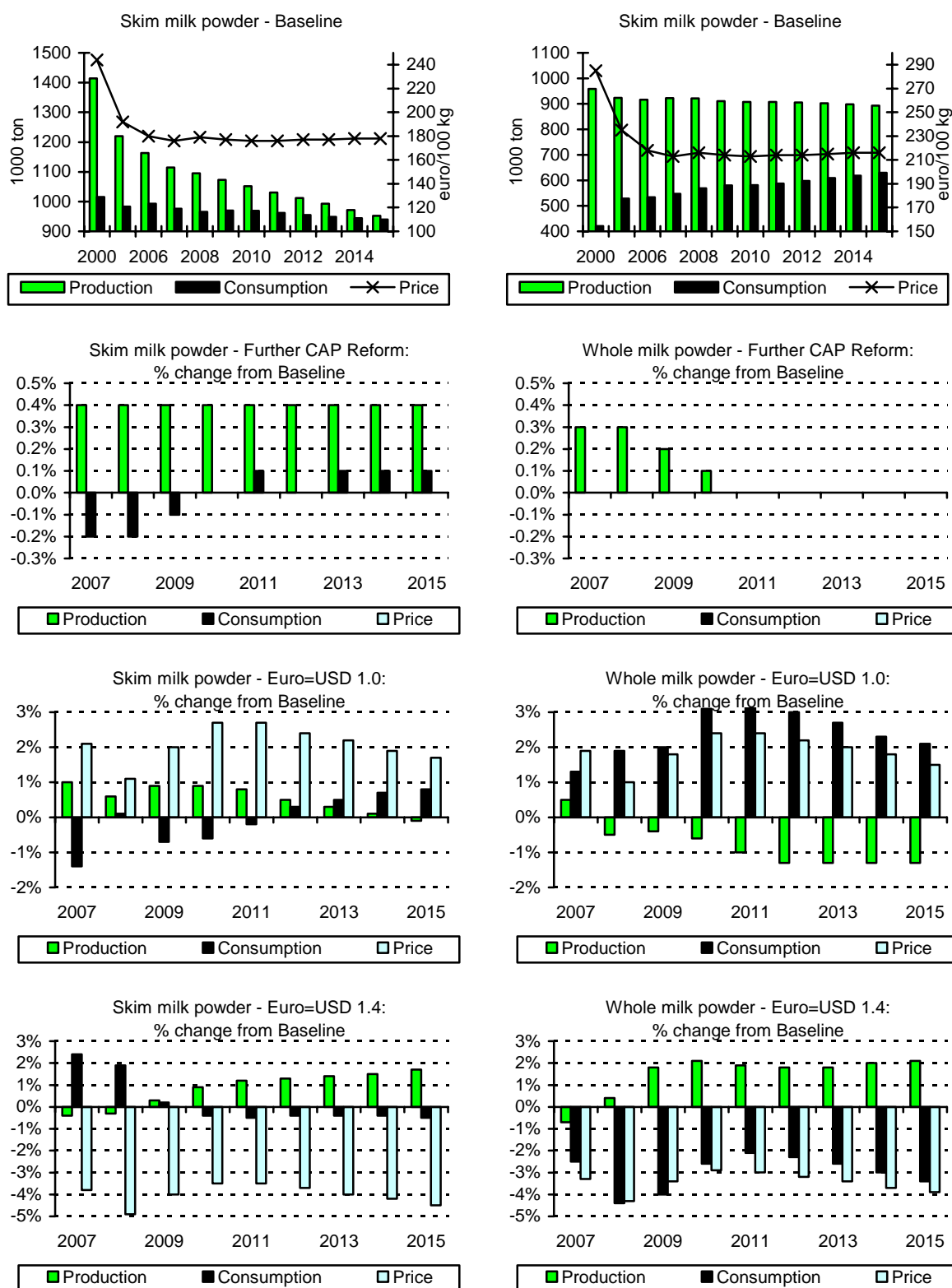
The results for dairy product markets of the Exchange Rate Change scenario simulations fit with a priori expectations as to how prices, production and uses would adjust in the event of such exogenous macroeconomic changes occurring. Under the Euro=USD1.0 scenario all dairy product prices are higher than under the baseline from 2007 onwards, while all product prices under the Euro=USD1.4 scenario are lower than under the baseline. In response to these lower prices, the production of butter and cheese in the EU25 aggregate is lower than under the baseline and the domestic uses of these products are higher.

Figure 4.10 EU25 butter and cheese projections under baseline and scenarios



Source: AGMEMOD Country Models (2006)

Figure 4.11 EU25 skim and whole milk powder projections under baseline and scenarios



Source: AGMEMOD Country Models (2006)

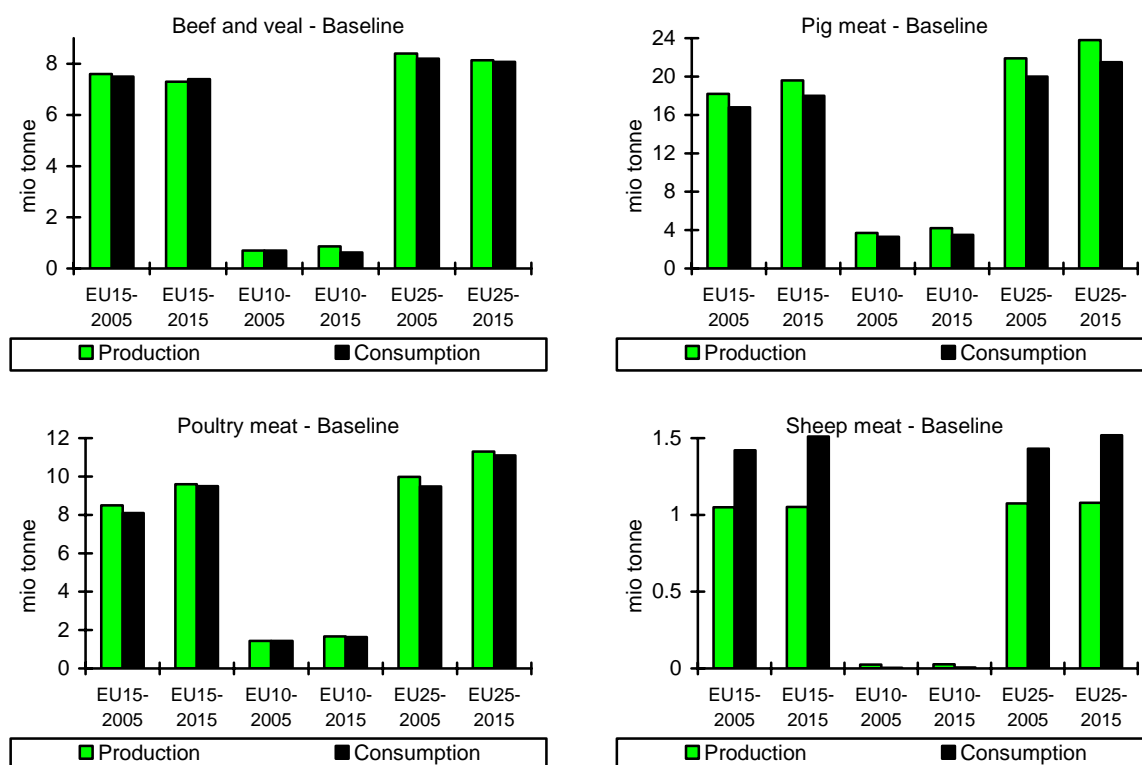
EU15 and EU10 results

Figure 4.12 splits the EU25 projections for livestock products production and consumption under the baseline into results for the EU15 and the EU10. Between 2000 and 2015, the share of the EU15 in the EU25 beef and veal production and consumption is projected to fall as a result of the decoupling effect. On the other hand, the EU10 beef and veal production increases following accession, which is mainly due to higher slaughtering weights in the new Member States (technical progress of better beef breeds). Projections for consumption per head fall all over the EU. In 2015, the EU15 is expected to be a net beef importer, while the self-sufficiency rate of the whole EU25 reduces to a level just above the 100%.

The share of the EU15 in the EU25 pig meat and poultry meat production projections decreases in the period 2005 to 2015. In particular, Hungary would explore a significant production growth of both meat types. Pork and poultry consumption per head will increase all over the EU, which is due to cross price effects. The net export position is projected to rise for pig meat, but it will decrease for poultry meat.

The EU25 is expected to remain a net importer of sheep meat under the baseline, which is caused by a decreasing self-sufficiency rate.

Figure 4.12 Livestock products production and consumption in EU15, EU10 and EU25 under baseline



Source: AGMEMOD Country Models (2006)

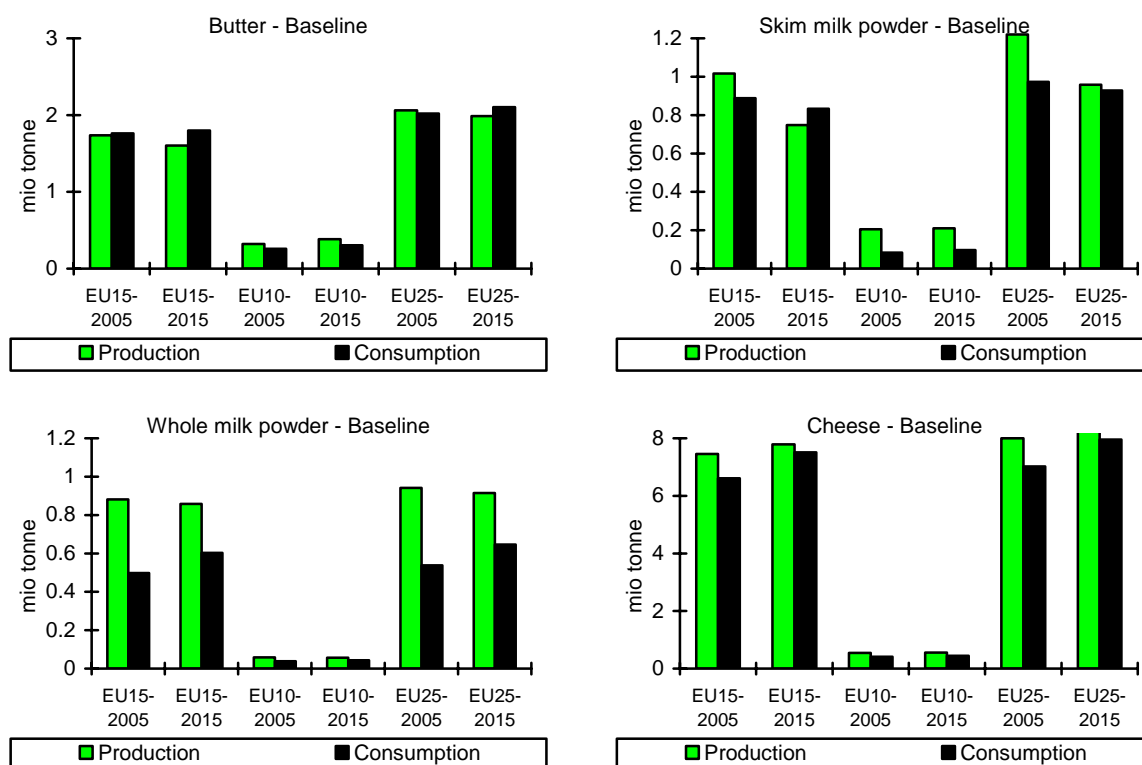
Table 4.6 Self-sufficiency rates for livestock products in EU15, EU10 and EU25 under Baseline

Self-sufficiency rate	Group	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Beef and veal	EU15	1.03	1.02	1.02	1.03	1.03	1.01	1.00	1.00	0.99	0.99	0.98	0.98
	EU10	1.07	1.08	1.24	1.25	1.27	1.29	1.32	1.34	1.35	1.34	1.34	1.35
	EU25	1.04	1.02	1.04	1.05	1.05	1.04	1.03	1.03	1.02	1.01	1.01	1.01
Pig meat	EU15	1.11	1.09	1.07	1.06	1.06	1.07	1.08	1.08	1.08	1.08	1.08	1.09
	EU10	1.03	1.12	1.10	1.09	1.12	1.15	1.18	1.20	1.18	1.17	1.18	1.20
	EU25	1.10	1.09	1.08	1.07	1.07	1.08	1.09	1.10	1.10	1.10	1.10	1.11
Poultry meat	EU15	1.12	1.06	1.06	1.06	1.05	1.05	1.04	1.04	1.03	1.03	1.02	1.02
	EU10	1.02	1.01	1.03	1.04	1.04	1.03	1.03	1.02	1.02	1.02	1.02	1.01
	EU25	1.11	1.05	1.06	1.05	1.05	1.04	1.04	1.04	1.03	1.03	1.02	1.02
Sheep meat	EU15	0.80	0.74	0.74	0.75	0.74	0.73	0.72	0.72	0.72	0.71	0.70	0.70
	EU10	2.76	4.61	4.54	4.46	4.36	4.37	4.38	4.39	4.40	4.18	4.12	4.09
	EU25	0.81	0.75	0.76	0.76	0.76	0.74	0.73	0.73	0.73	0.73	0.72	0.71

Source: AGMEMOD Country Models (2006)

Figure 4.13 divides the EU25 projections for dairy products production and consumption under the baseline into a EU15 and a EU10 group. The butter production is projected to decline as an impact of reduced intervention prices. The EU25 self-sufficiency rate for butter falls from 1.07 in 2000 to 0.94 in 2015, which brings the EU in a net import position. A similar development regards the self-sufficiency rate of milk powders and cheese due to a faster growth of consumption levels compared to production levels. The EU25 net export situation for cheese is projected to decrease.

