Project no. SSPE-CT-2005-021543

Project acronym: AGMEMOD 2020

Agricultural Member State Modelling for the EU and Eastern European Countries

Instrument: SPECIFIC TARGETED RESEARCH PROJECT

Thematic Priority: Integrating and strengthening the European Research Area
Sustainable management of Europe's natural resources

AGMEMOD 2020 Project Final Reports: Final Activity Report Part I

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Project coordinator organisation name: INRA Revision [draft, 1, 2, …]

Contents

1. General Introduction

In compliance with the FP6 project reporting guidelines, the Final Report of the AGMEMOD Project (Project No. SSPE-CT-2005-021543) is comprised of several reports:

- A Final Activity Report, which consists of two parts:
    - The first part ("Final Activity Report Part I") is the final activity report, including the plan for using and disseminating the knowledge, with an exhaustive annex (attached in accompanying CD ROM) in which all of the deliverables associated with the Project are presented;
    - The second part ("Final Activity Report Part II") is similar to the annual activity reports and summarizes the role of participants covering the whole duration of the project.

- The Final Science and Society Reporting Questionnaire

- The Final Reporting Questionnaire on Workforce Statistics

- The Final Socio-Economic Reporting Questionnaire

- The three last reports have been completed on-line by the coordination team and a printed copy has been delivered to the Commission representatives. Part I and part II of the final activity report as well as the final management report are delivered as separate documents, while the ***Final Management Report*** will be submitted after receipt of the final payment by the Commission.

2. AGMEMOD 2020 Final Activity Report Part I

2.1. Objectives of the AGMEMOD 2020 Project

The AGMEMOD Partnership has already developed dynamic multi-markets partial equilibrium country models for the following markets:

- wheat, durum wheat, barley, maize, rye, other cereals;
- potatoes, sugar beet;
- the main oilseeds and their processed products;
- protein crops;
- milk and the main milk products;
- beef, pork, poultry, sheep and goats.

This work was supported by public funds from the Commission, through the Fifth Framework Programme (QLRT-2000-00473).

The former AGMEMOD Partnership has developed national country models for the "old" EU Member States (OMS) as well as a composite European (EU15) model. The following countries are covered: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, Spain, Sweden and the United Kingdom.

For each individual country and for all the commodity markets mentioned above, an operational dynamic multi-market partial equilibrium model has been developed. In particular, the AGMEMOD model covers a detailed set of agricultural policy instruments in each country.

The EU-15 composite model developed by the Partnership is based on a methodology similar to that implemented at the country level. To combine these country models, some exogenous variables are internalised in the EU15 model, and become endogenous variables (key market self sufficiency rates and key market prices). The final dynamic, multi-market, multi-country composite model developed allows us to generate baseline projections and alternative scenario simulations for both the EU15 in aggregate and its Member States individually, under the assumption of exogenous world prices. In its current form the composite EU15 model also allows us to analyse agricultural policy changes for a given subset of the countries modelled, while considering the rest of the EU as exogenous.

The AGMEMOD Partnership has also developed preliminary national models for 'New' Member States (NMS) that have been used to carry out annual market projections and to analyse the impact of an accession scenario at the individual country level. The following countries are covered: Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, the Slovak Republic and Slovenia. For each country and for all commodity markets considered, an operational static recursive multi-market partial equilibrium model has been developed. In other words, these modelling tools allow the Partnership to generate annual medium term projections and to simulate the impacts of accession for each country.

In summary, the AGMEMOD model already possesses a number of features that are not found in other partial equilibrium models. It has been built by a consortium of economists working across the EU and beyond, enhanced by advisory experts in commodity markets in each country who have reviewed the models and projections.

The former composite EU15 model for the OMS and the current national models for the NMS form the starting point for this project, which extends the existing work in a number of ways, by including:

- the combination of all EU Member States country models into an EU27 model
- increased country coverage
- increased commodity coverage
- additional modelling of the impact of direct income supports and agricultural profitability on land prices
- a complementary study analysing the process of economic integration that contributes to the overall model by enhancing its representation of agricultural markets in NMS, Candidate countries and other European countries.

The contribution of the AGMEMOD 2020 project to the task of building tools for the modelling of annual market projections with respect to existing PE models resides in:

- the theoretical framework used. The behavioural equations are derived from theoretically consistent models. Hence, the parameters, which appear in behavioural equations, allow for the measurement of the response of endogenous variables to variations in the explanatory factors (exogenous factors, policy instruments, prices and other endogenous variables);
- the determination of the parameters in the behavioural equations (supply, demand production, consumption, exports, imports, stocks and markets prices). The behavioural equations are econometrically estimated using national annual time series;
- the policy orientated focus. Agricultural policy instruments are modelled in an explicit way. Direct payments, support prices and maximum guaranteed area are introduced on the supply side. The impact on land markets of the new type of support (decoupled direct payments), the area payments systems and profitability of agriculture will also be analysed;
- evaluation of the effects on trade and prices in the new EU Member States of the process of economic integration following accession;
- the capacity to develop the first modelling tool that can generate projections and alternative policy scenarios at both the EU Member State level and for the EU27 aggregate;
- the provision of a harmonised database for commodities and countries considered in this proposal;
- the development of a user-friendly tool using spreadsheets, allowing policy makers easy access to model results;

- the ability to maintain a core competency in econometrics and policy analysis in a scientific group drawn from right across the enlarged EU and in the Candidate Countries. This will enhance the quality, consistency and transparency of the information available for policy decision making at all levels. Furthermore this would contribute to the development of the European Research Area. The range of countries from which partners are drawn is representative of the community of agricultural economists from across the enlarged EU;
- maintaining an independent review process with market experts across the enlarged EU.

In line with the requests for additional European agricultural products, the following commodity markets have been added to the model: rice, triticale, olive oil, table wine, apples, oranges and tomatoes. Hence the commodities considered are the following:

- common wheat, durum wheat, barley, maize, rye, oats, triticale;
- rice, soybean, rape seed, sunflower seed, vegetable oils and meals, energy oilseeds;
- potatoes, sugar, isoglucose;
- milk, butter, skimmed milk powder, cheese, whole milk powder, fresh dairy products, casein, drinking milk;
- eggs, beef and veal, pork, poultry, sheep and goat;
- wine, cotton, tobacco, olive oil;
- fruits and vegetables, including apples, citrus fruits and tomatoes.

With respect to the needs of the European Commission for market and policy analysis, the work to be undertaken building the EU27 combined model consists includes the following tasks:

- New Member States' country models will be combined with the models for the Old Member States to form a new composite model for the EU25;
- Existing models for Romania and Bulgaria will be improved in order to be combined and to form a new composite model for EU27
- Model templates for the Candidate Countries, for some potential Candidate Countries of the Western Balkans and new EU neighbours to the east such as Russia and Ukraine will also be developed.

2.2. Results of the AGMEMOD 2020 Project

2.2.1. AGMEMOD Model General Framework

The AGMEMOD model is an econometric, dynamic, multi-product partial equilibrium model in which a bottom-up approach is used. Based on a common country model template, country level models have been developed during the course of the AGMEMOD 2020 project that reflects the specific situation of the agricultural sectors in the individual countries. In this project these country level models have been combined in a composite EU

model.[1] The approach adopted within the AGMEMOD 2020 project allows for the capture of the inherent heterogeneity of agricultural systems existing within the EU, while simultaneously maintaining analytical consistency across the estimated country models.

The maintenance of analytical consistency is achieved via adherence to the common AGMEMOD templates (see Deliverable D2) by each of the individually estimated country models. The incorporation of Common Agricultural Policy (CAP) instruments in a harmonized fashion in each of the country models allows the AGMEMOD model to analyse important policy relevant questions and the impact of possible policy changes, at the Member States and aggregate EU levels, in an internally consistent and transparent fashion. The maintenance of this analytical consistency across the country models is essential to the successful aggregation of country models within the combined AGMEMOD model, and the meaningful comparison of the impact of changes to the CAP across different MS that is the objective of work-package 7 (WP7).

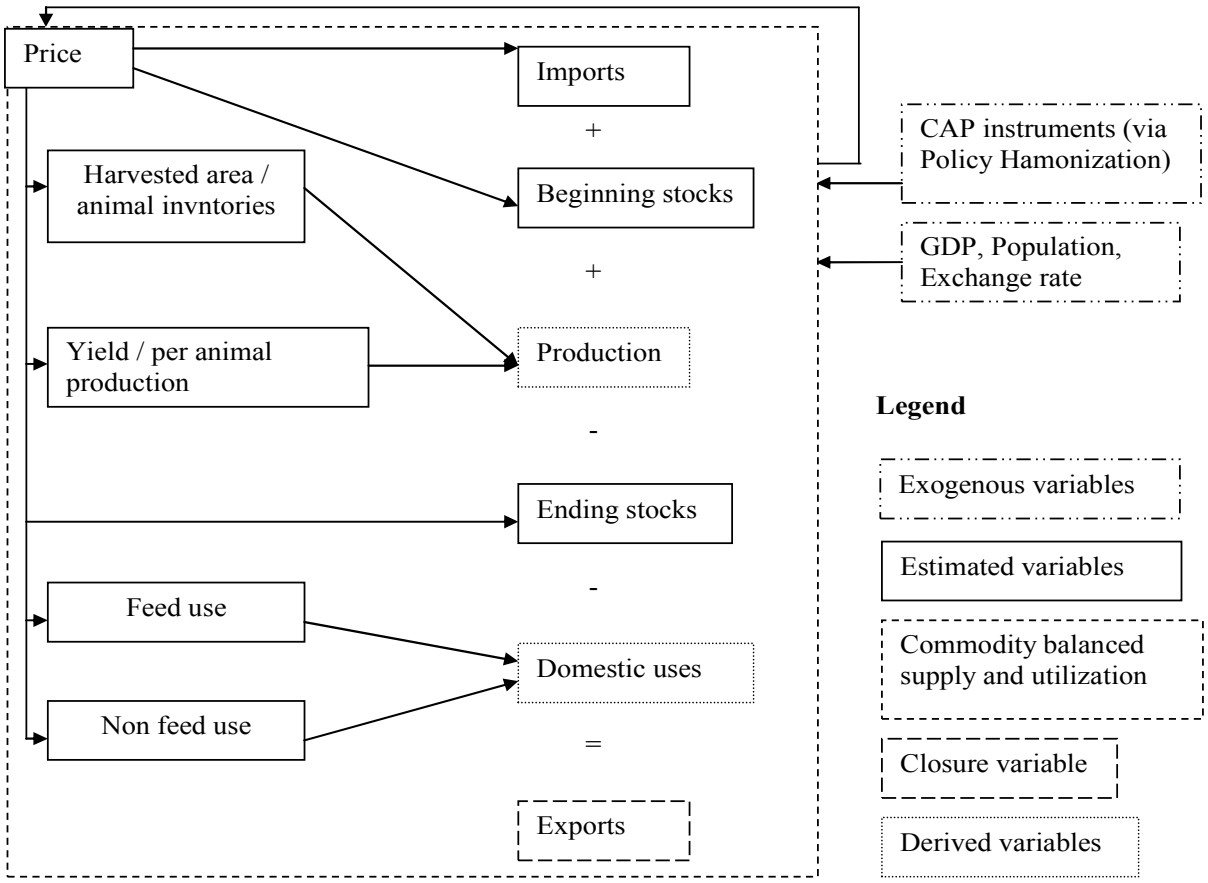
In general, the AGMEMOD model for any given country consists of different supply and demand modules for those commodities that represent the majority of the product coverage of the country concerned. In general, cereal and oilseeds with their derived products (oils and cakes), livestock (cattle, beef, pig, pig meat, poultry, sheep and goats, sheep and goat meat), dairy (raw milk, fluid milk, butter, skimmed milk, cheese, whole milk powder and other dairy products), potatoes, sugar beets and sugar are modelled in all AGMEMOD country models. Additional commodities such as tomatoes, tobacco, olives, olive oil, apples, and wine are also modelled in some but not all country models. These additional commodities are mainly modelled in those countries where these commodities form an important part of total agricultural sector output value.

