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Policy Description in the CAPRI Model

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1 Policy Implementation in the CAPRI Model

1.1 Introduction

The modelling of agricultural policies in the CAPRI model has been developed in the course of time, in response to needs for increasingly detailed analyses. A few years ago the model only featured a simple direct payment per production activity and import tariffs from the by then single world market. Now the model features a complex system of direct payments on the supply side, and the market side has been enhanced with intervention measures, export subsidies and tariff rate quotas. Those improvements have fundamentally changed the way agricultural policy scenarios are handled in the model and presented in the result tables. This working paper provides an updated documentation of how the agricultural- and trade policies are handled in CAPRI.

1.2 Definition of a Policy Scenario

1.2.1 General

With the previous policy representation in the model, the number of parameters used to model agricultural policy was comparably small, and the simple and rigid structure of the system allowed them to fit well into the database of the modelling system. That database system has, however, proved incapable of providing the flexibility required to model the modern CAP measures. An example would be the introduction of several direct payments per production activity, for each of which a different national ceiling apply. To allow this kind of flexibility in the policy scenarios, the definition of policies was lifted out of the database and instead stored in separate files of gams code. Due to the very detailed definition of the Common Agricultural Policy (CAP), each policy scenario consists of several files:

- ◆ Definition of *administrative prices*; normally referred to by the ending of the file name with “PADM” (Price administrative)
- ◆ Definition of *historic yield*; referred to by the file ending “HSTY”
- ◆ Definition of *direct payment schemes* with all relevant regulation details (payment amount, member state specific ceilings, specific payments, etc...) can be found in the files which start with “pol” and are followed by the “reform name”

- ◆ Additional files with changes in *quota, trade policy* etc, specific to a certain policy proposal, can be found at the appropriate places in the code in order to introduce the relevant changes.

Currently, the following policy description are implemented in the model:

- ◆ Base year policy (McSharry Reform 1992)
- ◆ Fully implemented Agenda 2000 reform (AGENDA)
- ◆ Mid Term Review proposal from July 2002 with continued dairy policy (MTR1)
- ◆ CAP Reform proposal January 2003 (MTRj)
- ◆ EU proposal for the WTO negotiations from December 2002 (EU)
- ◆ Harbinson proposal for the WTO negotiations from March 2003 (HARB)

Except the base year policy, all policy packages refer to the simulation year 2009.

1.2.2 Handling of Policy Scenarios

After the GAMS implementation of a certain policy reform package, the overall handling should be done over the user interface of the model. The following graph shows the CAPMOD user interface for the CAP reform proposal 2003.

Figure (1) CAPMOD User Interface for Policy Simulation CAP reform proposal 2003

```

Application settings
Presets loaded from file : MTRJ.PAR
Current Log file (LOG) : U:\CAPRI\CAPMOD2.LOG

File
  Mode
  Run model
  Output
    GSU files for map output      (YES/NO) = YES
    HTML output                  (YES/NO) = YES
    EXCEL output                 (YES/NO) = NO
    MAP file directory           = gams\map\mtrj
    HTML directory               = gams\htm\mtrj
    EXCEL result directory       = d:\temp
  GAMS
    GAMS call                    = Z:\gams
    GAMS file Simulation         = CAPMOD
    GAMS options                 = scrdir=z: o=z:\capmod_mtrj.lst
    GAMS directory              = gams
  Open
    Table file for type : MTRJ   (TAB) = U:\CAPRI\dat\capsim1.tab
    Table file for type : CAPREG (TAB) = dat\capreg.tab
    Table file for type : MTR1   (TAB) = U:\CAPRI\dat\capsim1.tab
    Table file for type : AGENDA (TAB) = U:\CAPRI\dat\capsim1.tab
    Table file for type : CAPTRD (TAB) = U:\CAPRI\dat\capsim1.tab

Data
  Simulation
    Market module                (YES/NO) = YES
    Young animal trade module    (YES/NO) = YES
    Milk quota trade module      (YES/NO) = NO
    Number of simulation steps    = 15
  Selection
    Member States                = BL-UK
    Nuts level (0/1/2/F)        = 2
    Projection year              = 09
    Periodicity                  = A3
    Description of simulation     = CAP reform prop.
    Result                       base year & type = 98MTRJ
    BAS Base yar data            base year & type = NNCAPREG
    REF Reference run             base years & types = 98AGENDA
    TRD Trend data                base years & types = 98CAPTRD
    CMP Compare data             base years & types = 98MTR1

Overlay
Rule : 1 = COL = *, ROW = *, REG=*,SOURCE = BAS
Rule : 2 = COL = SWHE-OANI DCOL=GRAI,ROW = SWHE-YCHI, REG=*,SOURCE = TRD BAS
Rule : 3 = COL = SWHE-OANI GRCU=GRAI,ROW = PRMC=PRMT PRME,REG=*,SOURCE = POL BAS
  