Figure 4.13 Dairy products production and consumption in EU15, EU10 and EU25 under baseline



Source: AGMEMOD Country Models (2006)

Table 4.7 Self-sufficiency rates for dairy products in EU15, EU10 and EU25 under Baseline

Self-sufficiency rate	Group	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Butter	EU15	1.05	0.99	0.96	0.96	0.95	0.94	0.93	0.92	0.91	0.91	0.90	0.89
	EU10	1.18	1.25	1.23	1.23	1.24	1.23	1.23	1.24	1.24	1.25	1.25	1.26
	EU25	1.07	1.02	1.00	1.00	0.99	0.98	0.97	0.97	0.96	0.95	0.95	0.94
Skim milk powder	EU15	1.28	1.14	1.05	1.03	1.02	0.99	0.97	0.96	0.95	0.93	0.92	0.90
	EU10	2.77	2.42	2.58	2.60	2.57	2.51	2.46	2.40	2.35	2.29	2.24	2.19
	EU25	1.39	1.25	1.18	1.15	1.15	1.12	1.10	1.09	1.08	1.06	1.05	1.03
Whole milk powder	EU15	2.31	1.77	1.74	1.71	1.64	1.58	1.57	1.55	1.52	1.49	1.45	1.42
	EU10	1.64	1.50	1.37	1.39	1.38	1.37	1.36	1.34	1.33	1.32	1.31	1.30
	EU25	2.25	1.75	1.72	1.69	1.62	1.57	1.56	1.54	1.51	1.48	1.44	1.41
Cheese	EU15	1.16	1.13	1.12	1.11	1.09	1.08	1.07	1.07	1.06	1.05	1.04	1.04
	EU10	1.15	1.33	1.30	1.27	1.26	1.25	1.24	1.24	1.23	1.23	1.23	1.24
	EU25	1.16	1.14	1.13	1.12	1.10	1.09	1.08	1.08	1.07	1.06	1.05	1.05

Source: AGMEMOD Country Models (2006)

Appendix 1 presents figures with baseline results and scenario simulation impacts of livestock and dairy products in the EU15 and EU10 respectively.

4.2.3 Agricultural income

EU25 results

In general the decoupling provisions of the Luxembourg Agreement lead to lower volumes of agricultural output, though the impact of such projected developments on the agricultural output value are offset by price increases. Baseline projections show a 9 percent rise of agricultural output value between 2005 and 2015. Despite the phasing in of the full value of the SFP supports in the new Member States, the amount of subsidies reduces in value over the baseline projection period by 4 percent. The trend in gross agricultural income is increasing with its level in 2015 almost 7 percent higher than the level in 2005 (see Table 4.8, in which only the agricultural output value, subsidies, feeding costs and gross agricultural income related to the commodities in this study have been covered).

Table 4.8 EU25 Output value, subsidies, feed cost and gross income in baseline¹⁾

	Unit	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Agricultural output value	billion euro	136.8	131.8	129.0	131.9	136.2	137.2	138.3	137.7	137.4	139.3	141.4	143.7
Subsidies	billion euro	21.8	26.3	25.7	25.9	26.2	26.5	26.8	26.6	26.5	26.0	25.7	25.5
Feeding costs	billion euro	23.2	20.1	20.2	21.3	21.9	21.5	21.3	21.4	21.6	21.8	22.0	22.1
Gross agricultural income	billion euro	135.4	138.1	134.5	136.6	140.5	142.2	143.7	142.9	142.3	143.4	145.2	147.1

¹⁾ Only the commodities analysed in the study carried out for the IPTS are taken account of (see list in section 1.2).
Source: AGMEMOD Country Models (2006)

The Further CAP Reform scenario would be expected to have a negative impact on agricultural output value and agricultural income, since the full decoupling of direct payments would lead to reductions in the volume of agricultural output produced. Further, the doubling of the compulsory modulation rate will reduce the value of direct payments to farmers via reduced single farm payment checks (see Table 4.9). The output value as expected falls, though the magnitude of the decline relative to the baseline is quite small. The value of subsidies declines as the impact of the compulsory modulation of 10% from 2007 onwards is felt. By 2015, under the Further CAP Reform scenario the value of subsidies is over 10 percent lower than under the baseline. Because of the only slight changes in the EU25 livestock sectors there are only minor changes in the aggregate EU25 expenditure on animal feeds. Overall EU25 gross agricultural

income is by 2015 over 2 percent lower under the Further CAP Reform scenario than under the baseline.

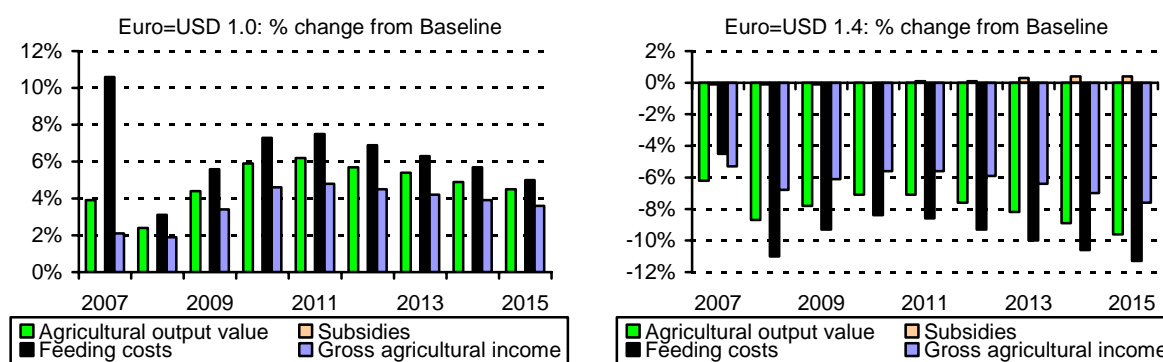
Table 4.9 EU25 output value, subsidies, feed cost and gross income in Further CAP Reform scenario (% change from Baseline)

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Agricultural output value	-0.1%	-0.1%	-0.2%	-0.2%	-0.3%	-0.3%	-0.3%	-0.4%	-0.4%
Subsidies	-8.7%	-8.4%	-8.4%	-8.4%	-8.5%	-8.9%	-9.9%	-10.1%	-10.4%
Feeding costs	4.8%	0.4%	0.1%	0.1%	0.0%	0.0%	-0.1%	-0.1%	-0.1%
Gross agricultural income	-2.5%	-1.7%	-1.8%	-1.8%	-1.9%	-2.0%	-2.1%	-2.1%	-2.1%

Source: AGMEMOD Country Models (2006)

Projections of gross agricultural income, agricultural output value, feeding costs and subsidy receipts under the exchange rate change scenarios fit with a priori expectations. Gross agricultural income for the EU25 is higher under the Euro=USD1.0 scenario in which the exchange rate between euro and dollar is equal to parity from 2007 onwards (see Figure 4.14).

Figure 4.14 EU25 output value, subsidies, feeding cost and gross income projections under exchange rate scenarios



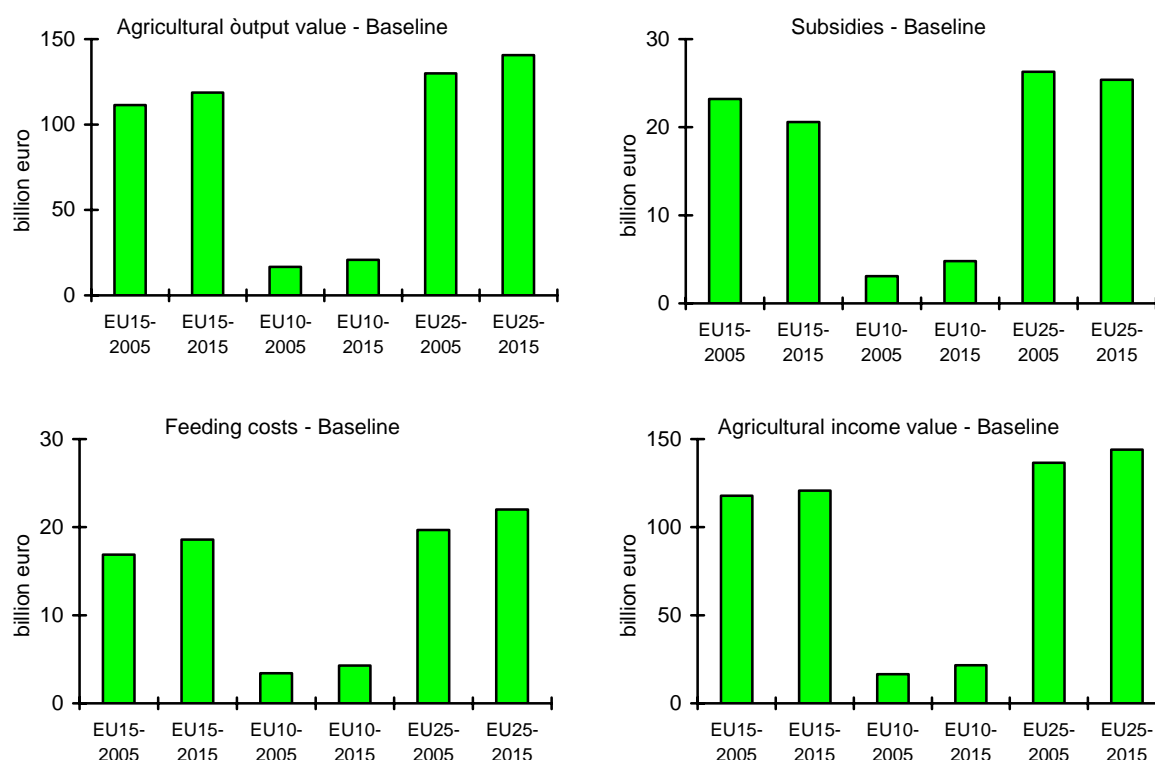
Source: AGMEMOD Country Models (2006)

The larger driver of the change in income is the increased value of agricultural output when compared with the baseline between 2007 and 2015. The change in the exchange rate from the baseline assumptions has no impact on the value of subsidies on products that are paid and only affects the expenditure on feed to the extent that the prices of cereals and oilseed products change and this gives rise to a change in the demand for feed. The Euro=USD1.4 scenario simulation projections of total agricultural output value and gross agricultural income fit with a priori expectations in that the level of output value and gross agricultural income is lower than under the baseline.

EU15 and EU10 results

Agricultural output value, subsidies, feeding costs and agricultural income only reflect the commodities carried out in the IPTS study. From 2005 to 2015, the agricultural output value projections are expected to increase on the EU15 (6%), EU10 (27%) and EU25 level (8%). Due to the increase in the EU10 subsidy level (with almost a factor four), the EU25 agricultural income projection would increase by 5% in 2015 compared to 2005 (Figure 4.15 and Table 4.10).