For each commodity modelled, and in each country, agricultural production as well as supply, demand, trade, stocks and domestic prices are derived by econometrically estimated equations. One element of the supply and demand balance, for each commodity modelled, is derived as a closure variable. Figure 1 illustrates the general modelling structure of a commodity market at the country level, with exports as the supply and demand balance ensuring closure variable.

Each AGMEMOD country model is incorporated within the combined EU27 AGMEMOD model. Within this combined model environment all EU prices, as well as all elements of agricultural commodity supply and demand in each member state, are modelled endogenously. As the combined AGMEMOD model does not represent a closed economy, key price equations are used to take into account the impact of the developments in non-EU markets (the Rest of the World) on EU agricultural sectors. To solve the combined modelling system in prices, the supply and utilisation balances of each product at both the EU and the Member State levels must hold and take into account the international trade and other commitments of the EU.

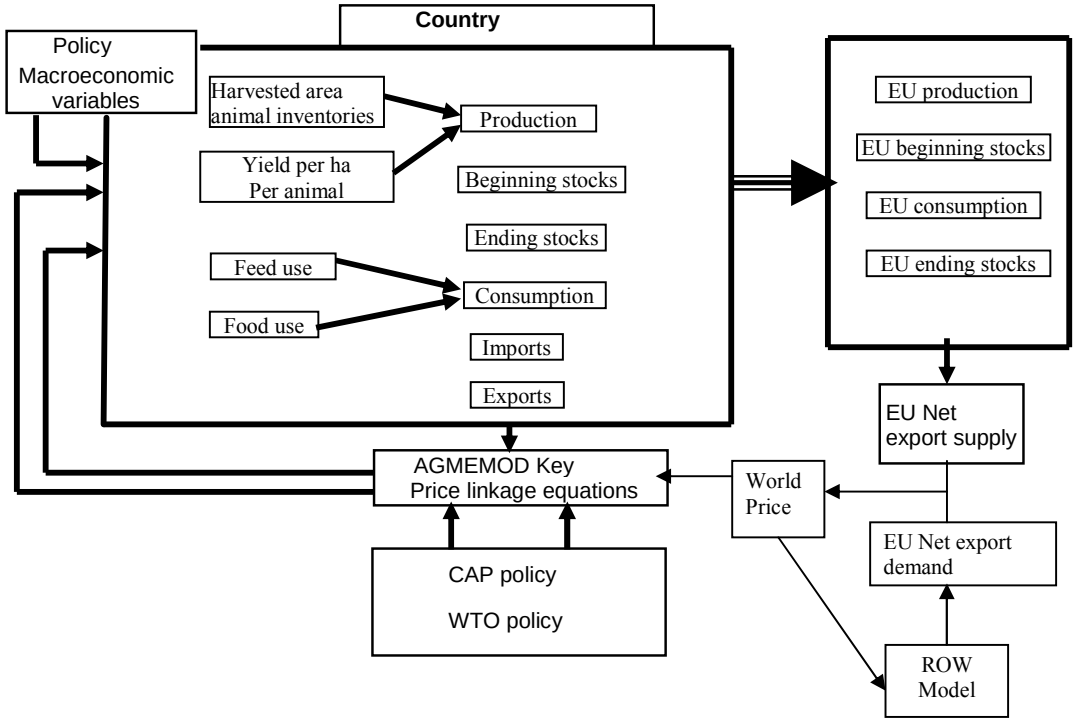
[1] The full set of commodity specific AGMEMOD 2020 model templates are described in the WP2 Deliverable D2. The country specific models developed in the project and their validation and test results are available in WP4 Deliverables D5 and D6.

Figure 1: Commodity modelling structure



The AGMEMOD model does not distinguish between intra-EU and extra-EU trade at the Member State level (that is it is a non-spatial model), thus intra-EU trade disappears at the EU level when summing over all Member States supply and use identities. This implies that the EU net export variable is used as the closure variable at the EU level. Thus, the AGMEMOD combined EU27 model generates market supply and use and price projections under Baseline and alternative scenario policy assumptions for both the EU27 and its individual Member States, under an assumption of exogenous world prices.

Figure 2: AGMEMOD combined model

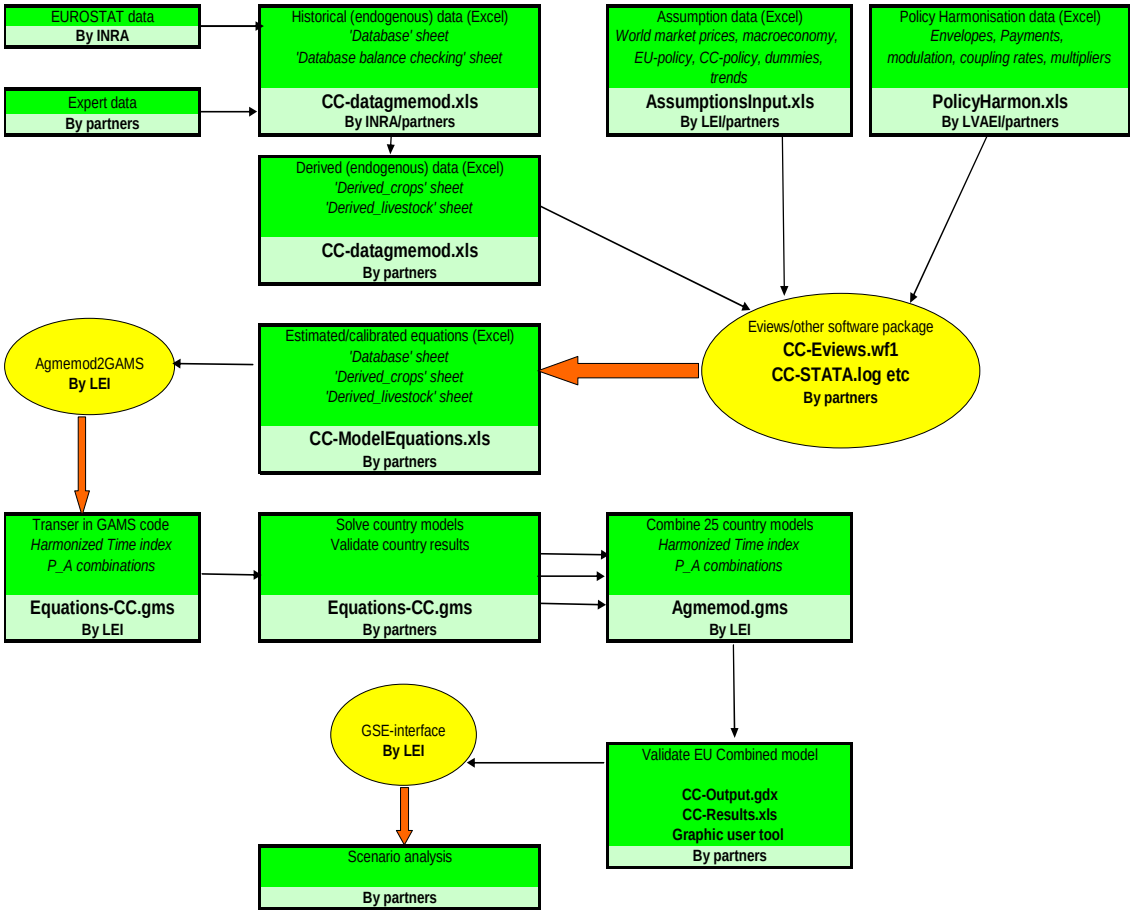


More complete descriptions of the general structure of the AGMEMOD model are found in Deliverable D2, while Deliverable D3 provides detailed information on the data used in estimating the AGMEMOD country models.

2.2.2. AGMEMOD Tool

We present here the concept to be followed from data preparation and equation estimation (the start) to model solving and scenario analysis (the end). Figure 3 provides a flow chart of the work procedure and the responsibilities of the actors involved in the study.

Figure 3: Procedure from data assembling to EU model solving



There must be a one-to-one relation between the database used (stored in the *CC-Datagmemod.xls* file) and the equations used (stored in the *CC-ModelEquations.xls* file) in the individual country models.[2] In other words, the number of equations must be equal to the number of variables in the database.

All endogenous and exogenous variables used in the AGMEMOD model have been categorised into various parameter types. Each variable has a unique mnemonic and can only be allocated to one parameter type.[3]

[2] Each country has a two character mnemonic, e.g. FR for France, SI for Slovenia. In the text that follows CC denotes an individual country.

[3] More detailed information on the building of the AGMEMOD database is available in the *Documentation on the Database* (document no. AGMEMOD WP3 P1 D3).