```

Management of Results (points to HTML and EXCEL output directories)

Policy description (points to Description of simulation)

Reference run (points to REF Reference run)

Comparison with additional scenario (points to TRD Trend data)

After starting the model, capmod.exe will produce the basic data input file in gams format, with all relevant information for the model run (fortran.gms).


The policy scenario files in the code for the respective run are addressed over a global gams option which refers to the result type, defined on the user interface (see graph 2).

Figure (2) Example for Code Implementation of Different Policy Scenarios

```

*
*-----
*
* --- policy scenario file: MTR: market instrument changes
*
$if %result_type%==98MTR1 $include 'policy\polMTR09_padm.gms'
$if %result_type%==98MTR2 $include 'policy\polMTR209_padm.gms'
$if %result_type%==98MTRJ $include 'policy\polMTRJ_09_padm.gms'
*
* --- policy scenario file: market instruments for WTO simulations
*
$if %result_type%==98HARB $include 'policy\polMTRJ_09_padm.gms'
$if %result_type%==98EU $include 'policy\polMTRJ_09_padm.gms'
*
* --- policy scenario file: changes to trade policy for WTO simulations
*
$if %result_type%==98TRQ $include 'arm\wto.gms'
$if %result_type%==98HARB $include 'arm\wto_harb.gms'
$if %result_type%==98EU $include 'arm\wto_EU.gms'
*

```



1.2.3 Management of Results

The model results can be accessed in several ways. The most convenient way is to look in the HTML output. Additionally, the mapping tool can be used for visual impression and comparison of regional results. CSV tables can be written to facilitate additional spreadsheet calculations. The steering of the different options should be done over the model interface.

In order to compare the results of three different simulations, the *compare parameter option* on the user interface can be used. Thus, for the simulation, defined in Graph 1, the HTML- tables will include:

- ◆ the base year data
- ◆ the results for the reference run (Agenda 2000 for the simulation year 2009)
- ◆ the results of the current run (CAP reform proposal for the year 2009)
- ◆ and the results of the Mid term review as presented in July 2002 (MTR1 for the year 2009) which will be written on an additional data parameter in the model, just for comparison purposes.

The HTML-tables are stored in the directory defined on the user interface and access to them is over the file: Result.htm

1.3 Definition of Direct Payments

1.3.1 Modelling direct payments

The current system of direct payment in the CAP provides an interesting challenge for modellers of the EU agricultural sector. The system of national ceilings (base areas, premium rights, national envelopes...) makes the actual amount paid per animal or hectare an outcome of the model rather than an input – when for example the production of grandes cultures overshoots the national base area, the premiums are cut proportionally for all producers. For other premiums, for example suckler cows, there is also a national ceiling for the number of premiums paid, but unlike the grandes cultures premium, overshooting that ceiling does not lead to an equal cut of all payments, but rather works as a limit for the number of payments paid for each individual farmer, which thus has to possess the appropriate number of premium rights, which in turn leads to the capitalization of the premium in premium rights, implicitly or explicitly. The way the ceiling is defended also influences the economic incentives perceived by the producer. If each producer has his own premium rights, a producer with a marginal cost of production below market income plus premiums but above market income alone, would not expand his production beyond the individual premium right endowment, as the marginal premium payment beyond that limit is zero. If the premiums on the other hand are cut equally for all farmers, a producer with a marginal cost less than market income plus premiums but higher than market income will increase his production even though the resulting marginal income for the entire sector equals market income. The premium cut is shared between all producers.