Figure 4.15 Agricultural output value, subsidies, feeding costs and agricultural income in EU15, EU10 and EU25 under baseline



Source: AGMEMOD Country Models (2006)

Table 4.10 Agricultural output value, subsidies, feeding costs and agricultural income in EU15, EU10 and EU25 under baseline (2000=1)

	Group	2000	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Output value	EU15	1.00	0.94	0.91	0.93	0.95	0.96	0.96	0.96	0.96	0.97	0.99	1.00
	EU10	1.00	1.17	1.20	1.26	1.31	1.34	1.36	1.37	1.38	1.39	1.41	1.44
	EU25	1.00	0.95	0.93	0.95	0.98	0.98	0.99	0.99	0.99	1.00	1.01	1.03
Subsidies	EU15	1.00	1.09	1.05	1.04	1.03	1.02	1.01	1.01	1.00	0.99	0.98	0.97
	EU10	1.00	6.18	6.68	7.70	8.70	9.62	10.40	10.42	10.55	9.92	9.81	9.75
	EU25	1.00	1.21	1.18	1.19	1.20	1.21	1.22	1.22	1.21	1.19	1.18	1.17
Feeding costs	EU15	1.00	0.85	0.84	0.89	0.92	0.90	0.90	0.90	0.91	0.92	0.93	0.93
	EU10	1.00	1.00	1.08	1.14	1.17	1.16	1.16	1.18	1.19	1.20	1.21	1.23
	EU25	1.00	0.86	0.86	0.91	0.94	0.93	0.92	0.93	0.94	0.95	0.96	0.96
Agricultural income	EU15	1.00	0.98	0.95	0.96	0.97	0.98	0.98	0.98	0.97	0.98	0.99	1.01
	EU10	1.00	1.43	1.47	1.57	1.67	1.75	1.81	1.82	1.83	1.82	1.83	1.86
	EU25	1.00	1.01	0.98	0.99	1.02	1.03	1.04	1.03	1.03	1.04	1.05	1.06

Source: AGMEMOD Country Models (2006)

4.3 EU27 baseline and scenarios projections

This section presents the results under the EU Enlargement scenario and a counter-factual Non-enlargement scenario. In contrary to the previous EU25 section, attention is paid to the individual country results of Bulgaria and Romania. The availability of model results for all the EU27 countries facilitates the projection of the impact of the 2007 enlargement on the EU single market. The EU25 baseline scenario results and the Bulgarian and Romanian Enlargement

scenario results were combined to allow for a comparison between these EU27 results and the EU25 baseline results. This gives insights into which EU27 markets are likely to experience marked changes in supply and use.

4.3.1 Crops

Bulgaria and Romania

Accession to the EU is projected to have a very positive effect on the Bulgarian crop sector. As a result of expected higher prices, and the significantly increased budgetary support that Bulgarian farmers will receive following accession, total grain production is projected to increase by nearly 11% when compared to the baseline for 2015. Within the grain sector, the increases under the Enlargement scenario are particularly notable for wheat and barley. In 2015, production levels of these crops are expected to be respectively 16% and 20% above the baseline levels (see Figure 4.13). These growths in production result from both increased area harvested and increased yields. Bulgarian maize production is projected to decline when compared to the baseline level, which is explained mainly by the negative relative change in the assumed maize price projections. Further technological development in grains production, which was not fully integrated into the modelling approach, could improve the situation significantly.

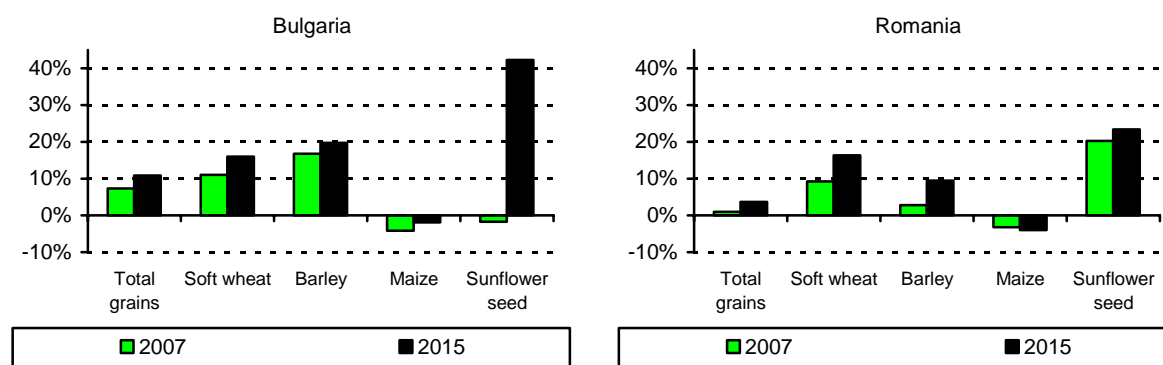
Though consumption of maize is projected to increase by 5%, the use of wheat and barley is expected to reduce by 2% and 3% respectively. The negative development of domestic use of grains will increase the export potential of Bulgarian grain producers after accession. However, the likelihood of realising this potential is still limited by market deficiencies and high transport costs. Without changes in the CAP policy much of this production may be offered for sale into intervention.

Sunflower seed production is the most important Bulgarian oilseed culture. Under the Enlargement scenario strong growth in production is projected to occur (by 40% when compared to the baseline). The main reason for this increase is the much higher support (though only 50% is considered coupled) that is offered to farmers when compared to the baseline and the substantial price increase that is assumed to occur. The projected increase in Bulgarian oilseed production is a result of both increases in area harvested (20%) and yields (2%). However, the higher production will also depend on the development and competitiveness of the Bulgarian processing industry. Some investments and development in this sector will be necessary if the projected growth in oilseed production is to occur. On the other hand, it is expected that Bulgaria, following accession to the EU, will strengthen its position as net exporter of sunflower seeds. The country could become at least a strong regional player in this sense. Further, Bulgarian experts predict that as a result of the projected price increases following accession, the per capita consumption of oilseeds will decline. Due to this, total domestic use of oilseeds in Bulgaria is projected to be approximately 10% below the baseline level.

Higher prices and budgetary support to agriculture is projected to lead to increasing Romanian grain production (+4%) and consumption (+6%). Wheat and barley production is expected to increase by 16% and 10% respectively when compared to the baseline of non-enlargement. On the other hand, maize production could decline by 5% due to the impact of a projected negative relative price change for maize. Nevertheless, under the Enlargement scenario the Romanian maize production is in 2015 still 12% higher when compared to levels observed in 2004. The

positive change in the domestic consumption of grains that is projected is linked to a higher feed use of wheat and maize. These increases compensate for a lower domestic use of barley. The growth in domestic consumption of grains in Romania (+25%) is due almost exclusively to increased feed use. Figure 4.16 presents the impact of enlargement on crop production in Bulgaria and Romania.

Figure 4.16 Crop production in Bulgaria and Romania under Enlargement scenario (% change from baseline)



Source: Bulgarian and Romanian AGMEMOD Models (2006)

Under the Enlargement scenario, the largest increase that is projected to occur in Romania is in the production of sunflowers. Sunflower is generally cultivated in larger farms that can afford better technology, certified seeds, mechanical operations and pesticide use. The 23% increase in production is mainly the result of assumed technological development and is not due to any large change in the area of oilseeds harvested. Prices of oilseeds in Romania are, due to the large increase in projected production, expected to decrease somewhat when compared with the baseline. They will remain well below the international market price level. Domestic consumption is expected to grow by 31%, due to increased demand for crushing, and will increase sunflower oil exports over the projection period.

EU27 results

The accession of Romania and Bulgaria is projected to have a significant impact on the EU27 single market in only a limited number of crop products. An example of such a product is sunflower seed. With the accession of both countries, EU sunflower production could increase by two third. The EU27 is projected to remain a net sunflower seed importer, however, the self-sufficiency rate is expected to increase (by 2015) from 67% in the case of no enlargement to 81% with the accession of Bulgaria and Romania. Relevant changes should be also in the grain sector, especially in the maize production. The production of grains in the expanded EU27 is projected to be almost 12% higher than in EU25 by 2015. However, the changes in the self-sufficiency rates are more limited since accession also increases EU domestic use and reduces exports (Table 4.12).

Table 4.11 Crop Production in EU25 compared to EU27 (percentage change)

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total grains	12.0	11.8	11.7	11.8	11.8	11.8	11.8	11.9	11.9
Soft wheat	9.7	9.5	9.6	9.6	9.7	9.6	9.7	9.8	9.9
Barley	6.5	6.6	6.6	6.6	6.7	6.7	6.7	6.8	6.8
Maize	31.7	30.5	29.8	29.6	29.3	29.0	28.7	28.4	28.1
Sunflower	49.5	57.9	57.6	57.6	59.3	61.5	61.6	62.9	64.0

Source: AGMEMOD Country Models (2006)

Table 4.12 Self-sufficiency rates for crops in EU25 compared to EU27

	EU25	EU27
Total grains	1.16	1.17
Soft wheat	1.20	1.22
Barley	1.21	1.24
Maize	1.01	1.03
Sunflower	0.67	0.81

Source: AGMEMOD Country Models (2006)

4.3.2 Livestock and dairy products

Bulgaria and Romania

The Bulgarian accession to the EU is projected to lead to relatively unfavourable results in the livestock sectors when compared to the baseline of non-enlargement. The only sector where positive developments are projected is the sheep sector. Especially, country experts expect negative results for the Bulgarian milk sector, which would, given the production systems in Bulgaria, have strong negative consequences for beef production following accession to the EU.

The impact of accession on the Bulgarian sheep sector is positive with respect both to the number of breeding animals and with respect to the volume of projected lamb production. The projected growth in this sector is a result of the positive price change (+23% compared to the baseline) and a substantial increase in budgetary support to the sector. Sheep numbers are projected to be 28% more than in the baseline. A similar increase in the volume of lamb production is also expected. Generally, domestic consumption of lamb is low (being mainly seasonal) and respectively the price elasticity of lamb consumption is low. Due to this low own price elasticity, the price increase of lamb is not projected to have a significant impact on domestic consumption, and growth in total domestic use under the Enlargement scenario is projected to be 5% higher than under the baseline.

The milk quota determined in the accession negotiations undercut the Bulgarian dairy sector, thus potentials for this relatively under-developed sector remained depressed. Under the Enlargement scenario, the Bulgarian milk production is projected to decline by 23% relative to the baseline. This decline is reflected in a 28% lower production of cheese than under the baseline. The negative changes are projected to occur in the first year following accession. Also, reductions in Bulgarian butter production are projected under the Enlargement scenario, though the level in 2015 is only 1% less than under the baseline. There is little change expected in milk and dairy product consumption in Bulgaria. The milk production limitations associated with the

imposition of the milk quota regime in Bulgaria following accession would lead to changes in the trade status of Bulgaria with respect to dairy commodities. From a position under the baseline of being a net exporter of cheese, under the Enlargement scenario Bulgaria becomes a net importer of cheese.

Due to dual purpose nature of beef production systems (i.e. beef is a joint product of milk production), the negative trends that are projected for the Bulgarian milk sector under the Enlargement scenario will have a significant impact on the beef production. As a result of the milk quota regime, the number of dairy cows will decline following accession, so that by 2015 ending dairy cow numbers in Bulgaria are 24% lower than under the baseline. This reduction is reflected in declines in the total number of cattle (minus 13% by 2015). The impact of the milk quota system on Bulgarian beef production is stronger than the effect of the projected increase in cattle prices and the increased level of budgetary support to the beef sector. However, increased slaughter weights, projected under the Enlargement scenario (in response to higher cattle prices) moderate somewhat the negative impact of the milk quota system on beef and veal production. Bulgarian beef production is projected to decline by only 4% when compared with the baseline. The negative impact of the price increases on per capita consumption of beef will be largely offset by the increases in income. Nevertheless, per capita beef consumption is projected under the enlargement scenario to be 4% lower than under the baseline. As a result of declining production, the trade position of the Bulgarian beef sector will worsen and Bulgaria remains a net importer of beef.

The Bulgarian pork and poultry sectors are less competitive and are expected to remain parts of the subsistence rural economy of Bulgaria following accession. As a consequence of the subsistence nature of much of Bulgarian pig and poultry production the impact of the Enlargement scenario relative to the baseline will be limited. Generally, pork and poultry production is lower under the Enlargement scenario than under the baseline (minus 4% and 1%). The higher increase in feed prices that are projected to occur when compared to the prices of livestock output leads to some projected declines in Bulgarian pork and poultry production. The subsistence nature led to the fact that the opportunities for increases in productivity to offset the negative impact of increased feed costs are limited. After an initial decline in pork domestic consumption that occurs due to price increases, domestic consumption per capita will increase by 5% compared to the baseline. In contrast to pork, since the poultry price increases following accession is higher than under the baseline, the domestic use of poultry in Bulgaria is projected to be 1% lower than under the baseline. Bulgaria remains to be a net importer of pork and poultry.