The maintenance and updating of datasets – which are internally consistent and coherent – are important conditions to enhance the AGMEMOD model for further use in policy analysis. Each country model is based on an aligned database with annual time series for agricultural commodity supply and use market balance elements and for price data related to the respective commodities modelled.

All endogenous data used in the EU AGMEMOD model are stored in the *CC-datagmemod.xls* files (Table 3.2). Subsequently, the data series of these *CC-datagmemod.xls* files have been stored in one large file – named *HistoryData-EU27.xls* – which contains individual country sheets with a common set of time series.

The data is constantly subject to updating, thus the latest version of *HistoryData-Eu27.xls* will always be accommodated within the combined model situated on the AGMEMOD FP6 project website (AGMEMOD model) The current sample covers a period from 1970 to 2005/2007 (depending on the country concerned).

The AGMEMOD model database itself is composed in part of balance sheets for all commodities with values on beginning stocks, production, imports, human food use, feed use, processing and industrial use, exports and ending stocks. Where possible the Partnership uses Eurostat sources such as *AgrIS* (Agricultural Information System) and *NewCronos*, as these meet the criteria on consistency and coherency. In addition, these data are relevant and meaningful to end users, as they are widely used and referenced by policy makers and agricultural stakeholders. Ideally, all data would be drawn from the same database. In practice, however, databases may be incomplete or inconsistent, or may show different numbers for the same variables in a given year, or they may include definitions which are unclear. Gaps range from the absence of a data point in a series to the total absence of data for the series in one or more countries. Where there are such gaps, comparable data from other international sources such as the FAO or USDA, and in particular, national sources are derived. If these options fail, however, partners use interpolations based on statistical techniques or expert judgement. In all instances data sources are made available to all partners so that the AGMEMOD database is subject to review and to the detection of discrepancies. Nevertheless, each partner checks the commodity datasets assembled in order to ensure that for all commodity markets, and for all years of the sample time period, the market the supply and use balance holds:

$$production_t + imports_t + beginning\ stocks_t \equiv domestic\ use_t + \exp orts_t + ending\ stocks_t$$

In those cases where the supply and use do not balance, adjustments are to be made so that the balance will hold for all commodities and in all years. As already mentioned, Eurostat data, as well as data from other databases, are subject to frequent revisions. These revisions might not only affect the previous year's observation but may also extend over a longer period such as a decade. Where these amendments are not taken into account through re-estimations, the model results will not reflect such changes in the database. Within this project it is possible to re-estimate a limited number of equations e.g. milk production, yield, and key prices, while less relevant equations are not re-estimated.

Data for exogenous variables are determined outside the model and these reflect information on agricultural and trade policy, the macro economy and world market prices. Policy and macroeconomic variables will underlie the baseline and scenarios projections to be conducted with the EU AGMEMOD model.

All exogenous data used in the EU AGMEMOD model up to 2020 are stored in the *AssumptionsInput.xls* file and the *PolicyHarmonisation.xls* file.

Policy variables

An 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 includes the increase in milk quotas, the cut in intervention prices and the implementation of the Single Farm Payment scheme. The implementation of the 2003 CAP reform was not immediate, and has been staggered over the period 2005 to 2007, depending on the Member State concerned. Also, member states have chosen different options within the scheme as allowed for under the 2003 CAP Reform, these choices have been reflected in the AGMEMOD country level models.

Following the Accession Agreement negotiated at the Copenhagen EU Summit in 2002, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovenia and the Slovak Republic joined the EU on May 1st 2004, while Bulgaria and Romania acceded on January 1st 2007. These new Member State 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).

Macroeconomic variables

Macroeconomic data are needed to generate baseline and scenario 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 from 2006 to 2020, 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.

World price variables

Although the Partnership is in a process of endogenizing the world market prices within the EU AGMEMOD Version 2.0, the generation of baseline and scenario projections mainly depends on exogenous world market prices. The price projections have, in general, been taken from the FAPRI World Outlook (2008). 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. In particular, the world market prices are introduced

in the key price equations to capture the effects of global supply and demand on the EU market.
All equations to be used in the AGMEMOD country models must be specified in the *CC-ModelEquations.xls* file.[4]

There must be a one-to-one relation between the number of variables/data series used in the Excel database (*CC-Datagmemod.xls*) and the number of variables/equations used in the Excel equation file (*CC-ModelEquations.xls*). Furthermore, the – unique – defined mnemonics and dimensions of variables in respectively *CC-datagmemod.xls*, *AssumptionsInput.xls* and *PolicyHarmon.xls* must be exactly followed. These conditions are crucial in order to make sure that the Agmemod2Gams tool can automatically transfer the mnemonics into the correct GAMS parameter type (as described in Section 3.1). The left hand side variables of the equations specified in *CC-ModelEquations.xls* must be divided into three types:

- EQ: variable is estimated or calibrated;
- IDEN: variable is an identity or a calculation from other variables;
- FX: variable is fixed on its last observation value.

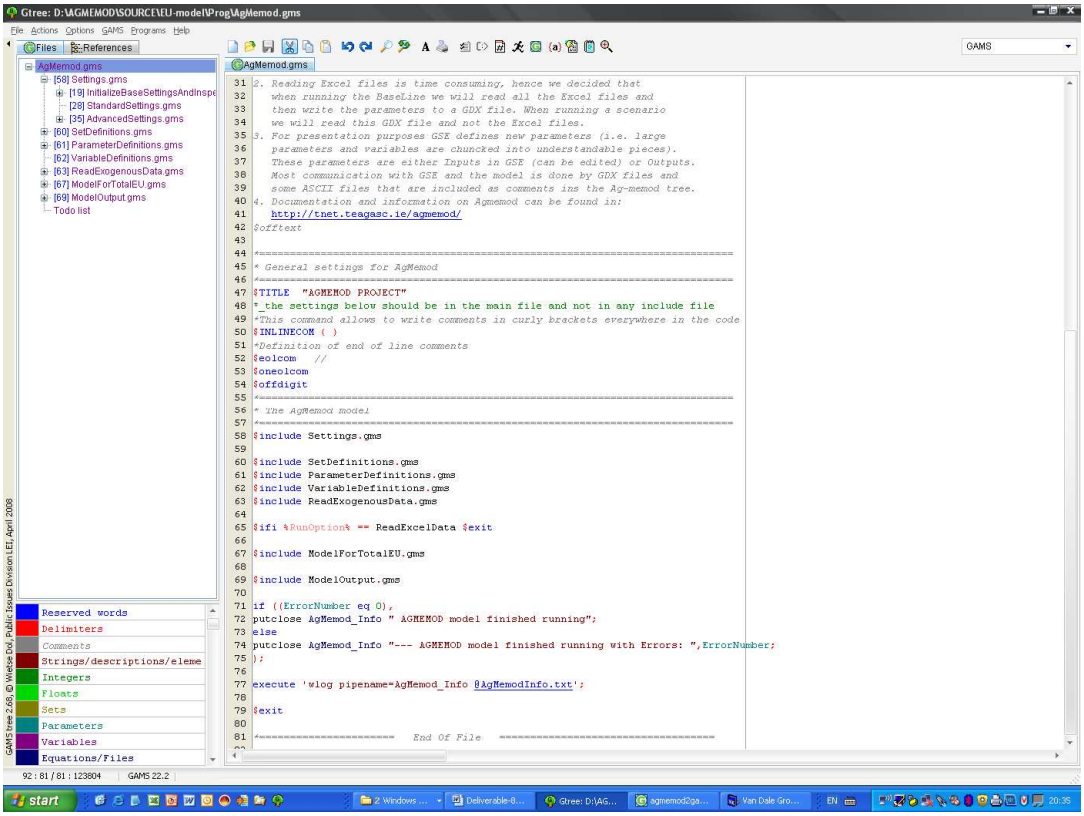
The Agmemod2Gams tool has been developed by the LEI with the objective of supporting the generation of GAMS programs by AGMEMOD partners. The tool forms the bridge between the data and estimated equations used on the one hand and the GAMS model on the other hand. The Agmemod2Gams tool ensures that consistent and transparent GAMS country models are developed in that the technical requirements concerning the use of time-indices, bounds and parameter types are fulfilled automatically.

EU AGMEMOD model

The EU AGMEMOD model is built within a *Gtree* framework. Gtree has been developed by the LEI (Dol, 2008) and stands for *GAMS tree*. Gtree is an alternative tool with which to run a model in GAMS. After having installed the fundamental software, the AGMEMOD model – *Agmemod.gms* – can be found in the folder ***Agmemod\Source\EU-model\prog\Agmemod.gms***. Figure 4 presents the structure of the EU AGMEMOD model by means of a logical sequence of GAMS files. It is important to mention that the generated GAMS code is fully in accordance with rules and guidelines on transparent and consistent modelling.

[4] More detailed information is available in the *Technical Report on the modelling structure* (document no. AGMEMOD WP2 P13 D2).

Figure 4: Screen showing the main file structure of the AGMEMOD tree



The EU AGMEMOD model consists of seven components at the first level of the tree:

1. **Settings.gms**: this file defines the so called *Globals*, which navigate the user through the AGMEMOD GAMS model. In particular the Globals in the sub-file StandardSettings.gms are of interest (notice the instructions in StandardSettings.gms itself).

2. **SetDefinitions.gms**: this file presents all declarations of the sets used in AGMEMOD and contains sets for Periods, Products, Activities, Countries and Time (notice the tree structure). Partners are not allowed to make adjustments in the **SetDefinitions.gms,** and hence this file has been locked. When new sets need to be defined, that must be communicated with the Work Package 6 leader.

3. **ParameterDefinitions.gms**: all declarations of the parameters are stored in this file and it contains sub-files for history parameters, scenario parameters and output parameters. If there is a need to add a new Parameter, it must be communicated to the Work Package 6 leader.