Further complications are provided by the partial disconnection of premium payments from physical production: The production activity *per se* provides the farmer with a right to apply for a premium, and the same produced premium right can in some cases find alternative uses, like a hectare of soft wheat either can be used to apply for a grandes cultures premium or be used as fodder area required for the application for beef premiums. This type of interconnections between different premiums and premium rights not only challenges the farmers trying to optimise their production programmes, but also complicates the construction of agricultural models.

1.3.2 From the Legislation to Model Code

The new definition of direct payments in CAPRI is a compromise between the desire to imitate as closely as possible the function of the real system and the need to keep the code on a level of complexity that is manageable with respect to both the computers and the humans that operate them. Hence the major features of the premium system that are easy to generalize have been included, whereas regionally specific features or measures that for other reasons would require major changes of the model have been left out.

First of all there is a list of all premiums that are implemented in a certain scenario. The list can easily be extended or reduced in different policy scenarios. For each premium there are three types of information needed. Below, these are presented by the example of the slaughter premium for adult cattle of 80 EURO per head.

1. The default (maximum, uncut) amount of the premium according to regulatory texts, for all activities and regions of the model. In the example, this means that it is 80 EURO for dairy cows, suckler cows, male adult cattle and fattened heifers in all regions of the model and null elsewhere. This is defined in a hierarchical way: if it is set to 80 EURO for the EU and not set at all at lower regional level, the 80 EURO are mapped down to all sub regions by the program. The program also lets you define groups of activities. In this case a group PGMEAT has been defined which contains the relevant animals. This number is called regulation premium, PRMR.
2. The way that the amount PRMR should be applied in CAPRI. In our example, the 80 EURO should be paid when the animal is slaughtered. That means that in order to get the amount per living animal and year, the 80 EUROs have to be multiplied by the frequency with which the animal is slaughtered. For male beef cattle it is 1/year whereas it for dairy cows is something like 1/5 years. That number is taken from the database. The resulting number is called declared premium, PRMD and applies per head or hectare and year. There are three other such application types (APPTYPE): Per activity level or head, per main output (e.g. yield per hectare) and per historic yield.
3. Regional ceiling, expressed in maximum number of premiums paid and/or total payment in EURO. In the example with the slaughter premiums, this is used to set a national ceiling limiting the total amount spent on slaughter premiums in each

member state. There can be additional ceilings at other regional levels, and the most strongly binding is always the one that limits payments.

Those three pieces of information are generally easily accessible without further processing from the regulatory texts. Starting with PRMR and APPTYPE (information pieces 1 and 2 above), it is possible to calculate PRMD, the amount of premium per head or hectare that would be paid if there were no (active) ceiling. The preparatory calculations, e.g. the hierarchical break down from higher to lower regional level and from activity groups to individual activities, as well as the calculations of PRMD from PRMR (using APPTYPE) is carried out in a file called policy.gms.

For most premiums in CAP there are ceilings, which if they are binding influence the average amount of premiums actually paid (effective premium, PRME) per head or hectare. This reduction of premiums can only be done endogenously in the simulation and has to react to changing production patterns. How this is done is described in the next section.

1.3.3 Calculation of Effective Direct Payments in the Model Run

The way the premiums are cut to fit under the given ceilings affect the economic incentives perceived by the agents in the model as well as in reality. In the model, there would be two principally different ways of implementing the ceilings:

1. To introduce premium payment activities in the objective function with national or regional restrictions on the maximum number of premiums or amounts paid, or
2. to treat the premium level as exogenous (fix) in the optimisation and adjust it iteratively between the main model iterations.

The first version would let the producers “see” the marginal premium level and the resulting model would be prone to stick precisely to the ceiling levels. This may be a realistic behaviour for some premium controlled activities at micro level, but does not well resemble the mechanisms for the area payments (introductory discussion). This implementation also means that all regional models which “come under the same ceiling” have to be solved simultaneously.

The second version is technically easier to implement, and does also make sense for a model that is working on an aggregated (not micro) level. Here, the premium level is constant in the objective function, and hence the model does not “realise” that the

marginal premium payment is null as soon as the ceiling is reached. This formulation is the one used in CAPRI.