Under the EU Enlargement scenario, the imposition of the EU milk quota system in Romania is projected to have a strong negative impact on its dairy sector. Current Romanian production is almost double the agreed milk quota. As a consequence, milk production will be, following accession to the EU, 45% lower than under the baseline in 2015. Due to increases in yields and the milk quota system, dairy cow numbers are projected to decrease substantially over the period 2005 to 2015. Approximately 47% of the current dairy cow number could produce the agreed milk quota at current (relatively low) milk yields. Subsistence dairy farming will remain important and the commercialisation process will not happen rapidly. Since production is limited by quota, the projected price increase will not lead to any expansion in commercial milk production. Important investment is necessary in the sector in order to comply with the quality, hygiene and veterinary requirements for the raw milk which could additionally depress the

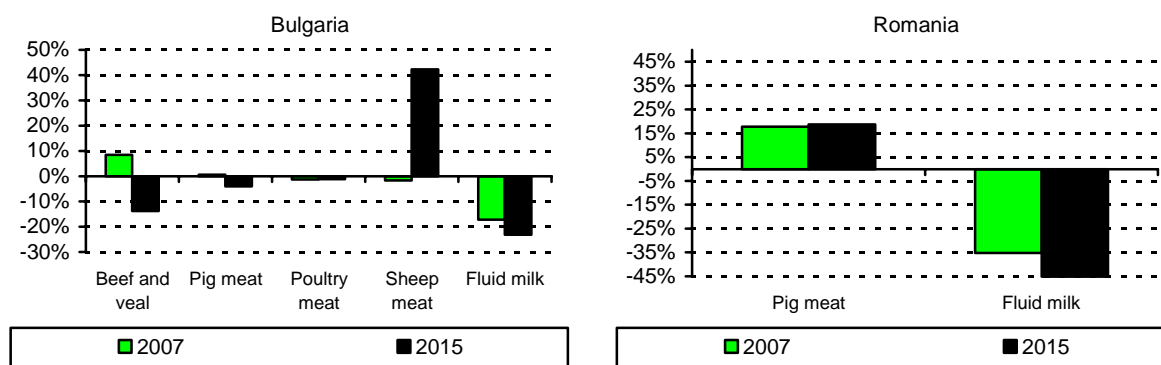
economic position of the less developed parts of the dairy sector in Romania. The income growth projected for Romania after accession should lead to increased demand for dairy products. The decline in the milk supply will push up imports of dairy commodities after accession.

The Romanian accession to the EU is expected to lead to production and market specialisation in beef and dairy production systems. Higher subsidies will provide a strong incentive for increased investment in beef breeds and will replace over time the current more dual purpose breeds with beef breeds. This will increase the Romanian beef production. The export potential for beef should also grow due to structural changes in slaughtering that will be supported by EU rural development funds. Domestic beef consumption is projected to increase under accession. This favourable development scenario for Romanian beef is based on the thesis that due to the restrictive milk quota, increased specialisation will occur in dairy and beef production and that the overall cattle herd will not be reduced significantly.

The pork sector is very important in Romanian agriculture. The sector is recovering from the closing of the former large collective farms. Thus, the country has since been a net pork meat importer. Production of pork is projected under the Enlargement scenario to increase significantly (+19%) as well as the domestic consumption. The increased demand and higher prices are expected to provide incentives for the expansion of pork production. The domestic supply will remain below the demand, so that Romania is projected to remain a net importer of pork.

Figure 4.17 presents the impact of enlargement on livestock production in Bulgaria and Romania. As the beef market of the Romanian model is still under development, no projection results of this sector are shown.

Figure 4.17 Livestock production in Bulgaria and Romania under Enlargement scenario (% change from baseline)



Source: Bulgarian and Romanian AGMEMOD Models (2006)

EU27 results

Compared to the projected impacts on grain and oilseed markets, the accession of Bulgaria and Romania are projected to have only limited impacts on EU27 livestock markets compared to what is expected to occur in the absence of accession. The changes in production at the EU27 level are limited to between almost 3% for pig meat to almost 5% in the beef and veal sector (Table 4.13). Due to the fact that Romania and Bulgaria are net food importers for pig meat and

dairy products and due to the projected increasing domestic use in these countries, the enlargement should decrease the self-sufficiency level by 3% for fluid milk and by 1% for pig meat (Table 4.14).

Table 4.13 Livestock Production in EU25 compared to EU27 (percentage change)

	2007	2008	2009	2010	2011	2012	2013	2014	2015
Beef and veal	4.2	4.3	4.3	4.5	4.6	4.7	4.9	5.0	5.1
Pig meat	3.2	3.2	3.1	3.1	3.0	3.0	3.0	3.0	3.0
Fluid milk	3.2	3.2	3.2	3.2	3.2	3.1	3.1	3.1	3.1

Source: AGMEMOD Country Models (2006)

Table 4.14 Self-sufficiency rates for livestock products in EU25 compared to EU27

	EU25	EU27
Beef and veal	1.01	1.01
Pig meat	1.11	1.10
Fluid milk	1.79	1.74

Source: AGMEMOD Country Models (2006)

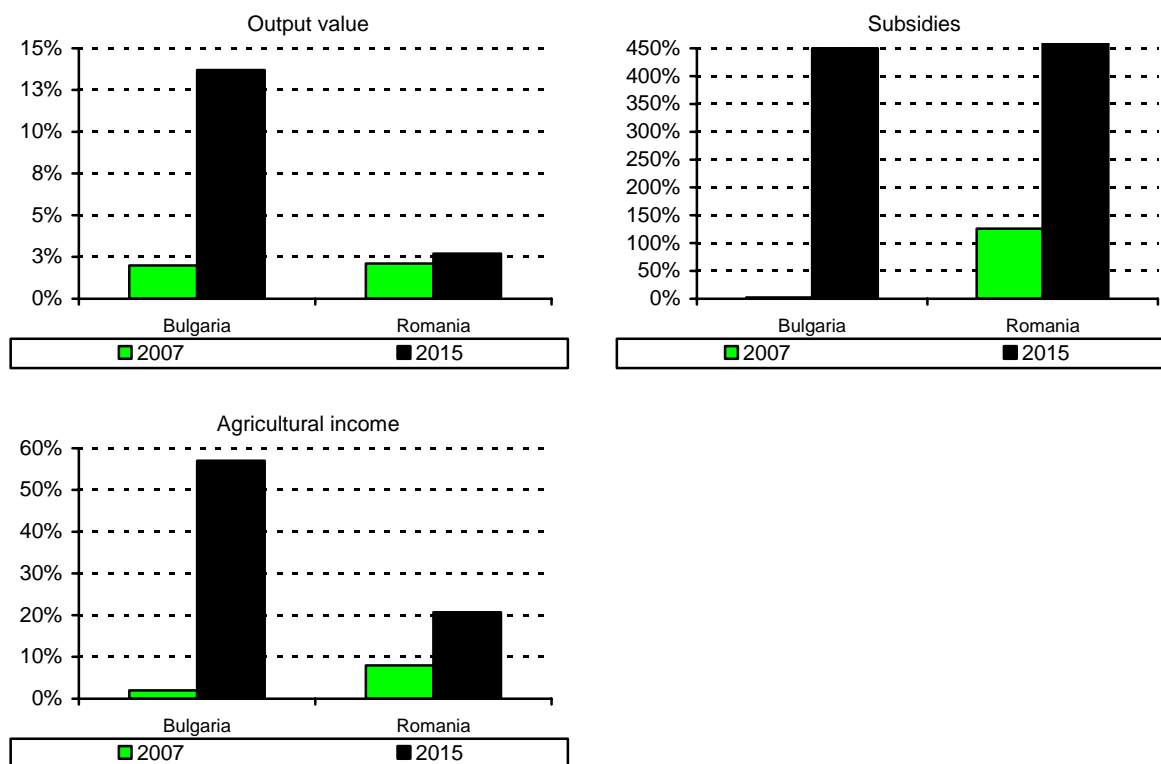
4.3.3 Agricultural income

Bulgaria and Romania

Under the EU Enlargement scenario, agricultural income is expected to be higher than under the baseline. Bulgarian gross agricultural income is projected to increase by 56% compared to the level projected under the baseline (see Figure 4.18). This projected increase in sectoral income is due mainly to the substantial higher subsidy receipts (by a factor of almost 4.5) and is to a lesser extent due to the projected increase in the value of agricultural output produced in Bulgaria, which increases by 13% when compared with the baseline.

An important benefit from the accession to EU for Romanian agriculture is an improvement in the economic situation for the majority of the agricultural sectors. According to the Romanian modelling results, gross agricultural income is projected to increase after accession by 21%. This result is largely due to the substantial increase in subsidy receipts (by more than 5 times). Expected production and price increases for most products also contribute to the expansion in sectoral income. The share of subsidies in the output value doubles over the Enlargement scenario projection period (from 9% to 18%). Direct payments receipts by the Romanian agricultural sector in the first year of enlargement are almost double the equivalent subsidies received in 2004-2005. It is expected that the increased payments for the supported agricultural products will not have an immediate impact on production, but will contribute gradually to significant and necessary improvement in technology and farm efficiency.

Figure 4.18 Agricultural output, subsidies and income in Bulgaria and Romania under Enlargement scenario (% change from baseline)



Source: Bulgarian and Romanian AGMEMOD Models (2006)

EU27results

Regarding the EU25, the agricultural output value, subsidies and agricultural income in Table 4.15 only reflect the commodities carried out in the IPTS study. Regarding the EU27, the commodity coverage of Bulgaria and Romania is even more limited.

Bulgaria and Romania acceded the EU on 1 January 2007. In the period 2007-2015, the EU27 agricultural output value is projected to increase with 9%, which is one percent point more than the growth in the EU25. The subsidy level would rise from 26 billion euro in 2007 for the EU25 to 28 billion euro in 2015 for the EU27. Without Bulgaria and Romania the EU subsidy amount would decrease with 2% in the studied period, while it would grow with 2% when Bulgaria and Romania are included. Due to the increase in the subsidy level in the EU27, the EU27 agricultural income development is projected to be somewhat higher than the corresponding EU25 development.

Table 4.15 Agricultural output value, subsidies and agricultural income in EU25 and EU27 (2007=1.0)

	group	2007	2008	2009	2010	2011	2012	2013	2014	2015
Output value	EU25	1.00	1.03	1.03	1.04	1.04	1.04	1.05	1.07	1.08
	EU27	1.00	1.03	1.04	1.04	1.04	1.04	1.05	1.07	1.09
Subsidies	EU25	1.00	1.01	1.02	1.03	1.03	1.02	1.00	0.99	0.98
	EU27	1.00	1.01	1.03	1.04	1.04	1.04	1.03	1.02	1.02
Agricultural income	EU25	1.00	1.02	1.03	1.04	1.04	1.04	1.04	1.06	1.07
	EU27	1.00	1.03	1.04	1.05	1.04	1.04	1.05	1.06	1.08

Source: AGMEMOD Country Models (2006)

5 Discussion and Conclusions

Section 5.2 summarizes the areas of the current model version which need to be addressed more deeply in the future. Section 5.1 of this final chapter draws some conclusions on the agricultural sector model that was developed as well as on the market projections that were provided with this tool.

5.1 Discussion

The current AGMEMOD tool acknowledges some weaknesses and deficiencies, which need further investigation in the future. This study has addressed the following shortcomings.

Caveat 1 – Decoupling

The precise degree to which decoupled direct payments do or do not affect the production decisions of farmers across the EU remains unknown.

The degree to which decoupled direct payments do, or, do not affect the production decisions of EU farmers is an active research area, and represents a research question that a policy analysis tool such as the AGMEMOD model is not probably best suited to address. Future research work that seeks to further develop the AGMEMOD model (the FP6 project AGMEMOD 2020) will attempt to incorporate research results from other research projects on the production impact of decoupled payments.

Solution

The extent to which decoupled payments may or may not have a supply inducing impact within the EU is an active research area. Micro level research focussed on the farm level could be used to provide better insight into this issue. Ideally such work would take place at a Member State level. Such work however would need also to consider the wider picture in terms of overall supply demand and price conditions (more readily addressed by models such as AGMEMOD). Thus a two step process whereby results from both micro level and macro level models would be combined to provide answers to this question in order to improve the covering of production impacts of decoupled payments in AGMEMOD.

This Future research work that seeks to further develop the AGMEMOD model (the FP6 project AGMEMOD 2020) will attempt to incorporate research results from other research projects on the production impact of decoupled payments. It should be possible at some future point to integrate the results of other projects (including Framework project such as GENEDEC) to address this question

In the short term it might also be possible to examine the impact on the AGMEMOD model of differing assumptions in relation to the extent of the supply inducing impact of decoupling by way of sensitivity analysis.

Caveat 2 – The EU Small Country Assumption

The AGMEMOD model, as currently structured, embodies a small country assumption with respect to the EU.