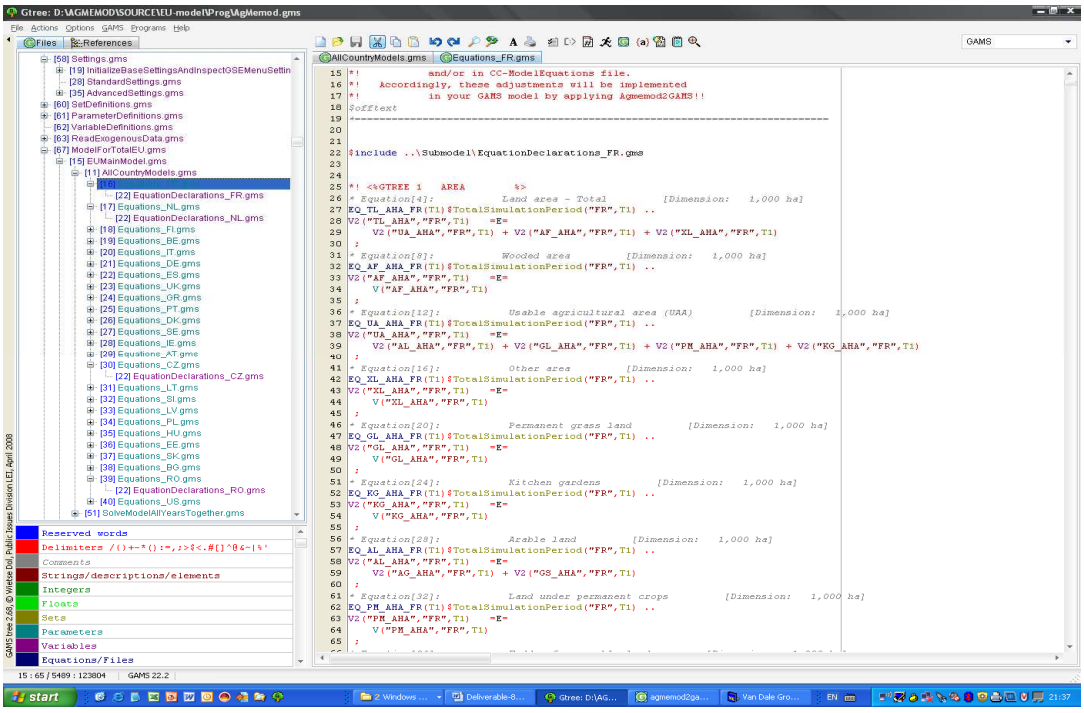
Partners are not allowed to make adjustments in the **ParameterDefinitions.gms,** and hence this file has been locked.

4. **VariableDefinitions.gms**: all declarations of the endogenous variables are stored in this file. The file contains the *V2(P_A,C,T1)* variable and the objective value *Z*. This file has been locked and can't be changed or edited.

5. **ReadExogenousData.gms**: this file organises the reading of data from the Excel files and the saving into GDX-files. The advantage of GDX files over Excel files is that the memory use is much lower. If there is a need to adjust EU specific data (e.g. USD/euro-exchange rate), it must be communicated to the Work Package 6 leader. The sub-files in this part of the program have been locked.

6. **ModelForTotalEu.gms**: this file contains all the equations and definitions of the country models. Partners must adjust, improve, and validate their own country model with the help of the Agmemod2Gams tool. The revised models must be delivered to the Work Package 6 leader, who will integrate it in the central system.

Figure 5: Screen showing the structure of the country models in Gtree



7. **ModelOutput.gms**: this file organizes the saving of all model outputs in GDX-files (CC_Output.gdx). Further, the output of the individual country models as well as the EU combined model can be written into *CC-Result.xls* files. This will be done in SaveOutputToExcel.gms.

Folder structure of .. Source\EU-model

The …***Source\EU-model*** folder is the main folder of the EU AGMEMOD model's structure. It comprises six sub-folders:

1) **CountryOutput**: contains output information from the country models, which are transferred into CC-Output.gdx files. This is useful to analyse and validate model results. GDX-files must be opened in the DataExplorer (for more information, refer to the **Notes&Guidelines_8d.doc).**
2) **Data**: contains all data files that the EU combined model needs for running the combined model, such as *HistoryData-EU27.xls*, *AssumptionsInput.xls*, *PolicyHarmon.xls*, *SFP.xls*, *CountryTimeSet.xls*, and the *CCadjust.xls* files.
3) **Prog**: contains the programs needed to run and solve the EU AGMEMOD model.
4) **Results**: contains output information stored in *CC-Results.xls* from the country models which is useful to analyse and validate the model results.
5) **Submodel**: contains the GAMS code of the country models that has been generated by the Agmemod2Gams tool. The Equations_CC.gms files immediately start with the specifications of the equations, while the declaration lists (automatically generated) are stored in the EquationDeclarations_CC.gms sub-files.
6) **XX_Graph**: contains output information on Dairy, Fruits, Grains, Livestock, Oilseeds and Roots and is used to graph and analyse the model results.

GAMS programs

This section shows how the *Agmemod2Gams* tool brings together fundamental information on data and equations and transfers that information into GAMS code (in *CC-ModelEquations.xls* files available under the folder ***…\Source\EU-model\submodel\Equations-CC.gms).*** This generated GAMS code is fully in accordance with the guidelines on transparent and consistent modelling across the AGMEMOD framework that have been agreed on by the AGMEMOD Partnership. The **steps and checklist** aimed at transferring information from the *CC-datagmemod.xls*, *AssumptionsInput.xls*, *PolicyHarmon.xls* and *CC-ModelEquations.xls* files into GAMS code is now described:

► Open Agmemod.gms in the Gtree program;

► Go to ..Agmemod.gms\Settings.gms\StandardSettings.gms and check if the ranges of the *'CC'* sheets in the *HistoryData-EU27.xls* file have been set correctly. As mentioned, the *'CC'* sheet contains all the country specific variables from respectively the *'database'*, '*derived_crop'* and '*derived_livestock'* sheets of *CC-datagmemod.xls*;

► Whether or not GAMS can read in all 'CC' sheets correctly must be checked. This must be managed in the StandardSetting.gms file:

$SetGlobal NewBaseData YES and press F9 (or click on the **running person** in the upper toolbar).

When the '*CC*' sheet of *HistoryData-EU27.xls* contains mistakes (e.g. #DIV/0, #REF, duplicate use of mnemonics), then GAMS will give an error message and the database must be amended. Accordingly, the reading in procedure must be repeated again.

2.2.3. Analysis of the European Milk and Dairy market

The study conducted as part of a project in collaboration with IPTS (DG JRC, Seville) was aimed at providing an in-depth quantitative assessment of possible implications of dairy policy reform and other policy adjustments on the milk and dairy market as well as on other agricultural markets. The focus was on the aggregate EU27, EU15, and EU12 results as well as on the individual Member States results, using a modelling tool that captures the diversity of European agriculture (multi-commodity approach) and its regional variations. The spot light was placed on those MS displaying important and interesting results.

The objectives in detail were:

- to assess the implications of changing policy and market conditions for EU agriculture, with special emphasis on milk quota phasing out and export subsidy removal, using a modelling tool that allows for regional and sectoral differentiations;
- to carry out policy relevant scenarios reflecting the impacts of deregulation (e.g. quota abolition or expanded quotas), the changes in quota and price levels, different types and levels of direct payments; and
- to conduct an analysis concerning the implications of policy reform scenarios and to draw appropriate policy recommendations.

Within the assessment, special emphasis was placed on the milk and dairy market, which is represented by

- raw milk (cow milk and other milk);
- milk fat and milk protein use;
- whole milk;
- butter;
- cheese;
- skimmed milk powder (SMP);
- whole milk powder (WMP);
- and aggregated other dairy products.

The number of specific dairy products included in AGMEMOD was diversified within the 6th Framework project AGMEMOD2020. Consequently drinking milk, cream and other fresh products - which heretofore were either subsumed in fluid milk or all other dairy products - have been modelled explicitly.

Production, domestic use, stocks, exports, imports and prices for milk and dairy products are projected and simulated. Furthermore, interactions with other agricultural sectors are captured by linkages to the beef and crop sectors, examples include- the supply of calves for beef production and feed demand for SMP and grain and oilseed based animal feeds. Thus, results for the following sectors are available:

- the cereal sector with soft wheat, durum wheat, barley, maize, rye, other grains;
- the oilseed sector with rapeseed, sunflower seed, soybeans, derived vegetables oils and meals; and
- the livestock sector with beef and veal, pork, poultry, sheep and goats.

Projections and simulations results cover:

- the individual MS results selected on the basis of respective outcomes;
- EU15 as a whole (15 MS before May 2004);
- EU12 as a whole (12 new MS from May 2004);
- EU27 as a whole (27 MS from January 2007).

Projections are generated from year 2006 to 2020 with the underlying quantitative and qualitative assumptions on macroeconomic and other variables reported.

In the simulation, policy scenarios comprised changes in the following policy instruments:

- adjustment and phasing-out of milk quotas;
- reduction of export support (WTO subsidized export limitations);
- changes in support aids for domestic consumption.

To provide a better representation of the dairy sector and to simulate the impact of milk quota abolition, the dairy model structure in AGMEMOD has been improved with an enhanced milk supply function.

2.2.3.1. Assumptions for the Baseline

Given the upheaval in commodity markets in 2007 and 2008, an exact description of the baseline policy in advance of undertaking the analysis is not possible. To a degree, it is an empirical question which is dependent on the strength of international markets and the extent to which this might condition the EU Commission's decisions with respect to intervention, export refunds and subsidised domestic consumption. Taking this point into account, the baseline in this study has been developed as follows:

- milk quotas remain in place at the 2008/09 level throughout the projection period;
- 2008/09 quota expansion package (the 2% milk quota increase agreed for 2008/09) has been implemented.
- butter and SMP intervention remains in place throughout the projection period;
- no further WTO reform occurs and the URAA conditions hold;
- export subsidies and import tariffs remain 'on the books' and are used when required to support the farm gate milk price.

2.2.3.2. Assumptions for the Scenarios

One could conceive of many milk quota reform scenarios, but the number of scenarios must be kept reasonable to allow a proper interpretation of the results of the scenarios by both the researchers and the policy makers. The main issue for the scenarios will be the pace of quota reform, whether it takes place rapidly in a short number of years (i.e. over 1 or 2 years) or whether it takes place more slowly (e.g. over 3, 4, 5 or 6 years).

It seems highly unlikely that quota removal would be accompanied by any additional compensation for the resultant decrease in milk prices, so no compensation will be assumed. Alteration of other policy levers in order to create a coherent set of policies for the dairy CMO as quotas are relaxed is a possibility. For example, it might be required that quota removal is accompanied by further reductions in the intervention price for dairy products, in order to prevent stock-building as market prices decrease. This is particularly the case for butter, given that the internal EU butter price is ordinarily substantially above the world butter price. Reform of the butter intervention price would also help adjust the butter/protein price ratio in the EU and bring it closer to that prevailing on international markets. Another possibility is that dairy export subsidies would be completely removed. Intervention price reductions and the elimination of export subsidies would be seen as important steps towards ensuring that EU dairy policy is able to cope possible outcomes from the Doha WTO negotiations.