Technically, the iterative adjustment of the effective premiums PRME is handled in a file called PRMCUT for “premium cut”. The program then adds up total number of premium units (hectares or heads for which it is paid) that belong to each ceiling. In most cases this simply means summing up number of animals or hectares of the activities for which each premium applies. This is also multiplied with the declared amount PRMD to get the total payment which would be paid if it would not be cut. For each premium this is compared to the ceilings defined (total level with the level ceiling and total amount with the value ceiling) and a “cut factor” is calculated, which defines how much the premium has to be reduced in order to fit under all ceilings. Then PRMD is multiplied by this factor to get the effective premium (PRME) for the next iteration.

1.4 Elements for Trade Policy Definition and Domestic Support in non-EU regions

1.4.1 Types of trade policy instruments

It should first be noted that the market model is spatial and hence offers the chance to define trade policy instruments applied to bilateral trade flows. The trade policy instruments implemented in the model are the following ones:

- ◆ *Tariff Rate Quotas (TRQs)*. The mechanism consists in the application of a preferential tariff for imports under a certain quota level. Once this quota is filled, imports are taxed with the higher so-called “most favourite nation tariff” or MFN-tariff for short. The latter is the standard tariff for imports, when no TRQ system or preferential trade agreement is applied. If imports are exactly at the quota, a quota rent occurs. The TRQ will cease being binding and the quota rent will fall to zero if imports beyond the quota level do occur or the price differences between import price and internal market price exceed the MFN tariff. Additionally, in simulation runs imports beyond the quota level can be provoked by the following policy changes:
 - *Expansions in the quota volume* or policy changes which lower the border price, as for example higher export subsidies of the trading partner.

-
- *Reductions in MFN tariffs which reach the preferential ones.* In this case the TRQ mechanism does not have any sense anymore because all imports will be taxed with the lower MFN tariff.
 - ◆ *Most Favourite Nation (MFN) Tariffs (not included in the TRQ mechanism).* Tariffs increase import prices, thus raising the competitiveness of domestically produced goods. There are two types of tariffs implemented which may work in parallel:
 - Ad valorem tariffs, expressed as a percentage of the border price.
 - Specific tariffs, expressed in monetary units per physical unit imported.
 - ◆ *Export subsidies and subsidised exports.* *Export Subsidies* act as a negative tariffs and hence raise competitiveness of the supported export flow in the import market – both compared to domestic sales and other import flows. They are expressed in the model in monetary units per physical unit exported. On the other hand *Subsidised Exports* refer to the amount of exports subject to subsidisation. In order to reduce disturbances in the market, the WTO sets up country specific maximum allowances for subsidised exports (commitments) in quantities and values (subsidised exports times the per unit subsidy), which might or not be fully utilised by them (notifications).
 - ◆ *Intervention Purchases.* They are an instrument of domestic policy which aims to guarantee a minimum farmer's income by preventing domestic prices from undercutting a certain price floor (administrative price). The price is defended by government purchases to stocks (whereas government purchases which are exported are accounted as export subsidies). The government acts like a highly elastic demander once the market prices hits the price floor. Intervention purchases affect global trade indirectly as they require an effective isolation from world markets to prevent an influx of non-domestic production into government stocks. They are relevant only for the European Union.
 - ◆ *Producer Support and Consumer Support Estimates (PSE and CSE).* Its definition is given by the OECD: “measure of the transfers from taxpayers and consumers of agricultural products to producers (PSE) and the transfers from domestic consumers to producers and taxpayers (CSE)”¹. They are mainly expressed in units (Euro/tonne) or percentages of the total value of production. The so-called PSE market support is