The small country assumption means that projected developments on EU25 agricultural commodity markets do not have any impact on world agricultural commodity markets and while the EU is perhaps less important now in this context that it may have been in the past, its influence on international prices is still relevant. Thus, the exchange rate scenarios, each of which resulted in differing levels of EU prices and net trade for an exogenous world price level, underline this limitation in the current model's structure.

The current EU25 hybrid model doesn't incorporate a feed-back of the new Member State models on the old Member State models. This can only be overcome by a EU25 combined version that integrates all Member State models. In addition, the evaluation of the impact of Bulgarian and Romanian accession on EU25 agricultural commodity markets will require the incorporation of both countries in an integrated EU27 version of AGMEMOD. The construction of EU25 and EU27 combined models will be other tasks for the future.

In the context of the CAP reform and exchange rate change scenarios analysed in this report, and for planned work that might examine the impact on EU agricultural markets of WTO reforms this small country assumption is lacking in realism.

Solution

Future work on the AGMEMOD will seek to relax the small country assumption by altering the manner in which the model closes. This modification will allow for interaction between AGMEMOD with other similarly structured economic models. In this way the impact of the EU on international prices for commodities (through changes in its level of net exports will allow for the endogenous generate projections of world agricultural commodity prices.

Caveat 3 – Impact on Agriculture of Biofuel Production

Currently the model does not address the emerging issue of biofuel production and its potential impact on agriculture in terms of land allocation, crop prices, feed prices and in turn livestock production.

This issue exists in an international context (outside the EU) in terms of its impact on production world wide. This concern may be incorporated in the model through the link which is planned between AGMEMOD and other modelling systems. Of more immediate direct relevance for the AGMEMOD model is the impact of biofuel production within the EU. This question is complicated by the fact that the extent of such production may be motivated by political considerations, at Member State and EU level.

Solution

In the short term this issue can be addressed by AGMEMOD through sensitivity analysis. As a starting point for a more detailed representation of biofuel demand and production may serve the established implementation of the two most relevant countries within the context of another project. The designated link of the AGMEMOD model with the world markets of the relevant

countries will better reflect the impact of the possible future development of biofuel production on international agricultural commodity prices.

Caveat 4 – Enlargement to include Bulgaria and Romania

The potential for growth in all sectors of the Romanian and Bulgarian agricultural sectors is relatively high. Therefore some further technological changes, supported also by rural development funds, could give much more dynamic pictures than presented in the current AGMEMOD country results. Due to structural and market deficiencies these changes will probably not happen in the first years following accession on 1st January 2007. It should be noted, that some of the main agricultural activities in Bulgaria and to some extent also in Romania were not modelled and the impact of these omitted markets on the expanded EU27 market would a priori be stronger. These sectors are vegetables, tobacco, wine and some other Mediterranean products.

Solution

The Partnership, in its ongoing work as part of the AGMEMOD 2020 sixth framework project, will endeavour to increase to the greatest extent the model commodity coverage for these countries subject to the availability of suitable data.

Caveat 5 – Specific difficulties in the modelling work for Romania

Finally, the modelling work in Romania presented some of the biggest challenges for the AGMEMOD Partnership as enormous problems were faced in several areas. The first problem relates to the data for Romania, which were inconsistent, unreliable and in some cases missing, and offered a poor reflection of the historical events. In such circumstances it was very difficult to follow the AGMEMOD approach which is based on econometric, or at least some statistical relations between economic and agronomic variables. The second problem relates to the absence of systematic information on political variables and their potential inclusion in the models. The third problem relates to human capacity in agricultural economics analysis at all levels in Romania.

Solution

The Core group of the Partnership have decided to overcome these problems by re-building this country model from scratch. This issue will be progressed at the Rennes meeting of the Core group in January 2007.

5.2 Conclusions

The first main objective of the study ‘Impact analysis of the CAP reform on main agricultural commodities’ was to develop an agricultural sector model for the enlarged EU, implemented in standard computer software and installed on the IPTS computers. The model had to provide projections and simulations for individual EU Member State level, Bulgaria, Romania, EU25 as a whole and EU27 as a whole with emphasis on supply, demand, trade and prices for a set of commodities.

This objective had been achieved by building on the AGMEMOD model that was developed under the 5th Framework Programme project. At the start of the study carried out for the IPTS various aspects and problems were encountered. A first problem concerned technical problems in solving the EU15 combined model. A working EU15 model version was one of the principle aims to be achieved at the end of this study. Another issue concerned the fact that only the old Member State models were established in a GAMS environment, while the new Member State models were just set-up in Excel. To combine all country models into a EU25 GAMS version, which is aimed for at the end of 2007 as part of another project, the new Member State models have been migrated to GAMS as an important part of this study.

A second group of adjustments required under this contract concerned the implementation of new commodities and the decoupling payment system in the individual country models. This study has improved the AGMEMOD model in the following way:

- new commodities ‘rye’ and ‘other grains’ were specified, estimated and implemented in the countries of significance;
- the decoupled payment system was differently implemented across the Member States;
- the new Member State models were migrated from Excel to GAMS, although there remain some technical problems to be solved in particular countries;
- all old Member State models were combined into a EU15 model version;
- the new Member State models were added to the EU15 combined version, resulting in a EU25 hybrid model;
- the Bulgarian and Romanian models were added to the EU25 hybrid model, resulting in a EU27 hybrid model;
- user-friendly software was implemented to the EU15 combined model.

The second main objective of the study was to provide market projections for the main agricultural commodities based on the latest agricultural and trade policy developments and information available for each Member State and the aggregate results for the EU25 and EU27. In addition, impacts of some scenarios regarding the further decoupling, exchange rate shocks and the enlargement of the EU were assessed. Report 4 of this study provided detailed baseline and scenario projections for each Member State modelled up to 2015. It is the first time that AGMEMOD outcomes are shown resulting from the EU25 hybrid model. This means that interactions between the old Member State models as well as the impacts of changes in EU production and consumption levels on price formation were regarded. However, the interaction effects of the new Member State models can only be captured by using the future EU25 combined model, but this objective lies beyond the scope of this study. Nevertheless, the EU25 and EU27 results provide insights in the general developments under the status-quo conditions, and so represent a new feature of AGMEMOD.

Successfully, the baseline and scenario analyses up to 2015 were conducted with the participation of all country teams. In this final section we summarise and attempt to draw conclusions with regard to the overall results and their implications for the policy reforms examined and the model used.

The AGMEMOD baseline results indicate that – in spite of the decoupling – EU production will grow in several sectors over the period 2005 to 2015. In the crop sector EU25 production of

wheat and maize will increase. This reflects a land use shift from barley to wheat which will generate better gross margins. Increase in consumption will lead to a decline in net-exports. A higher dynamic can be found in the oilseed sector with demand propelling the markets and sustaining a supply expansion that maintains net-imports virtually unchanged at the same level during the projection period.

Under the baseline the introduction of decoupling will induce a further decline in beef and lamb production. However, the price increases that results from the contraction in indigenous production within the EU25 and seems to lessen the negative impact on production of decoupling. The other livestock sectors (pig meat and poultry) are largely unaffected by decoupling except in so far as changes in the prices of beef and lamb cause demand for other meats to increase and thereby lead to increases in prices. Pig and the poultry production are both projected to expand in the aggregated EU25. Growth in demand is sufficient to maintain pig meat prices, but poultry meat prices are projected to decline. The dairy sector is negatively affected by declining prices (that occur largely as a consequence of the reductions in intervention prices for dairy commodities agreed as part of the Luxembourg Agreement), but quotas will be fulfilled under the baseline. In processing, there will be a shift away from butter and skimmed milk powder and growth in the production of cheese. The reduced wholesale and consumer prices as well as higher economic growth in new Member States will help domestic consumption at the EU25 level to increase.

In general the Further CAP Reform scenario results fit with *a priori* expectations, in that the impact of the scenario is very limited. This arises, at least in part, from the fact that many MEMBER STATES had already chosen to largely decouple direct payments under their national level implementation of the Luxembourg Agreement. However, it must be acknowledged that the limited impact of decoupling on EU agricultural production, both in the baseline and in the Further CAP Reform scenario, when compared with historically observed production is also in part due to the method of implementing the decoupled single farm and simplified area payment system payments in the AGMEMOD country models. The method of implementing the SFP and the SAPS in each country model was to construct synthetic premiums which maintained some of the supply inducing impact of the previously coupled direct payment systems, but also tried to capture effects of the distributional shift of the payments. The motivations for this approach were that even with the decoupling of direct payments, cross compliance criteria and other “good farming practice” requirements, and the linking of the SFP and SAPS payments to land, would mean that the SFP and SAPS payments would still, *ceteris paribus*, maintain some incentives to produce even though they were decoupled from production. It could be argued that the synthetic premiums employed in the AGMEMOD country models at this point are too close (in value terms) to the previously coupled (Agenda 2000) direct payments, and that thus the impact of decoupling in both the baseline and the Further CAP Reform scenario are understated.

The Exchange Rate scenario projection results largely accord with a priori expectations. A decline (increase) in the value of the €/US dollar exchange rate compared with the baseline assumptions leads to higher (lower) internal EU market prices and consequent adjustments to production, domestic use, imports and exports.

The 2007 enlargement of the EU that will occur with the accession of Romania and Bulgaria is not expected to change dramatically the situation on most key agricultural markets. There are increases projected for the production of EU sunflower oil, soft wheat and maize. Due to low

prices in Romanian and Bulgaria and the ongoing logistic problems in getting arable crops to world and EU markets (i.e. large volumes of intervention purchases), problems are predictable if no further changes in the EU market organisation mechanisms are made. The 2007 accession is projected to have less of an impact on livestock and meat markets.

Finally, it could be concluded that the caveats and the proposed solutions set out in section 5.1 provide a clear path for future work which the AGMEMOD project will undertake with the support of other funding source.

Thus future objectives would include:

- further exploration of the impact of differing assumptions with respect to the supply inducing impact of decoupling;
- incorporation of feedback impact of changes in EU net trade on international markets; and
- exploration of impact of the biofuel production on EU agriculture.

The end result will be a more robust model than it is now, which is capable of examining policy issues at a Member State level and presenting results in both a Member State and EU context. Results produced in an objective, timely, relevant and accessible fashion can provide some clarity in the always complex discussions relating to modification of EU and international agricultural and trade policy.

The AGMEMOD Partnership appreciates the input of policy makers in informing the direction of research endeavours.