Taking the foregoing into consideration the following four scenarios have been developed.

Scenario Milk 1:

- The dairy quota is expanded by 1% each year from 2009/10 to 2013/14;
- Represents 5 annual increases relative to the 2008/09 quota;
- 2009/10 is year 1 (total increase 5% by 2013);
- Milk quota is eliminated in 2015;
- No compensation is paid to producers for the resulting price drop;
- Other policies remain unchanged.

Scenario Milk 2:

- The dairy quota is expanded by 2% each year 2009/10 to 2013/14;
- Represents 5 annual increases relative to the 2008/09 quota;
- 2009/10 is year 1 (total increase 10% by 2013);
- Milk quota is eliminated in 2015;
- No compensation is paid to producers for the resulting price drop;
- Other policies remain unchanged.

Scenario Milk 3:

- Scenario Milk 1 plus the following policy changes:
- Butter intervention prices will be reduced by -2% per year starting in 2009.

Scenario Milk 4:

- Scenario Milk 2 plus the following policy changes:
- Butter and skimmed milk powder intervention prices will be reduced by -2% per year starting in 2009;
- Dairy subsidized export limits are reduced by -5% per year starting in 2009.

2.2.3.3. Main results

The main results for the baseline and scenarios analysis are summarized below. More detail information is available in the report published by the Commission.[5]

Baseline Results

- EU dairy commodity and milk prices decline from the elevated levels of 2007 over the period 2008 and 2009 and the medium term trend is for prices to be maintained at a level above those observed in the earlier part of this decade. Since EU production is virtually unchanged and consumption is increasing, the amount of dairy product available for export declines.
- The strong internal demand for cheese means that cheese production increases in the baseline, while production of butter and SMP decreases.
- As milk yields increase by about 1% per year, there is an offsetting reduction in the number of dairy cows. This means that the contribution of the dairy sector towards EU beef output declines over time.

Scenario Results

- Unless otherwise specified, the changes that take place under the scenarios are described in relation to the outcome in 2020 under the baseline.
- External factors relating to global supply and demand for dairy products (as reflected in the Baseline) are more important determinants of the future level of EU dairy product prices, milk prices and dairy production than the changes in the milk quota regime which are examined.
- Under the scenarios this change in product mix observed in the baseline is also a feature, but in addition some of the additional milk that is produced is channelled to all the major products.
- The outcome under the milk quota expansion/elimination scenarios leads to conclusions which are broadly the same for the first two policy options. EU dairy production increases by 2010 relative to the baseline by about 4% and there is a 5% reduction in the EU milk price as a result. The outcome at the aggregate EU level is the sum of both increases and decreases in individual MS level milk production. Beyond 2010 there is more or less a stabilisation of production in most of the MS. Due to the further policy intervention under Scenario Milk 3 and Scenario Milk 4 the outcomes especially concerning prices are more marked.
- EU MS can be categorised in accordance with the extent of the production increased (decreases) that are projected. Grass based dairy producers, with high initial quota rents, are best placed to expand milk production under quota expansion and elimination. High feed prices drive rents to zero relatively quickly in MS with low initial rents and where grain feeding is the dominant production system. Few countries exploit the full extent of the quota increase available to them in the phase

[5] AGMEMOD Partnership (2008): *"Modelling and Analysis of the European Milk and Dairy Market"*. Editors: Lubica Bartova and Robert M'barek. JRC Scientific and Technical Report. Under preparation.

out period. These results suggest that the quota expansion allowed under the Milk 1 and Milk 3 scenarios is sufficient for most MS and that a "hard landing" at the EU level is avoided. A few MS continue to increase milk production once quotas are removed even under the Milk2 and Milk 4 scenario and there is merit in considering larger quota increases for these MS, particularly given that their contribution to overall EU milk production is small. This would avoid large production increases at the point where milk quotas are removed, which could otherwise have negative short run consequences for the sector in these MS.

- The consequences of milk quota removal for other agricultural sector are minimal. There are projected to be more dairy cows (than in the baseline), but this is offset through a reduction in the number of beef cows, so the net change in the total number of cattle is small relative to the Baseline. Hence the consequences of the scenarios for the derived demand for feed are trivial.

2.2.4. AGMEMOD Model General Framework Continued

The importance of incorporating CAP instruments in a harmonized way across the different country models is central to the analytical capacity of the AGMEMOD 2020 combined model. The incorporation in each country level model of what was described in Deliverable D4 as "Policy Harmonization" ensures that the AGMEMOD Partnership's analysis of the differential impact across the Member States of a common policy change reflects, in so far as possible, the likely real differential impact of any policy change rather than differences in how a common policy is incorporated within the different AGMEMOD country models.

The incorporation of the policy harmonization approach within each AGMEMOD country model also widens the set of questions that can be addressed with the AGMEMOD model to include analysis of the consequences of changes in the budgetary envelopes devoted to CAP Pillar I instruments. Such questions are likely to arise as part of the wider EU budgetary review that is scheduled to commence following the conclusion of the ongoing CAP Health Check process.

The harmonized policy modelling approach (hereafter PH) was developed in work-package 5 (WP5) of the AGMEMOD 2020 project and its objective was to improve the modelling of economic integration processes within the AGMEMOD model. The overall description of the methodology developed and how the harmonized approach to policy modelling has been implemented in each AGMEMOD country model is presented in Deliverable D4.

The implementation of the PH approach involved:

- The development of specific harmonized country policy data sets;
- The introduction of policy data in harmonized way within the combined model environment.

The development of each country's harmonized policy data set was undertaken in two steps. The first step involved the collection of policy information which incorporates data on all of the different types of direct payments that are and were part of the CAP, and which is

detailed enough to be used analytically in the estimation of the agricultural supply and demand models that form the core of the model developed as part of the AGMEMOD 2020 project. The second step in the development of each country's harmonized database was the construction of a set of consistent country datasets which, in a coherent manner, incorporate total budgetary envelopes per member state, the different types of the EU CAP direct support elements, and their allocation from the total budgetary envelopes. The harmonized policy datasets provide the input information that is central to the AGMEMOD model's capacity to model the impact of policy in a coherent and consistent manner. The combined AGMEMOD model policy input file contains all modelled countries harmonized policy sheets, with each country sheet including information on direct payments envelopes, modulation rates, reference amounts and coupling rates. The full details on the process of building the harmonized AGMEMOD Policy data set are presented in the document Note&Guideline 9.

The second stage of the implementation of the harmonized approach to policy modelling involves the implementation of the harmonized policy data in the AGMEMOD modelling structure and the use of this data in the combined model. Full details of the steps taken in achieving this are presented in the document Note&Guideline 9a,

The implementation of PH within the AGMEMOD model took place in two stages. In the first stage a set of calculations on budget envelopes and payments, which is the same for all countries, was centrally done within the combined model environment. In the second stage a set of country specific calculations have been undertaken. These calculations generate the policy data that have been subsequently used to re-estimate certain components of the supply side of each of the AGMEMOD country models.

The set of country specific calculations that form the first part of the second stage of policy harmonization implementation are driven by equations that calculate the influence of policy instruments on gross returns for crops. These variables were then used in the re-specification and re-estimation of certain components of the supply side of each of the AGMEMOD country models (the equations that had to be re-estimated are specified in D4). For livestock and livestock product models the variables generated were used to create (when combined with market prices) what have been termed reaction prices.

The main assumption regarding the modelling of the impact of the different types of budgetary support is that all direct support measures, coupled as well as decoupled provide incentives to produce. The degree to which different types of CAP instruments (for example coupled versus decoupled) differ in their effect on production decisions is captured via explicit coefficients that are termed multipliers. The magnitude of the multipliers used to determine the differential supply inducing impact of direct payment instruments is based on qualitative and quantitative analysis and is harmonized across country models.

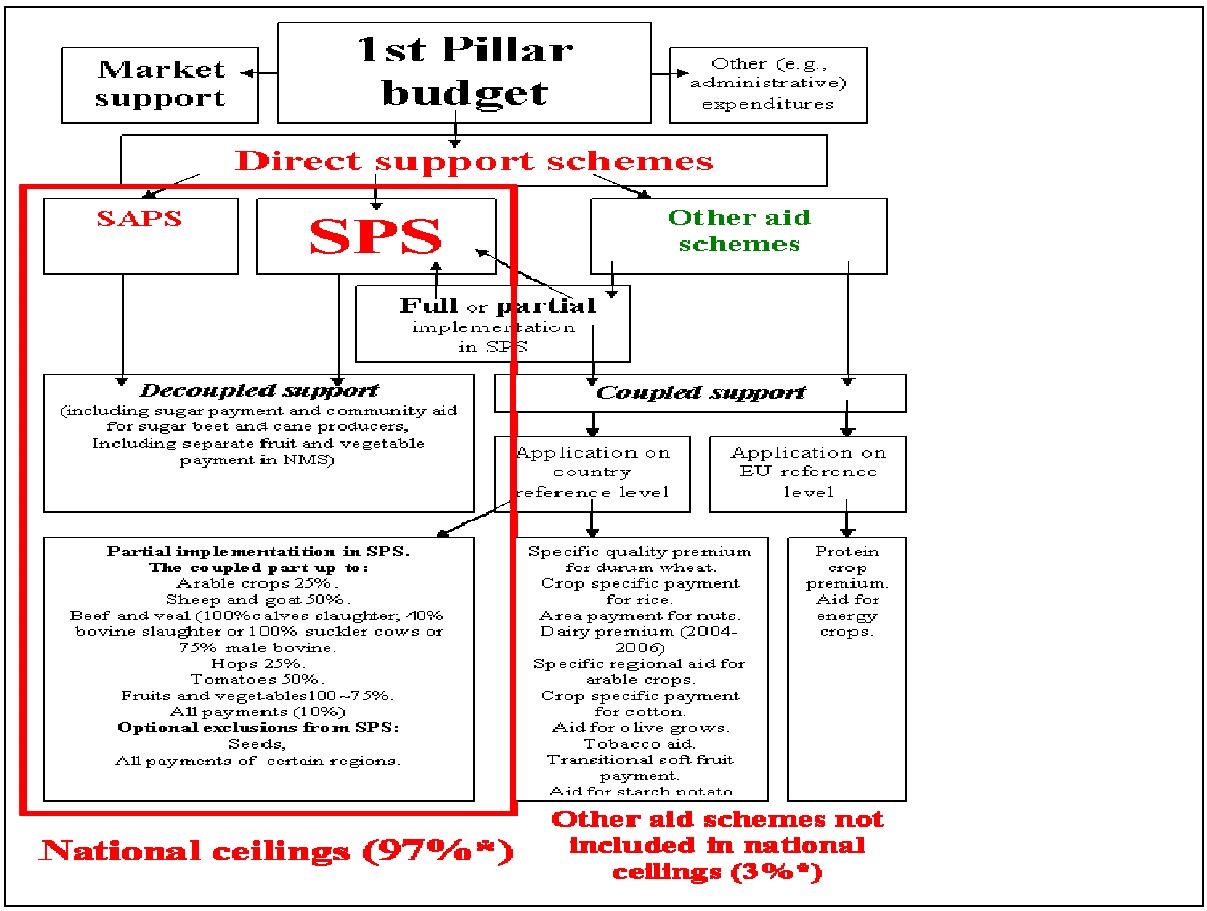
The approach adopted in harmonizing the modelling of agricultural policy within the AGMEMOD model means that the AGMEMOD modelling system accounts for the vast majority of the budgetary resources utilised within the current CAP budget's Pillar I measures. Three types of direct support schemes are currently supported by the CAP Pillar I budget, these are the payments (coupled and decoupled) that are associated with the single