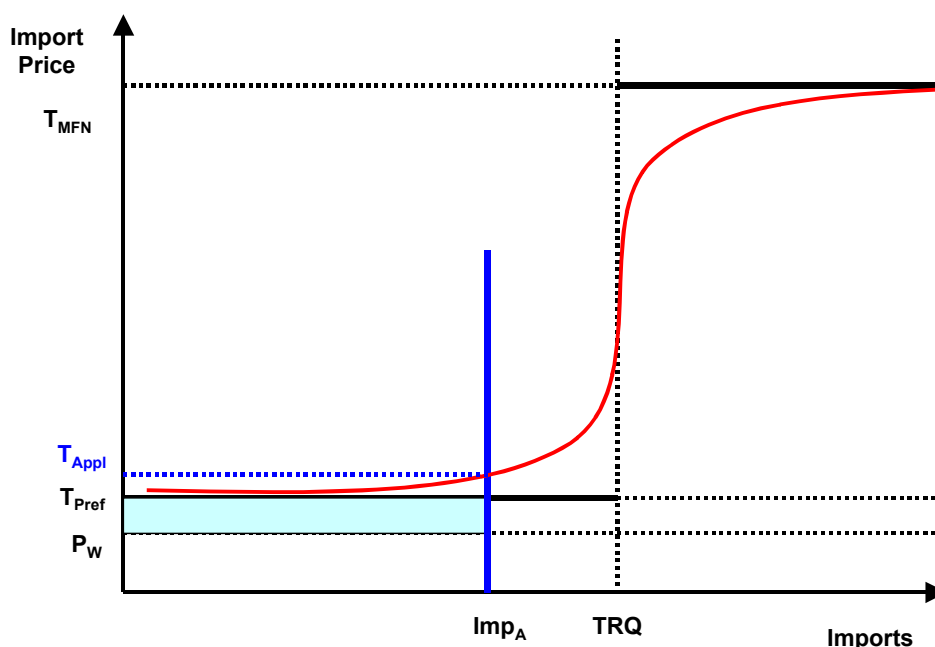
¹ New definition introduced by the OCDE in 1998.

calculated as the difference between observed domestic market prices and a reference border price – assuming that difference between the two are an effect of policy interventions.

1.4.2 Implementation in the model

- ◆ *TRQs*. A sigmoid (fudging) function is used in order to allow the model to replicate in a smooth manner the TRQ mechanism.² For imports under the quota the function stays at the preferential rate and once after reaching the quota it jumps steeply to the MFN rate, as represented in the following figure:

Figure (3) TRQ modelling solution



where:

- P_W : average domestic price for the corresponding country aggregate
- T_{MFN} : domestic price plus most favourite nation specific tariff (for the ad-valorem $T_{MFN} * P_W$)
- T_{PREF} : domestic price plus preferential specific tariff (for the ad-valorem $T_{PREF} * P_W$)
- T_{APPL} : domestic price plus applied tariff (reflects the margin of error incurred when using this functional form)
- TRQ: level of quota

When imports are above the quota the TRQ is not binding. In the model we consider binding all observed import flows not deviating much from the quota (+-1%). The blue area shows the public revenue collected from a combination of the preferential tariff and

² A more elegant solution applies a mix-complementary (MCP) solver to the problem. The market model is written so that it can be quite easily converted into a MCP problem. However, as most partners would need to acquire solver licences for MCP models, we currently stick to the fudging solution.

imports for a single product, i.e. the difference between average domestic price with and without the tariff. These two variables are observed in the base year situation (T_{pref} and ImpA) and endogenously calculated in the simulation year. The difference between the applied tariff (T_{Appl}) and the preferential tariff for the represented situation (ImpA) is the error incurred by using this function.

Import prices will be generated including endogenously the information contained in the tariffs and export subsidies (see following equation). TariffS and TariffA are only endogenously determined in the simulation if a TRQ mechanism is used for a commodity, otherwise they are fixed values determined within the policy process (see trade policy data included in the model, chapter 4).

- ◆ *Specific/Ad-valorem tariffs* (if not included in a TRQ). Basic mechanism already explained in the TRQ case. Import prices will be generated including endogenously the information contained in the tariffs and export subsidies. In the following equation it is shown how these tariffs are implemented in the model:

$$\text{ImpP}(\text{RM}, \text{RM1}, \text{XX}) = \text{PMrk}(\text{RM1}, \text{XX}) * (1 + 0.01 * \text{TariffA}(\text{RM}, \text{RM1}, \text{XX})) \\ + \text{TariffS}(\text{RM}, \text{RM1}, \text{XX}) - \text{ExpSub}(\text{RM1}, \text{XX})$$

where

- ImpP: Import Price
- PMrk: average domestic price (OECD calculations)
- RM: country aggregate
- XX: traded product
- TariffA: ad-valorem tariff (from importer country: RM for XX coming from RM1)
- TariffS: specific tariff (from importer country: RM for product XX coming from RM1)
- ExpSub: export subsidy (from exporter country aggregate: RM1)