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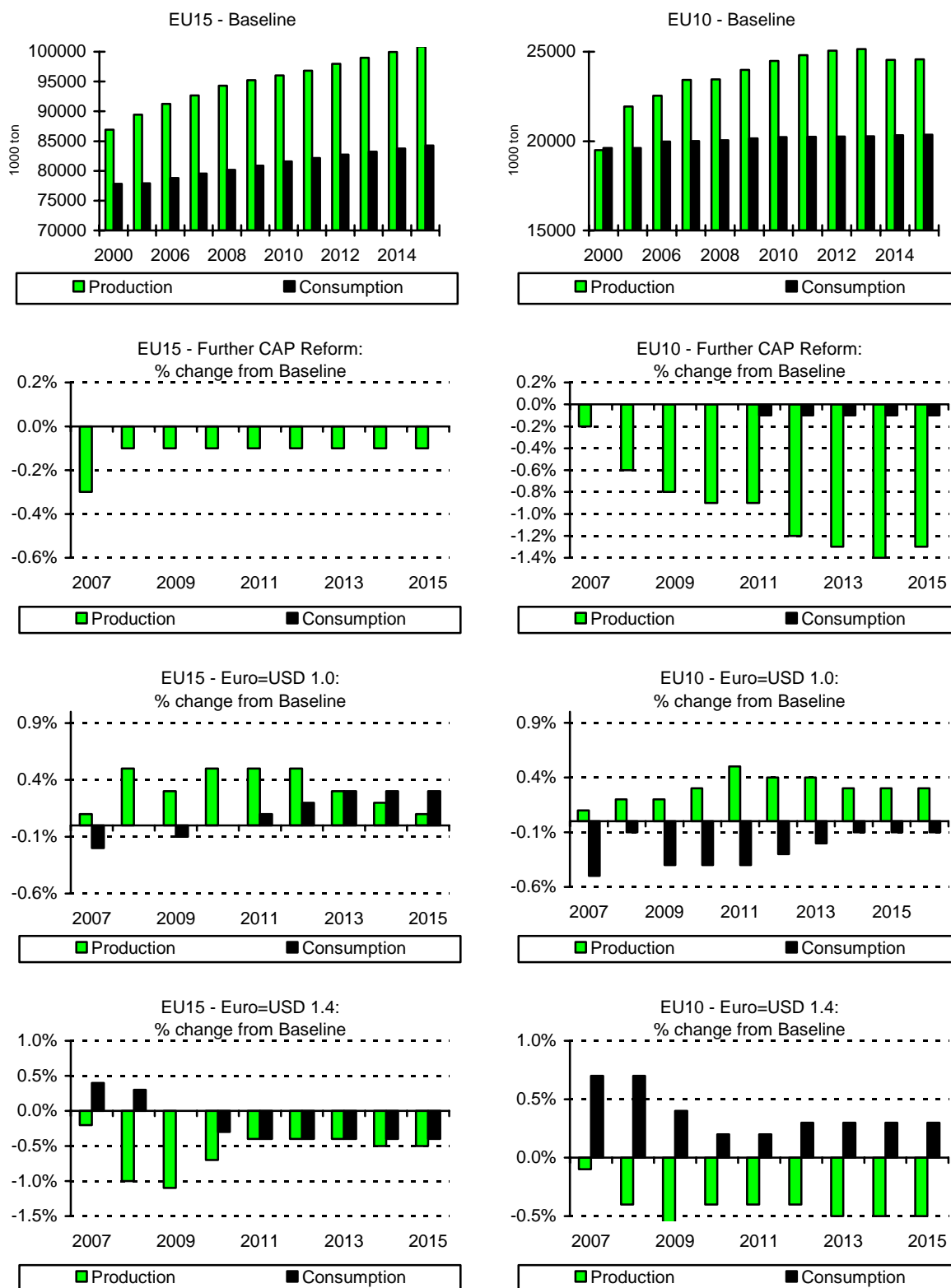
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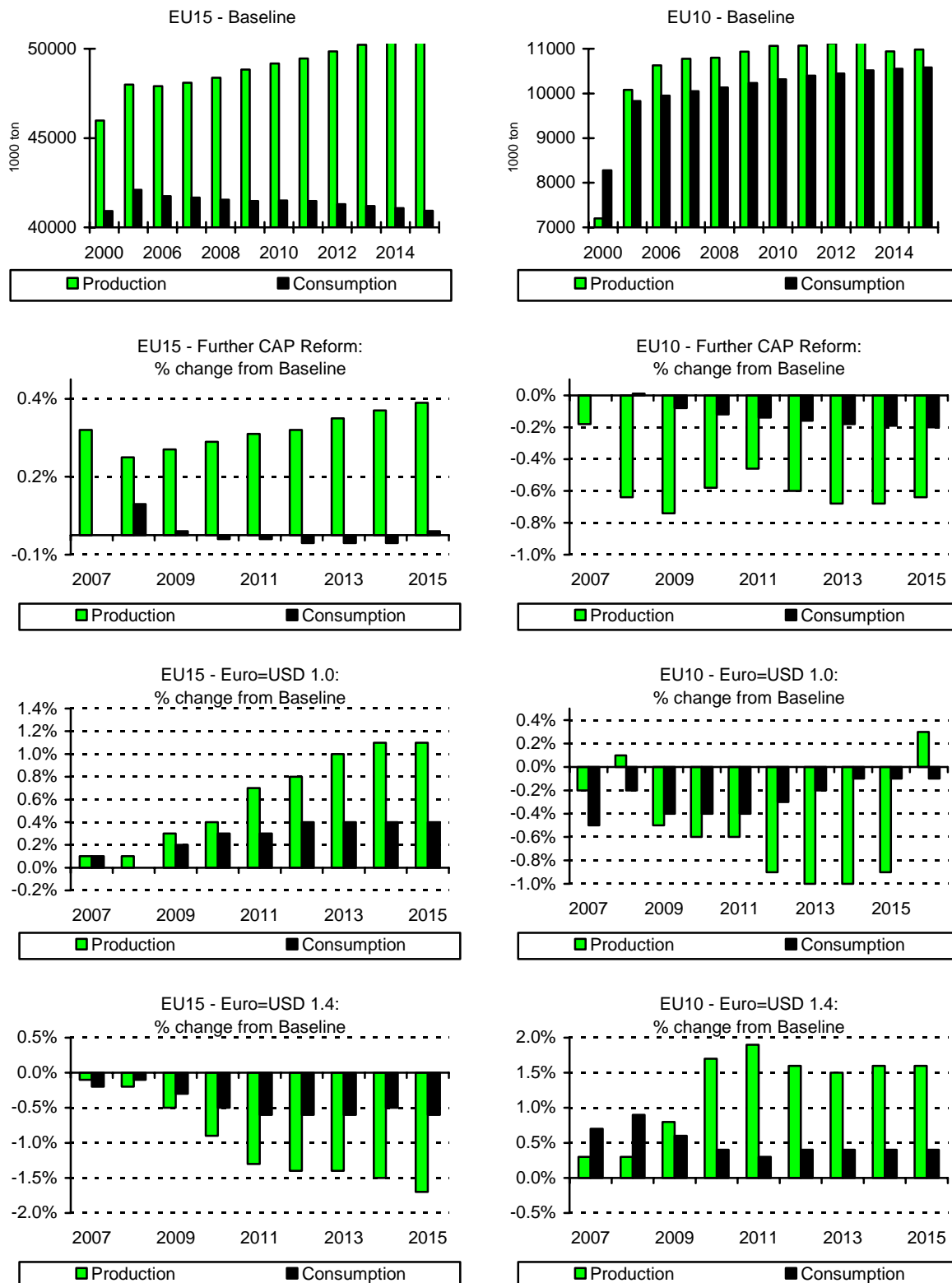
Appendix 1 Baseline projections and scenario impacts in EU15 and EU10

Figure A1 EU15 and EU10 soft wheat projections under baseline and scenarios



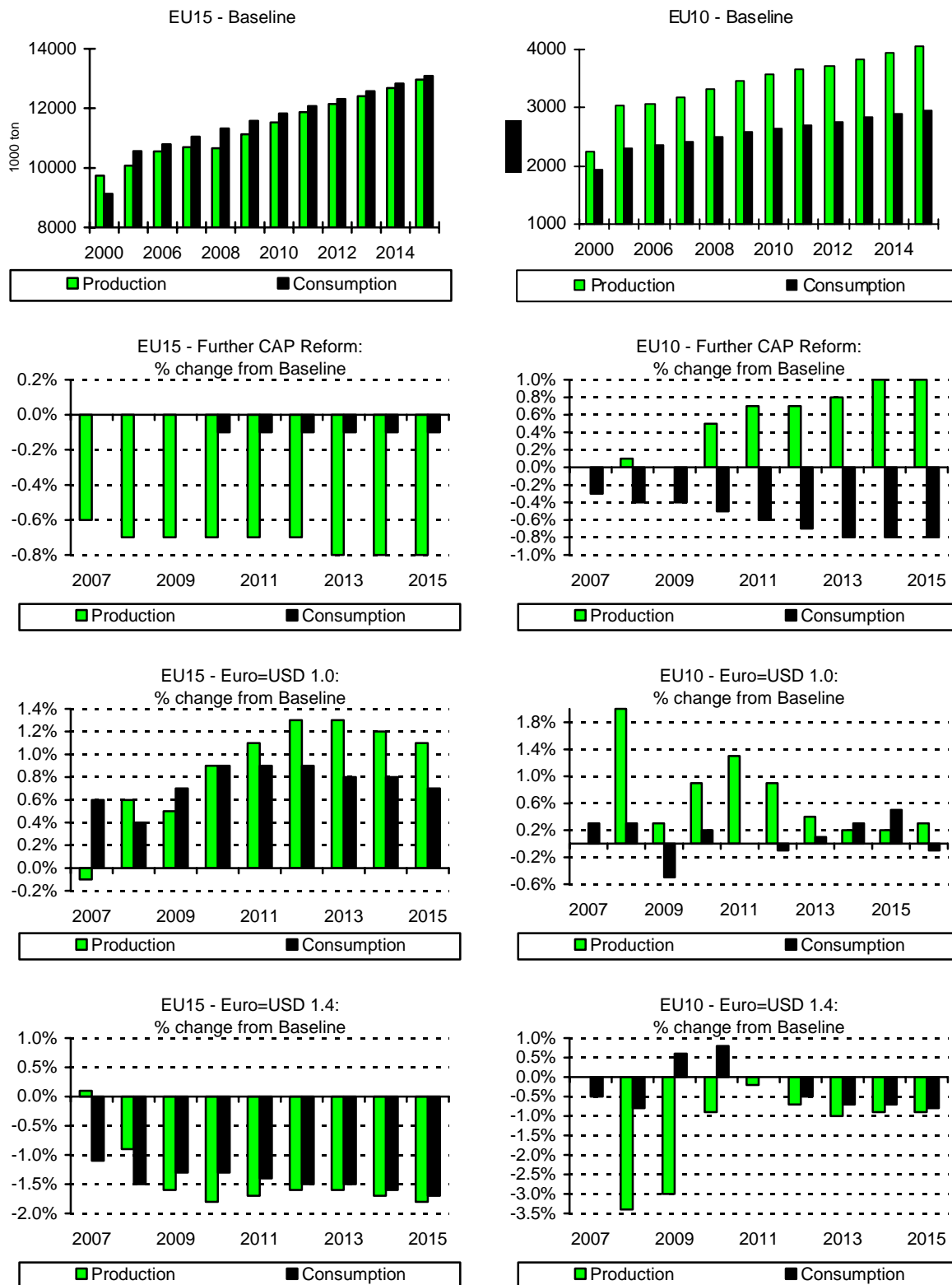
Source: AGMEMOD Country Models (2006)

Figure A2 EU15 and EU10 barley projections under baseline and scenarios



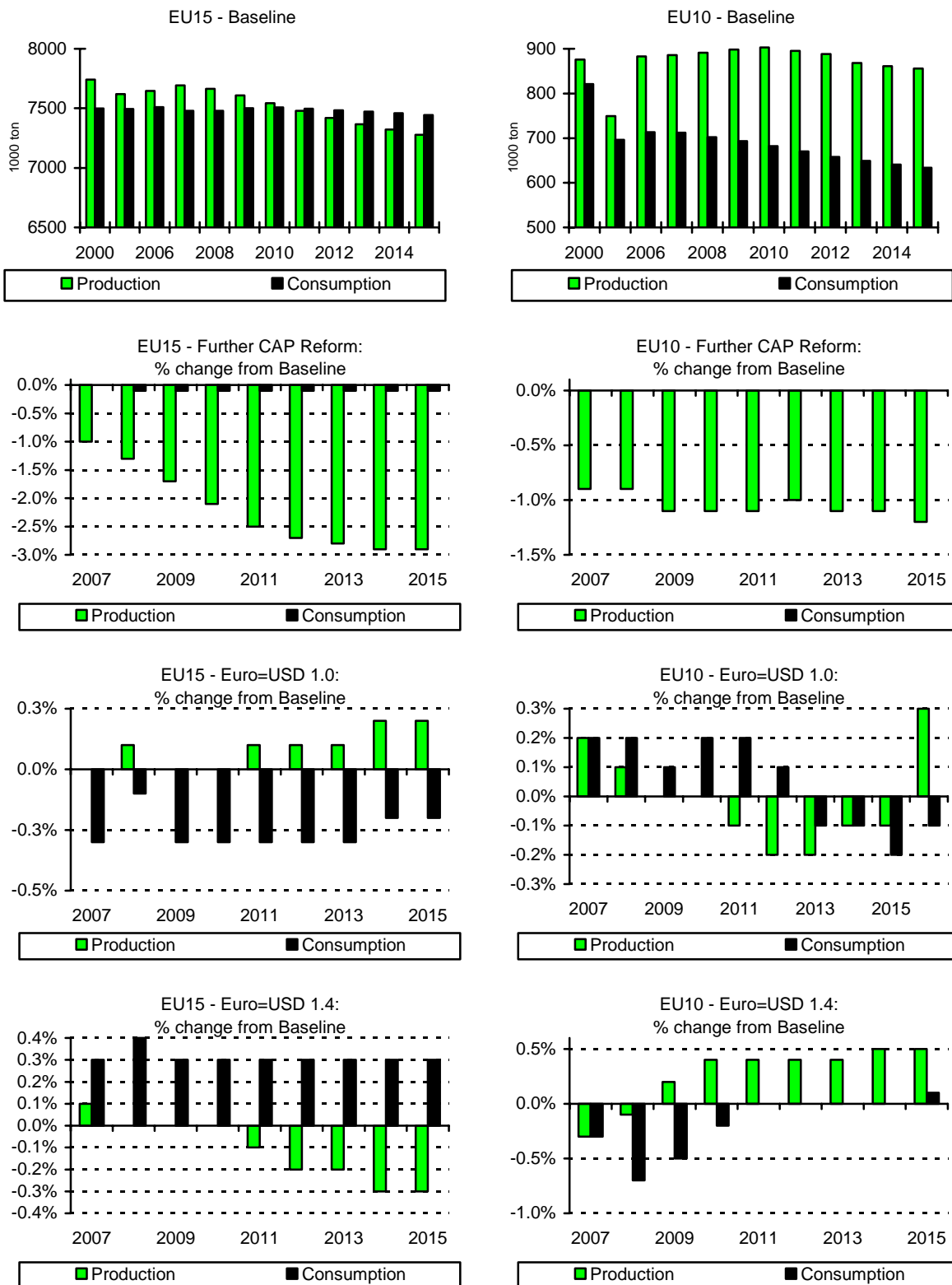
Source: AGMEMOD Country Models (2006)