payment system (SPS) that operates in EU OMS, Slovenia and Malta, the simplified area payments system (SAPS) that operates in all bar two of the EU10+2 Member States, and a limited number of other coupled direct payments.

Total funding for the SPS and the SAPS is aggregated in national envelopes called *National Ceilings* and together these accounted for almost 97% of total CAP direct support expenditure in 2007. Member States are allowed to decide (according to rules set by Council Regulation 1782/2003) on the sharing of their national budgetary ceiling between coupled and different types of decoupled (historical and/or regional) direct payment envelopes.

According to Regulation 1782/2003, there are still some other aid schemes, which accounted for approximately about 3% of CAP direct support expenditure in 2007, that are not included in the national budgetary ceilings. Only coupled payments that are defined on the basis of "partial implementation" of decoupling or the "optional exclusions" of SPS (Regulation 1782/2003 Title III, Chapter 5) are included in national envelope defined by Regulation 1782/2003. These payments are highlighted in red in Figure 6.

Figure 6: Type of support and measures financed by the CAP Pillar I Budget.

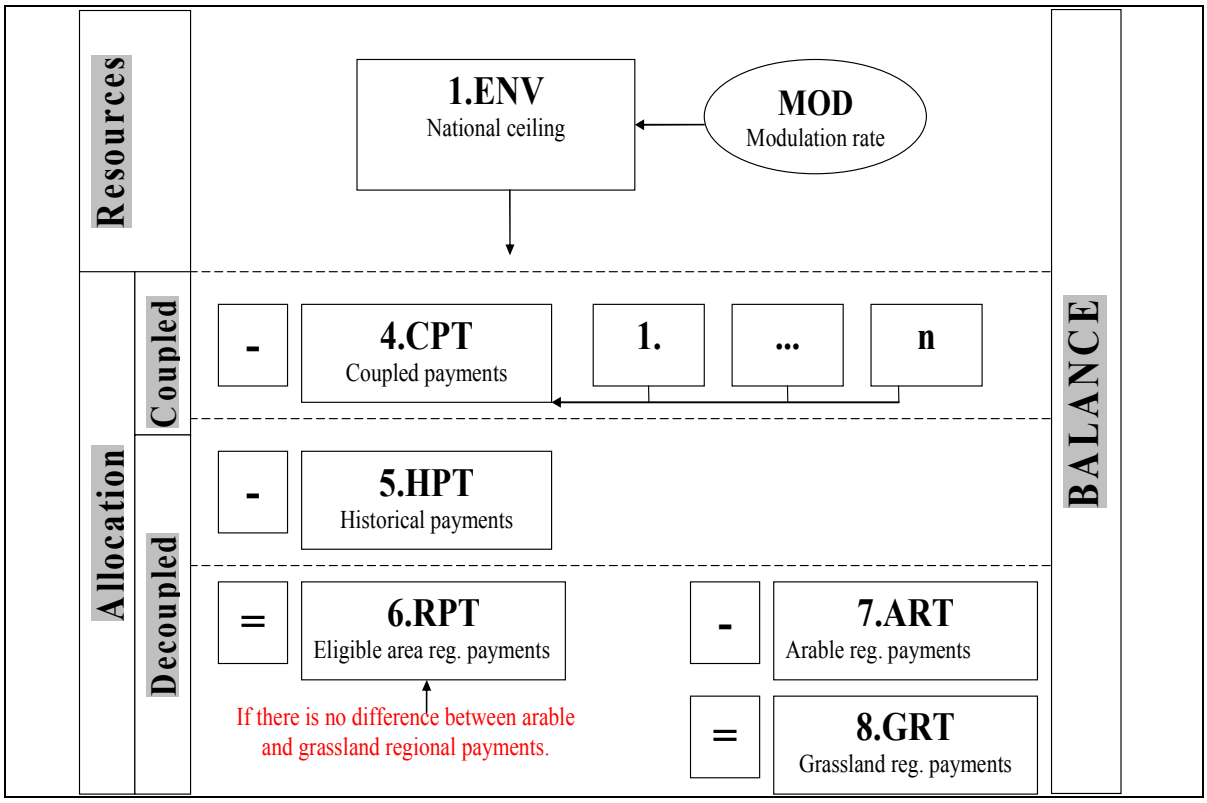


Source: Calculated according to R1782/2003 (consolidated version from 2008.01.01), R552/2007;

* - share in funding for direct support schemes in 2007

The allocation method utilised in the AGMEMOD policy harmonization approach (illustrated in Figure 7) ensures that the ceilings (and sub-ceilings) set out in the EU regulations are respected, that the allocation of overall national ceilings in each Member State across the three categories of coupled, historical and regional payments is correctly reflected, and that impact of the modulation of funds and their transfer from the 1st pillar to the 2nd pillar of the CAP budget is incorporated.

Figure 7: Allocation of Direct Support from National Ceilings



The second stage of the implementation of policy harmonization involves the calculation for each Member State of a set of country specific policy instruments based on the allocation of the direct payment budgetary ceiling across the three categories of direct payment illustrated in Figure 7. As noted earlier these policy variables alter the adjusted gross return variables that are the key economic drivers in the area allocation equations for cereals, oilseeds, potatoes, tomatoes, olives, cotton, tobacco and fruits and vegetable models in each AGMEMOD country model. Policy instruments derived from Regulation 1782/2003 using the AGMEMOD policy harmonization approach also alter the prices that are the key drivers in the livestock models' breeding stock inventory equations and the dairy models' milk production and milk yield per cow equations.

Through the implementation of the policy harmonization approach (PH) in every AGMEMOD country model the set of policy issues and questions that can be addressed in a

coherent and transparent way by the AGMEMOD combined EU27 model has been expanded.

2.2.5. Analysis of Alternative Policy Scenarios

2.2.5.1. Scenarios

Based on the issues highlighted in the European Commission's Health Check proposal and our discussion of the longer term issues facing the CAP we have formulated a total of six Baseline and alternative policy scenarios, which are detailed below.

Baseline Scenario

The Baseline policy scenario is, by definition, a no new policy scenario, in that it assumes a continuation of current policy. Under the Baseline there is no possibility for Member States to change their model of decoupling. The current mix of historic, static and dynamic regional models and hybrid models will continue for the complete projection period to 2020. The CAP budget and national ceilings remain at their current levels. Milk Quota is not increased and remains in place until the end of the projection period and set aside restrictions continue to apply. In the EU10+2 Member States, other than Malta and Slovenia, the SAPS will continue to apply until 2013 and from then on the SPS will apply. Currently coupled direct payments remain for the duration of the Baseline period where Member States have chosen to retain them

Alternative Scenarios

The AGMEMOD Partnership has analysed 5 alternative policy scenarios. In this report these alternative policy scenarios are grouped into two sets; the first alternative policy scenario set contains those policy scenarios that relate to the recently concluded *CAP Health Check*; the second alternative policy set contains those policy scenarios that were motivated by the upcoming *EU Budget Review*. In the rest of this section a short synopsis of the scenarios analysed is presented, where the definitions of the analysed scenarios differ from those presented in Deliverable D11.

CAP Health Check Agreement Scenarios

The first alternative policy scenario (Scenario 1a) analysed is based on the CAP Health Check political agreement reached by the Council of Ministers on November 20, 2008. The agreement differs in some important respects from the Commission's proposals and from the definition of the CAP Health Check scenario that was set out in project Deliverable **D11**. The most significant changes to the definition of the Health Check scenario relate to the increases in modulation rates that were agreed as part of the CAP Health Check and the limits on the percentage of national budgetary envelopes that can be devoted to potentially production distorting supports under Article 68 of the agreement. The agreed expansion of the milk

quota, termed by the Commission as the "soft landing" is incorporated in Scenario 1b and differs little from that originally proposed by the Commission. The Commission's proposals to extend decoupling remain in the actual Health Check agreement. Finally, the Health Check agreement proposed that those MS applying the historical model could move towards applying a regional flat area payments system. Since this element of the Health Check agreement was not made mandatory, we have assumed in alternative policy scenarios 1a and 1b that for the entire projection period EU15 MS continue to use the SPS model that they currently utilise.

The other two scenarios in the Health Check Scenario alternate policy set relate to alternate policy outcomes that could conceivably have emerged from the Health Check negotiations. Under the first of these scenarios (scenario 2a), in addition to the decoupling, modulation and CMO reforms in the Health Check Agreement, all Member States move to a national flat area payment. Thus this scenario interprets the optional element of the Health Check agreement on the SPS model as mandatory for all Member States. For those Member States which have already, in their current implementation of the CAP, chosen a regional flat area payment or hybrid model, this dimension of policy change is largely already incorporated in the Baseline and Health Check Scenario (1a and 1b). This scenario can be expected to have more significant impacts in those Member States that have chosen to implement the historical payment model under the 2003 CAP reform.