- ◆ *Export subsidies and subsidised exports.* *Export Subsidies* are modelled like negative tariffs (see above). *Subsidised exports* are implemented similarly and linked to the intervention purchases: both interventions and subsidisation of exports will take place when domestic price falls under the administrative price. In the base year they are trimmed to observed quantities (notifications to the WTO) and in the simulation they will be endogenously calculated with bounds on maximum allowances.
- ◆ *Intervention purchases* are model again with a logistic fudging function. The functional parameters are trimmed to observed intervention purchases and the observed differences between market and administrative prices in the base period. Here, compared to MCP trigger, the fudging function has the advantage of capturing

at least partially the effect of stochastic price movement, as intervention purchases are typically observed even with average market prices slightly above the administrative price floor. Wherever possible, the upper limit of the intervention purchases has been taken from legal documents. Otherwise, a percentage of the base period production quantity is used.

- ◆ *Producer Support and Consumer Support Equivalents (PSE and CSE)*. These instruments are included in the producer/consumer price equations. They are relevant for the market module since *producer prices* affect directly domestic production (normalised quadratic function) and *consumer prices* play a significant role in the demand function (General Leontief function):

$$\begin{aligned} \text{Cpri}(\text{RM}, \text{XX}) &= \text{Arm1P}(\text{RM}, \text{XX}) + \text{DATA}(\text{RM}, \text{"CMrg"}, \text{XX}, \text{"BAS"}) \\ &\quad - \text{DATA}(\text{RM}, \text{"CSEd"}, \text{XX}, \text{"CUR"}) - \text{DATA}(\text{RM}, \text{"CSEi"}, \text{XX}, \text{"CUR"}) \end{aligned}$$

where Cpri: Consumer Price
 Arm1P: domestic price for each country aggregate (coming from the Armington assumption)
 CMrg: consumer price margin in the base year (it remains constant in the simulation)
 CSEd / CSEi: direct and indirect consumer support estimate
 CUR: current run (base year, reference run or simulation run)

$$\begin{aligned} \text{PPri}(\text{RM}, \text{XX}) &= (\text{PMrk}(\text{RM}, \text{XX}) + \text{DATA}(\text{RM}, \text{"PSEi"}, \text{XX}, \text{"CUR"}) + \\ &\quad \text{DATA}(\text{RM}, \text{"PSEd"}, \text{XX}, \text{"CUR"})) * \text{DATA}(\text{RM}, \text{"PMrg"}, \text{XX}, \text{"BAS"}) + \\ &\quad (\text{DATA}(\text{RM}, \text{"AREP"}, \text{XX}, \text{"CUR"}) / \text{DATA}(\text{RM}, \text{"Yield"}, \text{XX}, \text{"CUR"})) \end{aligned}$$

where Ppri: Producer Price
 PSEd / PSEi: direct and indirect producer support estimate
 PMrg: producer price margin in the base year (it remains constant in the simulation)
 CSEd / CSEi: direct and indirect consumer support estimate
 AREP: area payments per tonne / head

1.4.3 Trimming of sigmoid functions for TRQs, intervention purchases and subsidised exports

The sigmoid function³ used for TRQs, interventions purchases and the quantities of subsidised exports is based on the following expression:

$$\text{Equation (1)} \quad \text{Sigmoid}(x) = \exp(\min(x, 0)) / (1 + \exp(-\text{abs}(x)))$$

The expression shows a symmetric S-shaped form and is overall differentiable. Its limits are zero at minus infinity for x and unity at plus infinity for x respectively. The function evaluates to $\frac{1}{2}$ at x equal zero. For examples, see figures below.

For the TRQs, the implementation in the model looks as follows:

$$\text{Equation (2)} \quad \text{Tariff}_i = \text{Tpref}_i + (\text{Tmfn}_i - \text{Tpref}_i) \left[\text{sigmoid} \left(\frac{\alpha}{\text{TRQ}_i} (\text{imports}_i - \text{TRQ}_i * 1.01) \right) \right]$$

³ The "fudging" of an if-else condition by the help of sigmoid functions is taken from a short note by Arne Drud, the brain behind the CONOPT solvers used in CAPRI to solve the non-linear problems including the market model.