Figure A3 EU15 and EU10 maize projections under baseline and scenarios



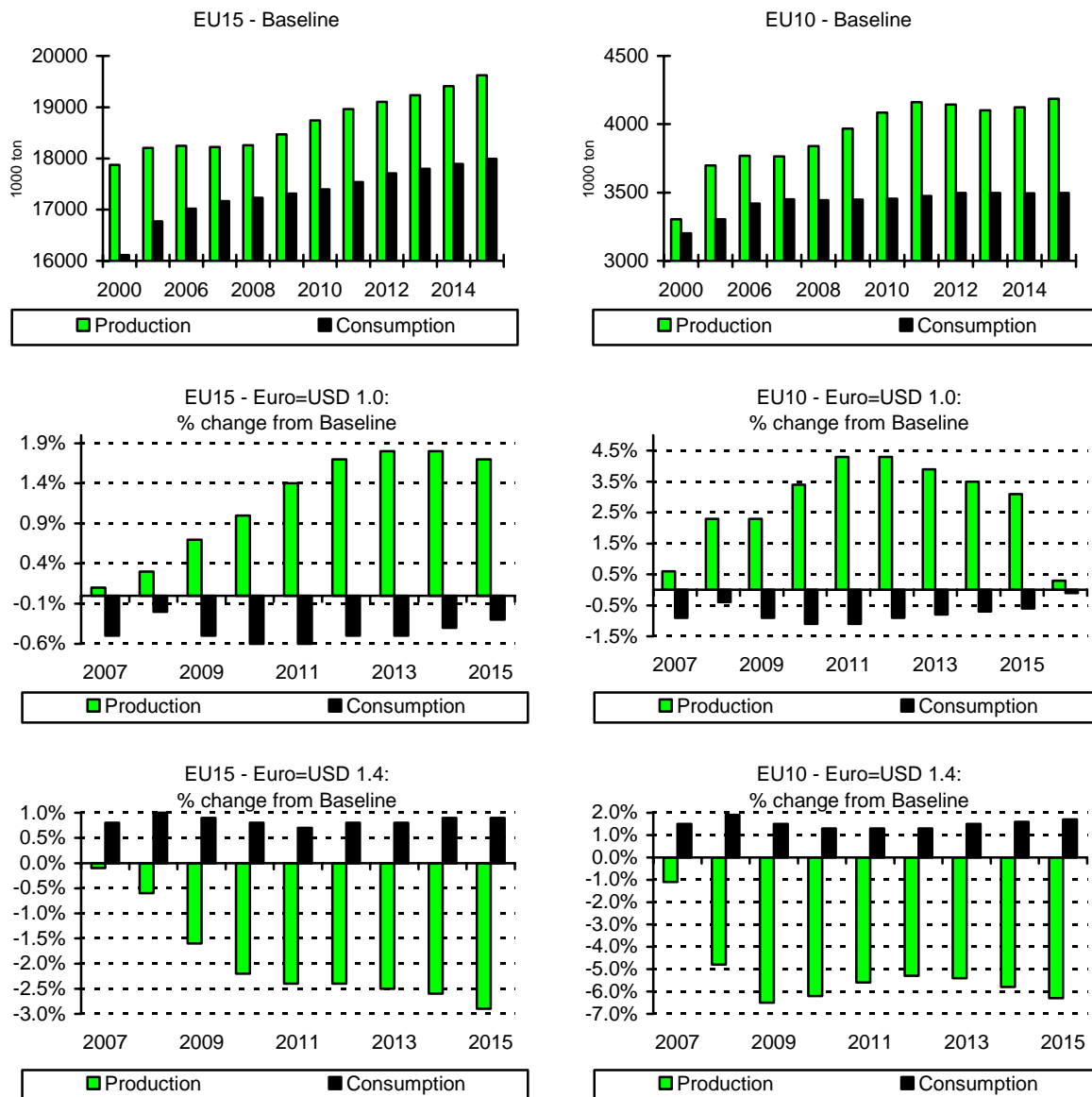
Source: AGMEMOD Country Models (2006)

Figure A4 EU15 and EU10 beef and veal projections under baseline and scenarios



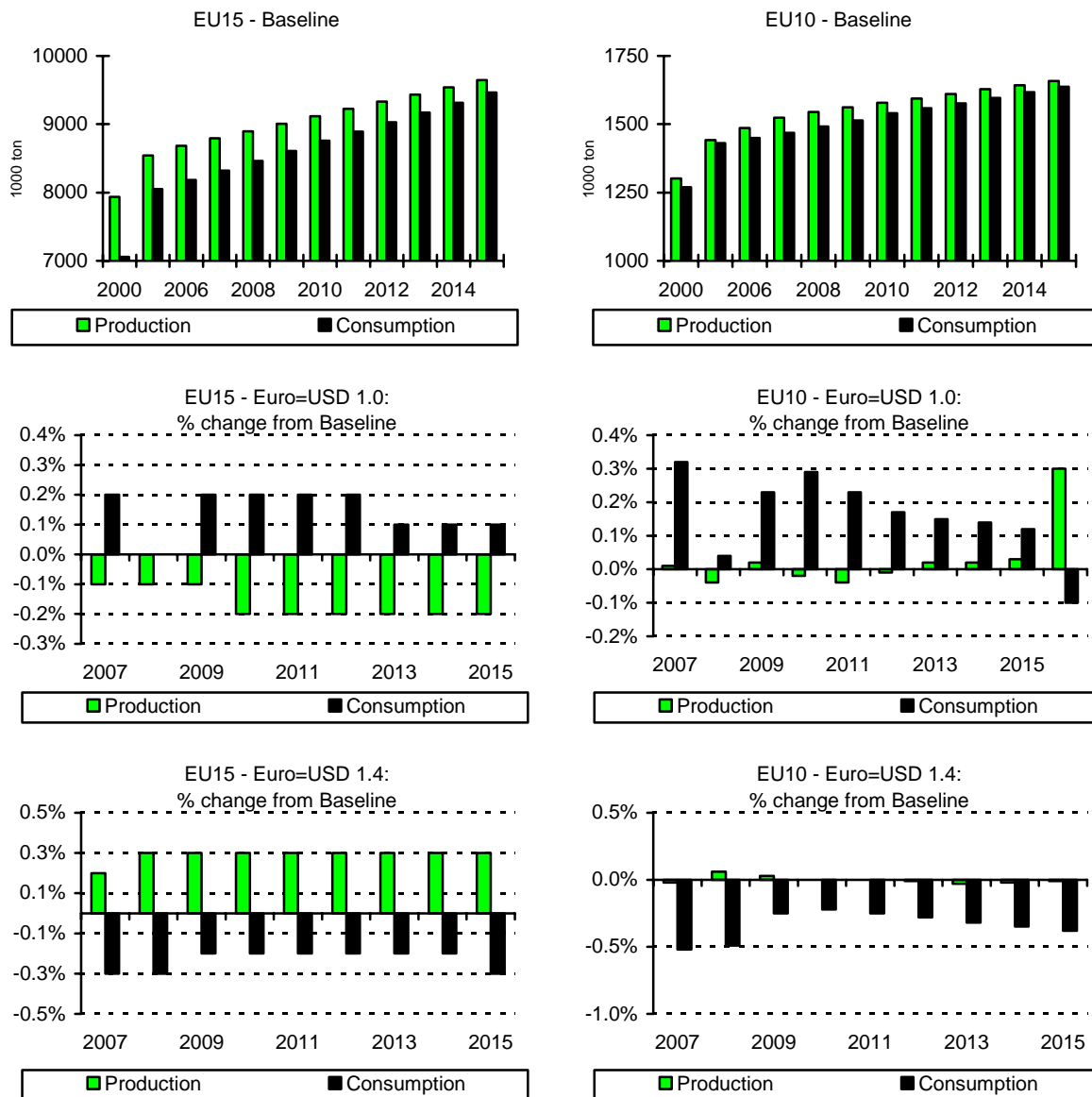
Source: AGMEMOD Country Models (2006)

Figure A5 EU15 and EU10 pig meat projections under baseline and scenarios



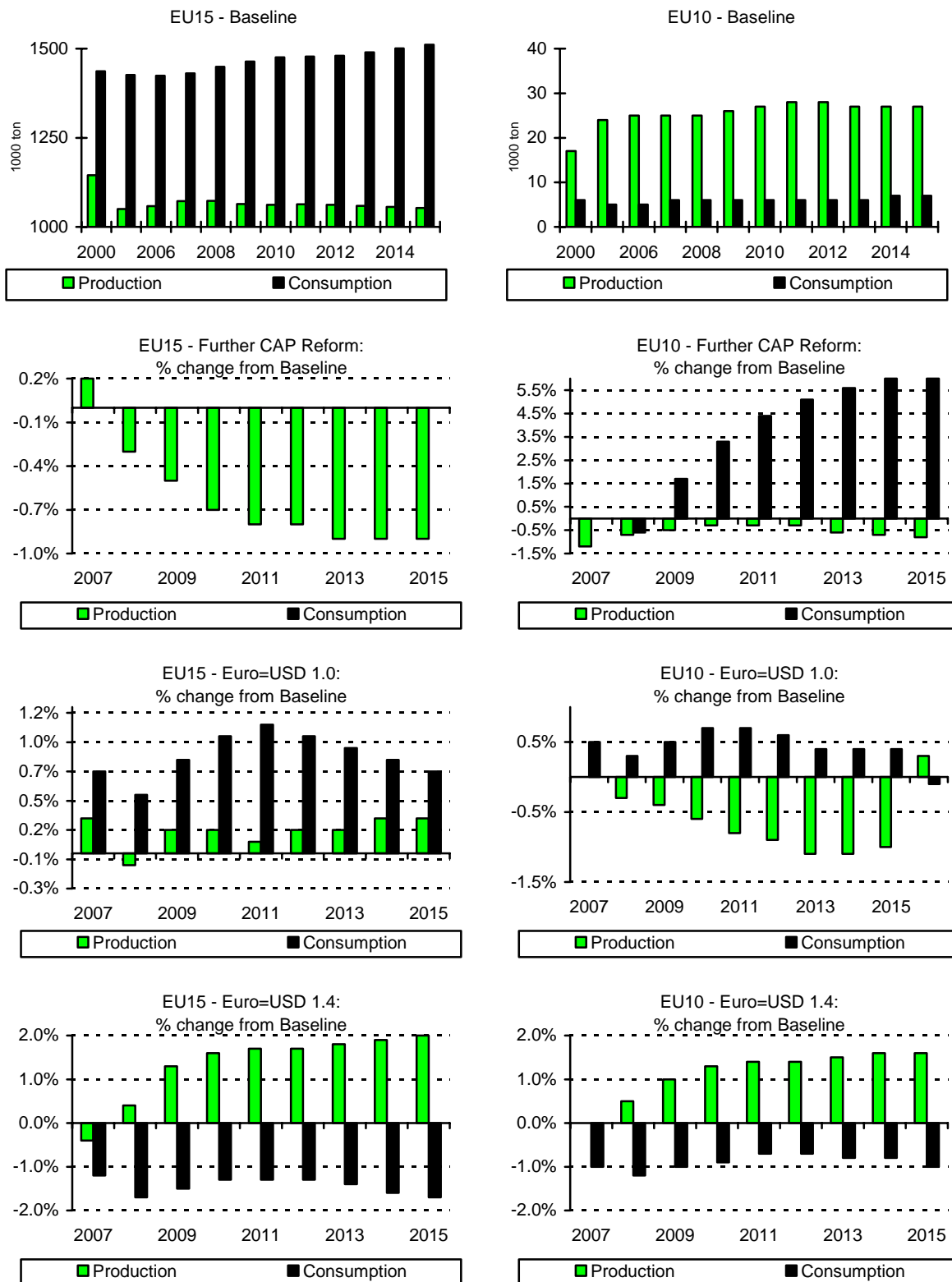
Source: AGMEMOD Country Models (2006)