Under the final alternative Health Check scenario (Scenario 2b) we examine the impact of the introduction of an EU flat area payment, this scenario is budget neutral at the EU level but leads to a large reallocation of Pillar I resources among EU Member States.

EU Budget Review Scenarios

The second set of alternative policy scenarios that are analysed are based on the expectation that the upcoming EU Budget Review will change the level of resources devoted by the EU to Pillar I measures. In the first of the Budget Review scenarios (Scenario 3a), resources are transferred out of the first pillar of the CAP budget through the imposition of a large increase in modulation rates. The increased modulation rates to be introduced from 2014 onwards under the recent Health Check agreement are doubled under Scenario 3a.

In the second Budget Review scenario (Scenario 3b), an EU wide flat area payment equal to €100 per hectare is introduced in all EU Member States. This EU Budget Review scenario is based on an element of the CAP reform proposals of Bureau and Mahé (2008). Within these proposals an EU wide flat area payment of €100 euro per hectare, which Bureau and Mahé term a *Basic Husbandry Payment* (BHP), was proposed in combination with a schedule of payments that are spatially differentiated and contractual payments for the provision of environmental and other public goods. Given that the AGMEMOD model is non-spatial agricultural markets model we analyse only the BHP element of the Bureau and Mahé proposals.

Table 1 Baseline and Scenarios Definitions

Option		SPS Model	Description	Calculated as
1a	Baseline	Status quo	- No review possibility for MS; both historic and hybrid/regional models continue as present - Other elements according to AGMEMOD Outlook (prices, macro …) - Budget remains at the level before Health Check decision	- MTR Standard: Status quo (Historic/regional/hybrid) - Coupled Elements - SAPS, NMS until 2013, then SFP
1b	Health Check	Health Check Agreement	- Modulation, Abolishment of some coupled measures, remaining allowed measures - Milk quota abolishment - Intervention prices reduced/abolished - Other elements as 1a	- MTR Standard: Status quo (Historic/regional/hybrid) - Coupled Elements - SAPS, NMS until 2013, then SFP
"Health Check PLUS: Towards flatter rate and full decoupling:				
2a	National flat rate	National flat rate per hectare	- Move towards national flat rate entitlements applied to all eligible area - No coupled measures at all - Other elements as 1b	- Total level of reference payments of the historic model in a region/total eligible area in this region - Change of multipliers
2b	EU-wide flat rate	EU-wide flat rate per eligible hectare	- The same flat rate payment entitlement per eligible hectare applies to all EU MS - No coupled measures at all - Other elements as 1b	- Annual financial envelope of all MS/all eligible agricultural area - Change of multipliers
"2013 Budgetary Review Scenarios"				
3a	Increased modulation	Regional flat rate per hectare	- Reducing budget national ceiling via increased rate of compulsory modulation - Other elements as 2a	- Doubling of net modulation according to Health Check agreement
3b	Basic Husbandry Payment Scenario	EU-wide flat rate per eligible hectare	- The same flat rate payment entitlement per eligible hectare applies to all EU MS - No modulation at all - Other elements as 2a	- Fixed value €100/ha

All macroeconomic, agricultural and agricultural trade policy data, and world commodity price data are assumed to be the same under the Baseline and all of the policy scenarios analysed.

In each scenario analysed the agricultural policy data set is different from that used under the Baseline. The implementation of the policy harmonization method within the combined AGMEMOD 2020 model allows for the transparent and homogenous implementation of each of the proposed policy change scenario across the different Member State models that together form the combined AGMEMOD 2020 model. The impact of the policy changes analysed in each scenario, as reflected in the policy data used, is inferred as the difference between the AGMEMOD model's projections under the particular scenario and the Baseline run.

2.2.5.2. Main results

The EU27 results, which are presented in an exhaustive manner in deliverable D12, illustrate the usefulness of the AGMEMOD combined model as a tool with which to examine alternative agricultural policy proposals for the EU. The discussion in deliverable D12 has largely focused on the analytical results at the level of the EU27. However, one of the advantages of the AGMEMOD tool is its ability to illustrate the differing impacts of policy changes across the European Union's increasingly heterogeneous Member States. The examples presented in the various text boxes of deliverable D12 illustrate the model's rich capacity to examine the differential impact of changes in *common* policies. The discussion of the results of the baseline and alternative policy scenarios analysed also illustrate the model's cross-sectoral linkages. Further work on the incorporation of Mediterranean commodities in the model as noted in the discussion of the scenario analysis results for the so-called "new commodities" is warranted.

In the discussion of the results of our analysis of the policy scenarios described in project Deliverable D11 we divided the alterative policy scenarios into two sets. The first set was based on the recent CAP Health Check process and the second was based on the recently initiated EU Budget Review.

Our CAP Health Check Agreement scenario results confirm that the reform recently agreed is a very limited one. This is not a criticism of the reform agreement reached since from the outset the intention was that the scope of this CAP reform would be much more limited than the 2003 reform. The agreement reached on the phasing out of the EU milk quota represents the principal agricultural policy change agreed. The analysis presented in the deliverable D12 suggests that the increase in the rate of modulation agreed by the Council will have only very modest impacts on agricultural production. The freedom to retain coupled suckler cow and ewe premium will, our results suggest, limit any adjustment in the cattle and sheep sectors.

The alternative CAP Health Check scenario we analysed examined the impact of a mandatory move to national flat area payment systems and the impact of the implementation of an EU wide flat area payment in conjunction with the full decoupling of all remaining coupled policy instruments. Our results suggest that the retention of coupled payments continues to support agricultural production in the EU. The introduction of an EU flat area payment leads to increased production in those member states with lower direct

payments per hectare than the EU average and declines in agricultural activity and agricultural commodity production in those member states with above average direct payment receipts per hectare. However, under the EU flat rate scenario there are no dramatic changes in the pattern of EU agricultural production. These results suggest that a bolder and perhaps more horizontally equitable decoupled payment regime could be considered.

The two EU Budgetary Review scenarios analysed examined the commodity market impacts of policy changes that would significantly reduce the budgetary resources devoted to CAP Pillar I measures. While these two scenario's impacts are the largest of the alternative CAP policies analysed the impacts on commodity markets and on agricultural output prices are relatively modest. The greatest impacts, as anticipated by Bureau and Mahé in their 2008 paper, are on the specialised beef and sheep sectors.[6]

2.3. Conclusions

The achievements of the project in its first year generally corresponded with the project's initial plan of work for 2006. For each country modelled and for each commodity considered a sub-model structural form has been specified, following Notes & Guideline documents provided by the co-ordinator of the corresponding work-package. Thus, the main objective of this work package n°3, which was to specify and explain the modelling approach chosen, has been achieved. Furthermore, the modelling approach was refined, emphasizing price convergence and technological improvement. As part of the data-gathering task, a general Mnemonic Protocol has been provided and each partner, following MS-Excel templates provided by the co-ordinator of the corresponding work-package, has built his/her own country database. The work done as part of the modelling and database building tasks has accounted for the model's increased geographical and agricultural commodity market coverage. By combining our efforts under the FP6 and IPTS projects we have been able to present AGMEMOD baseline scenario results as well as three sets of alternative scenario results. Furthermore, the migration of the AGMEMOD model to a GTREE was in progress. Even though the work performed in the first year of the project was compatible with the initial plan presented in the technical annex of the contract, the migration of the model to GTREE and the work done by the Partnership, and in particular by Core Group members, as part of the AGMEMOD EU Agricultural Outlook reduced our capacity to follow the project's original work plan for year 2007, and required some changes in the work processes of the Partnership.

The work undertaken during the second year corresponded with the project's initial plan of work for 2007 for most of the work-packages, even though some tasks were completed with some delay. The main objectives of the corresponding work-package have been achieved. The modelling structure and the fully completed AGMEMOD database were used to perform the estimation/calibration of all functional forms. Each resulting country model has been tested and validated. Furthermore, the migration of the AGMEMOD country models using GTREE was accomplished by most of the contractors. Nevertheless, with the re-setting of our priorities so as to work in closer conjunction with the Commission services, we were in a position to deliver a more transparent final tool. A first version of this tool was used as part of a collaborative project with the Institute of Prospective and

[6] A detail presentation is available in the document no. AGMEMOD WP7 P12 D12

Technological Studies (IPTS DG JRC, Seville). Another version of this tool has been developed and introduced as part of a study for the Commission services (AGMEMOD Milk), which has provided a quantitative assessment of possible implications of the dairy policy reform and other policy adjustments for the milk and dairy commodity markets as well as for other agricultural markets.

During the last year of the project, work has concentrated on the preparation of the AGMEMOD Outlook. The resulting baseline and scenario results, based on further developments of the AGMEMOD model introduced during the third year of the project have been presented at a workshop ***"The Agricultural Member States Modelling (AGMEMOD). Recent Outcomes and Developments"*** organised by IPTS in June 2008 in Brussels.

Through the development of the AGMEMOD country models a rich set of commodity supply and utilisation datasets for EU Member States and for Russia, Ukraine, Croatia and Macedonia have been developed. A database of EU Common Agricultural Policy instruments has also been developed.

During the third year, the AGMEMOD combined model has been used to provide policy analysis on the impact of milk quota abolition as well as several policy analyses related to potential CAP reforms.

The AGMEMOD Partnership has largely succeeded in its objectives outlined in section 2. The first objective was to develop an econometric, dynamic, multi-product partial equilibrium modelling system with the capacity to undertake model-based economic analysis of the potential impact of policy or other changes on the agri-food sector of each EU Member State and the EU as a whole. A total of 27 country level dynamic, multi-product partial equilibrium models of agriculture have been developed through the research undertaken as part of the AGMEMOD 2020 Project. The geographic coverage of the model extends to the 27 EU member States and 4 other countries (Croatia, Macedonia, Russia and Ukraine). The commodity coverage of the model accounts for the vast majority of temperate EU agricultural output and a significant proportion of traditionally Mediterranean crops.

All of the models developed as part of the Project have in so far as possible followed a model template structure established early in the project. However, it was necessary for all partners to deviate somewhat from this in econometrically estimating their country level models. This inherent heterogeneity represents strength of the modelling approach adopted in the AGMEMOD project wherein country level detail and characteristics are captured in the estimated and validated country level models. This strength of the modelling approach used, however, has its costs in the extent to which it prevents the seamless integration of all country models developed into a coherent EU composite model. Nevertheless, despite challenges faced during the project in integrating all of the country level models that have been implemented in GAMS, all such GAMS country level models have been integrated in the AGMEMOD EU composite model. Furthermore, the integration of the four remaining countries (Croatia, Macedonia, Ukraine and Russia) into the combined model environment shows our capacity to increase the geographical coverage using the tool developed under the AGMEMOD 2020 project.

The country models developed by all Partners, and the EU composite model, capture a rich set of the policy instruments that have historically made up the EU Common Agricultural Policy (CAP).

As well as successfully achieving the development of a policy analysis tool at the level of individual Member States and at the EU level, the AGMEMOD Project has contributed to the establishment of a rich set of networks within individual Member States and across the expanded EU. In each country modelled partners have liaised with industry experts in the evaluation of their country model's performance; this process has contributed to awareness of the research undertaken with the support of Community funds and will in the future reinforce the credibility and analytical usefulness of the model in policy analysis and support. The project has also contributed to the establishment of a strong and vibrant pan-European network of research economists working in the field of agricultural policy analysis that would have been difficult to establish through other means. This network's harmonious functioning is reflected in the numerous conference papers and jointly authored articles produced by researchers from institutes based in different Member States.

Although this project formally finished on 31 December 2008, the AGMEMOD Partnership will devote most of their efforts, in 2009, to the dissemination of the work undertaken under FP6 project and to maintain the model. All members of the AGMEMOD Partnership agreed to continue their efforts in 2009.

3. Use and dissemination of the knowledge

In this section, we first present the use and the dissemination of the knowledge for the duration of the project, while the use and dissemination planned for the next years is presented in a second part.

3.1. Dissemination and use

Most of the dissemination activity of the project has, to date, been focused within the Partnership. The objectives of this dissemination activity were the following:

- To present preliminary results so as to trigger the process of data-quality enhancement;
- To communicate the results of the research conducted on modelling structure;
- To implement a homogenized country models validation process;
- To set up rules, which when followed by each partner will ensure in so far as possible the successful combination of country models.

The following tables summarize the documents provided by the Partnership during the whole duration of the project.

Use and dissemination: Year 1

Type of documents	Number of documents	%
Progress and Discussion Reports	48	39.67
Notes & Guidelines and Templates	13	10.74
Communications (Newsletter and presentation of reports)	39	32.23
Communications (Seminar and Workshop)	15	12.40
Publications and Working Papers	6	4.96
Total	121	100.00

Use and dissemination: Year 2

Type of documents	Number of documents	%
Progress and Discussion Reports	162	61.36
Notes & Guidelines and Templates	20	7.58
Communications (Newsletter and presentation of reports)	41	15.53
Communications (Seminar and Workshop)	23	8.71
Publications and Working Papers	18	6.82
Total	264	100.00

Use and dissemination: Year 3

Type of documents	Number of documents	%
Progress and Discussion Reports	142	60.42
Notes & Guidelines and Templates	14	5.96
Communications (Newsletter and presentation of reports)	39	16.60
Communications (Seminar and Workshop)	24	10.21
Publications and Working Papers	16	6.81
Total	235	100.00

The cooperation with IPTS (DG JRC Seville) on complementary studies led to official publications edited by DG EDIT. Furthermore, IPTS organised a joint meeting of the AGMEMOD core group with DG AGRI, DG RTD, DG JRC and IPTS representatives: "*The Agricultural Member States Modelling*", where AGMEMOD results were presented and discussed. These official publications, the deliverables and articles published or presented to international seminars and conferences are listed below.

AGMEMOD Partnership (2008): Impact Analysis of CAP Reform on the Main Agricultural Commodities. Report III AGMEMOD - Model Description. Editors: Lubica Bartova and Robert M'barek. - EUR 22940 EN/3, JRC44263.
http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=1577

AGMEMOD Partnership (2008): Commodity Modelling in an Enlarged Europe - November 2006 Workshop Proceedings - AGMEMOD Report V - EUR 22940 EN/5, JRC42096; 2.2 JRC Scientific and Technical Reports. Editors: Lubica Bartova and Robert M'barek. http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=1566

AGMEMOD Partnership (2008): *"Modelling and Analysis of the European Milk and Dairy Market".* Editors: Lubica Bartova and Robert M'barek. JRC Scientific and Technical Report. Under preparation.

AGMEMOD Partnership (2007): Impact Analysis of CAP Reform on the Main Agricultural Commodities. Report I AGMEMOD - Summary Report. JRC Scientific and Technical Report. Editors: Lubica Bartova and Robert M'barek. EUR Number: 22940 EN/1. 11/2007; http://www.jrc.es/publications

AGMEMOD Partnership (2007): Impact Analysis of CAP Reform on the Main Agricultural Commodities. Report II AGMEMOD - Member States Results. JRC Scientific and Technical Report. Editors: Lubica Bartova and Robert M'barek. EUR Number: 22940 EN/2. 10/2007; http://www.jrc.es/publications

AGMEMOD Deliverable 1 (2007): First annual progress report, F. Chantreuil and M.-D. Le Barbenchon.

AGMEMOD Deliverable 2 (2007): Technical Report on the Modelling Structure, R. Esposti and B.Camaioni.

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3.2. Plan for using and disseminating the knowledge

As part of the FP6 project, several versions of the AGMEMOD combined model have been built and used to perform for agricultural market analysis:[7]

- The AGMEMOD combined model 2.0 has been developed combining the work undertaken under FP6 project and the IPTS contract. This work led to the first AGMEMOD baseline outlook;
- The AGMEMOD combined model 2.1 has been developed under the IPTS contract. This work led to a new modelling framework for milk and dairy commodity markets and to the analysis of milk scenarios reform;
- The AGMEMOD combined model 3.1 (the current version), has been developed during the last year of the FP6 project. This version considers a new modelling framework for policy (the Policy Harmonization approach) and led to a new baseline outlook and the analysis of several policy scenarios.

In the short term the AGMEMOD Partnership will devote most of their efforts to the dissemination of the work undertaken under FP6 project and to maintain the model. All

[7] All documents provided by the Partnership are listed in the reference section.

members of the AGMEMOD Partnership agreed to continue their efforts in 2009 in order to:

- Update exogenous data (World prices, macro economic variables);
- Write journal articles;
- Participate in international seminars.

Hence, in the short term, the objectives are to:

- Provide an updated baseline outlook and updated policy scenarios analysis using AGMEMOD combined model 3.2 version;
- Present these updated results to the WMOC (Saint-Malo, 18th-19th May 2009) and/or to the Commission representatives as part of a specific meeting/workshop organised by IPTS.

In the medium term, several topics for improvement should be considered in order to lead to new potential versions of the AGMEMOD combined model. Bioenergy, GHG, price volatility and agricultural incomes are important issues in debates on the development of European agricultural markets and agricultural policy. The current version of the AGMEMOD combined model does not take into account these issues (or only does so partially), and they represent valuable areas for further development of the model.

In the current version of the model, the demand for agricultural land is derived as the aggregation of estimated harvested areas (based on economic returns and policy instruments). Even though land prices are derived form the modelling framework, these prices are not endogenous. Furthermore, bio energy demands are incorporated in only a few countries (Austria, France, Germany, the Netherlands and Sweden) as additional demands for soft wheat and rape oil that are based on policy driven variables. In other words, there is no land supply function and no bio energy supply function.
With respect to these issues, the use of an agricultural commodity must be the result of competition across food, feed, fuel and other uses; the use of land must reflect the economic returns (allocation across crops) and land price formation. Hence the future version of AGMEMOD should include:

- Bio energy demand and supply functions explained from crude oil price, production costs and policy related variables;
- Endogenous land prices (selling and renting prices), including explanatory variables such as the supply and demand of bio energy, policy variables;
- Endogenous total land supply and demand depending on land prices and agricultural input and output prices;
- Land supply-demand equilibrium condition.

The current AGMEMOD combined model in its modelling of land uses and agricultural activity levels generates a large part of the information necessary to provide projections of GHG emissions from EU agriculture. Partners within the AGMEMOD Partnership have used partial equilibrium models of agricultural markets similar to the AGMEMO combined model to generate projections of the impact of agricultural policy on the sector's GHG emissions (Donnellan and Hanrahan, 2006a, 2006b). Similar research in each Member State using future versions of the AGMEMOD combined model could provide a similar capacity on a pan-EU basis and allow for the analysis of the impact of agricultural policy ad market developments on GHG emissions. Further research could also focus on the market impacts

of GHG policies that are developed at the EU and Member State levels. Hence future versions of the AGMEMOD combined model should have:

- The capacity to model each Member States agricultural GHG inventory;
- The capacity to analyse the impact of agricultural policy on agricultural GHG inventories;
- The capacity to analyse the impact of potential GHG policies on agricultural, activity, agricultural prices and agricultural incomes

As part of the Common Agricultural Policy, income and income inequality is a permanent subject of agricultural policy debates and it has nowadays a new dimension. The current AGMEMOD combined model allows us to derive from baseline and policy scenarios analysis simple information related to agricultural sector incomes (EAA). The question of the relative importance of the different income sources in the total income and in its distribution would be useful in studying the impact of CAP reforms on the distribution of income and on the modification of the households' structure and behaviour. To study the impact of the CAP on income distribution and the behaviour of farmers, we would have to undertake research activities in order to give appropriate answers to questions such as:

- What is the agricultural incomes inequality picture across the EU?
- What is the contribution of different income sources to this income inequality?
- Do between countries and/or within country differences matter to income inequality?
- Do farm types matter?
- Does income inequality result less from performance of farms and more from the mechanisms of public income redistribution (agricultural and other policies)?

Hence a potential future version of AGMEMOD should include indicators taking into account the impacts of policy scenarios on the households' income, structure and behaviour

Another dimension that should be considered is the geographical coverage of the AGMEMOD model. Actually, all EU member States (except Malta and Cyprus) are modelled. Furthermore, using the AGMEMOD standardised modelling structure, candidate or potential candidate for EU accession (Macedonia and Croatia) and EU neighbours (Russia and Ukraine) have been modelled and are part of the current AGMEMOD combine model. This expansion of the geographical coverage of the AGMEMOD model allows us to provide baseline outlook for these countries and offers the possibility of implementing accession or bilateral trade agreement scenarios. The only Candidate country missing is Turkey, and this country should be incorporated to the AGMEMOD model, following the work plan used for previous non-EU countries.