Figure A6 EU15 and EU10 poultry meat projections under baseline and scenarios



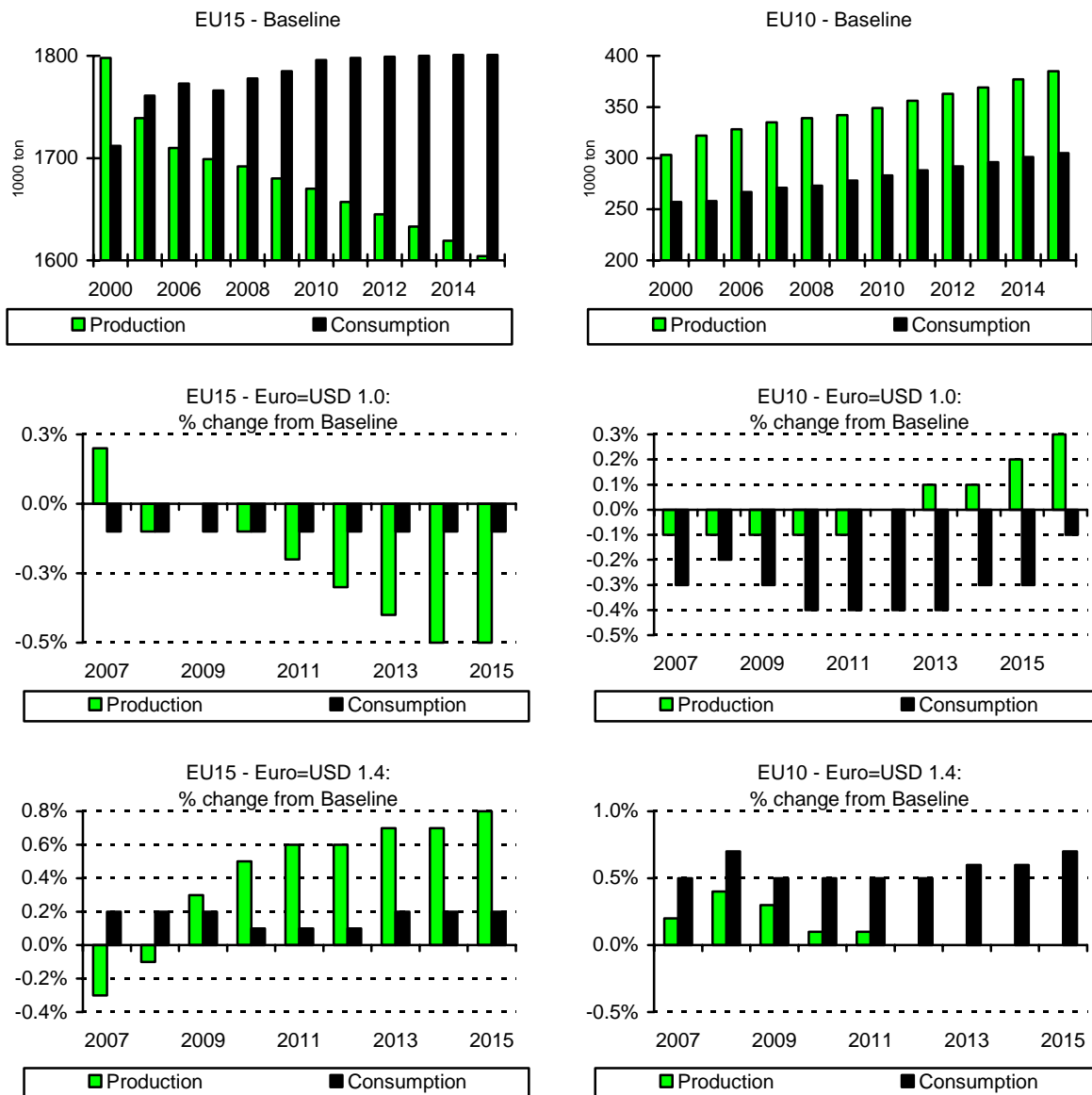
Source: AGMEMOD Country Models (2006)

Figure A7 EU15 and EU10 sheep meat projections under baseline and scenarios



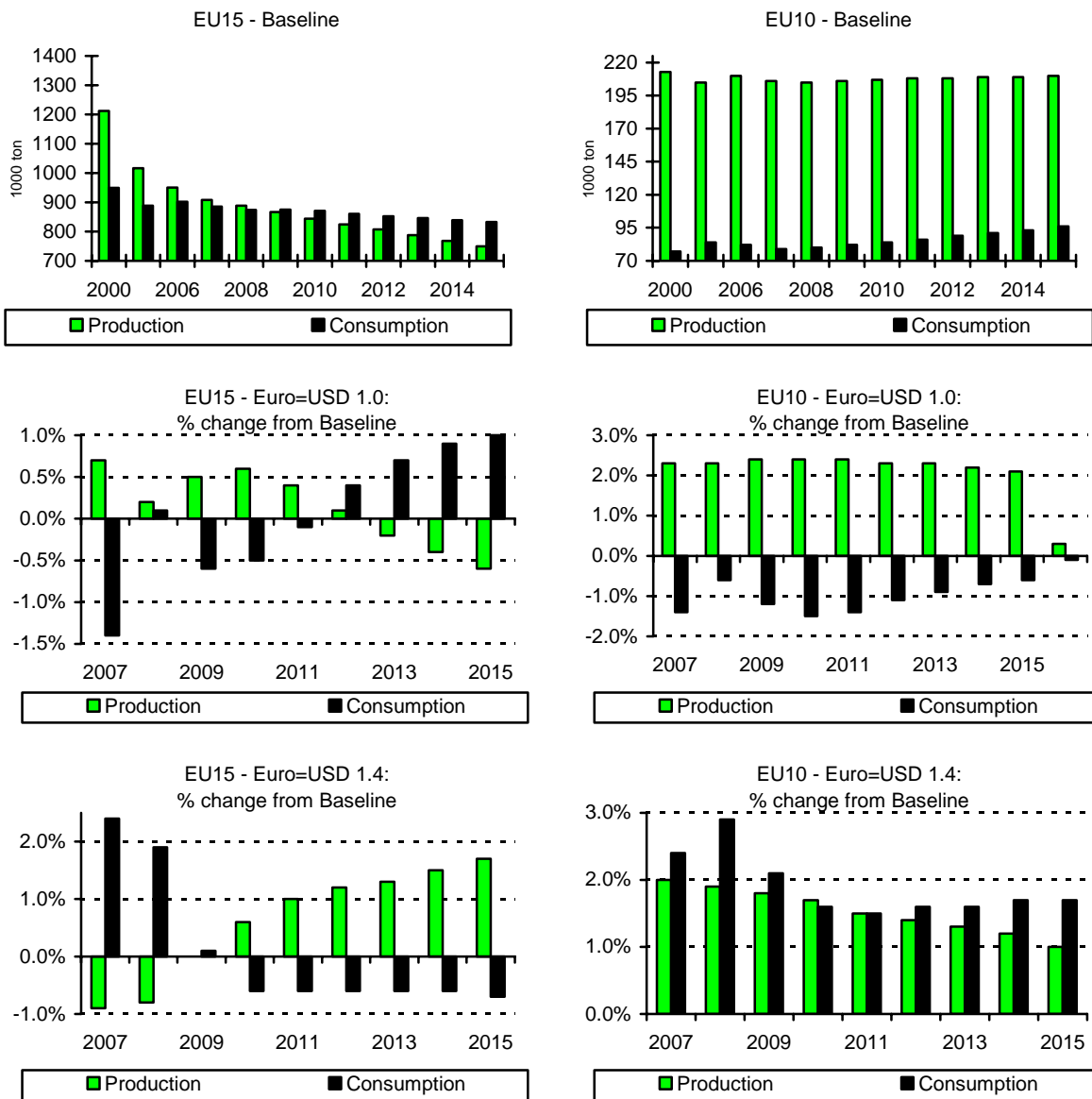
Source: AGMEMOD Country Models (2006)

Figure A8 EU15 and EU10 butter projections under baseline and scenarios



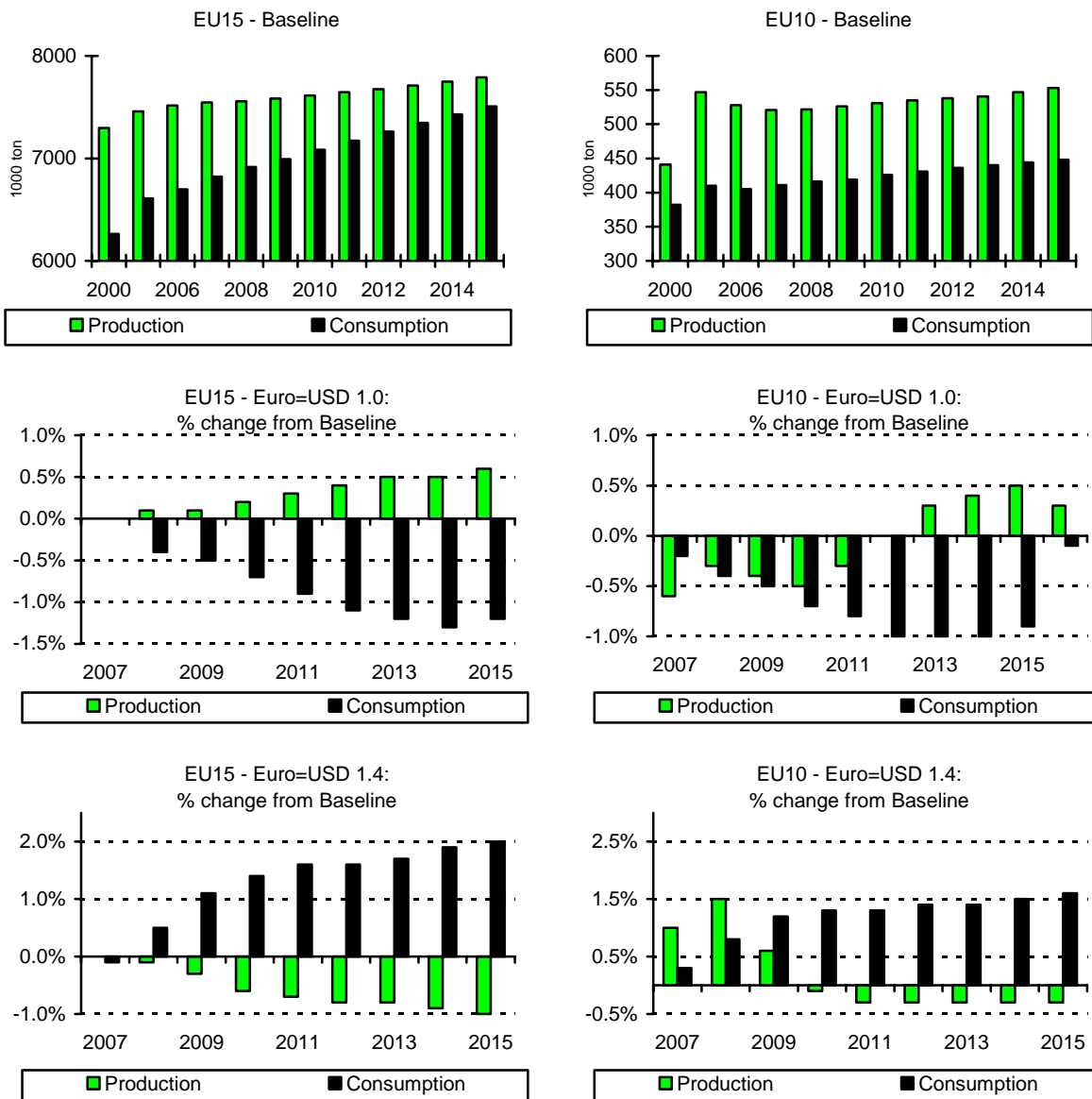
Source: AGMEMOD Country Models (2006)

Figure A9 EU15 and EU10 skim milk powder projections under baseline and scenarios



Source: AGMEMOD Country Models (2006)

Figure A10 EU15 and EU10 cheese projections under baseline and scenarios



Source: AGMEMOD Country Models (2006)