The following differences compared to equation (1) should be noted:

- (a) The in quota tariff (T_{pref}) is added as a constant term (even at zero imports, the in quota tariff is applied) and thus working as a lower bound for the function.
- (b) The sigmoid expression is pre-multiplied with the difference of the out-of-quota and in-quota-tariff, i.e. if the term in outer round brackets becomes infinity, the second term is equal to the difference between the out- and in-quota tariff, yielding together with the mentioned constant term the out-of-quota or MFN tariff. On the other hand, if the imports are at zero, the sigmoid expression gets a value close to zero, and (almost) solely the in-quota tariff is applied.
- (c) The sigmoid function is applied to the relation of $(Imports - TRQ * 1.01)$ divided by the TRQ and multiplied with a positive parameter α . The bigger α , the faster the sigmoid expression reaches its limits. Very large α render the function similar to a step function, and will hence yield numerically to an (almost) non-differential expression. In the model α is currently set to 100 for TRQs, a value which in practise still allows the solver to find a feasible solution for the market model.
- (d) The “1.01” factor in the equation ensures that a large fraction of the out-of-quota tariff is applied if imports are at the TRQ. Otherwise, exactly 50% of the difference between the two tariff lines would be added to the in-quota tariff if the imports fills the TRQ.

On the market side, market *intervention purchases* (INTP) and *subsidised exports* (EXPS) are also modelled by a sigmoid function, driven by the relation between EU market ($Pmrk$) and the administrative prices (PADM) – the latter multiplied with a parameter β . As for TRQs, the term is again multiplied with a parameter α which defines the steepness of the function, and is normalised by division of β times the administrative price.

$$\text{Equation (3)} \quad \text{exp}_{i,r} = \text{QuTE}_{i,r} \left[1 - \text{sigmoid} \left(\frac{\alpha}{\beta_{i,r}^E \text{PADM}_{ir}} (pmrk_{i,r} - \beta_{i,r}^E \text{PADM}_i) \right) \right]$$

$$\text{Equation (4)} \quad \text{intp}_{i,r} = \text{IntM}_{i,r} \left[1 - \text{sigmoid} \left(\frac{\alpha}{\beta_{i,r}^I \text{PADM}_{ir}} (pmrk_{i,r} - \beta_{i,r}^I \text{PADM}_i) \right) \right]$$

Quantities are now a function of prices instead of prices being depending on quantities, like in the TRQ case (tariffs). Furthermore differences compared to the TRQ formulation are based in the application of the political instruments:

-
- (a) For subsidised exports, the only clear fact is that quantities cannot exceed WTO commitment levels, which are hence used to multiply the sigmoid expression with (QutE). At a very low internal market price compared to the administrative one, the EU will hence export with subsidies at the WTO limit. For intervention purchases, no clearly defined quantity limits exists, and the maximum quantity of intervention purchases (INTM) is defined at 50% of the base year production.
- (b) There is not a clearly defined “trigger” level regarding the prices at which the commission starts to pay export subsidies. The legal text leaves some leverage as to when and to which extent exports are subsidised. The only clear statement can be found in the milk market legislation, where it is referred to a level of 25% above the administrative price at which subsidisation should not occur. Accordingly, we use observed subsidised quantities and observed prices (1998 three-year average) and the 25 % rule (at 5% of the WTO limit) to define α and β for subsidised exports. The graphic below shows how the two points together define both the steepness (α) and β of the sigmoid expression.
- (c) For intervention purchases, it is clear that the commission has an obligation to buy in (almost unlimited) quantities at the trigger price, and the “demand function“ of the commission should hence resemble to an edge. Accordingly, the steepness should be chosen as high as possible. Technical tests revealed that the solver works stable with α set to 30 in the case of intervention purchases. Remains the parameter β , which is again defined by driving the function through observed quantities and price differences.

Trimming the function to observed points has certain advantages. First of all, a “naive” implementation over an if-else-condition neglects the fact that the model simulates a comparative static (average) solution. Even if average market prices over a certain period are above administrative ones, stochastic price depression could lead to intervention purchases. Trimming the function to a three-year-average captures part of that effect, as intervention purchases are observed ex-post even if average market prices are above administrative ones. Secondly, in the case of subsidised exports, there is no “hard” trigger level which automatically leads to subsidisation. Here, the trimming tries to capture the behaviour of the board deciding upon the subsidies.

Figure (4) Trimming of the log function for subsidised exports in the base year

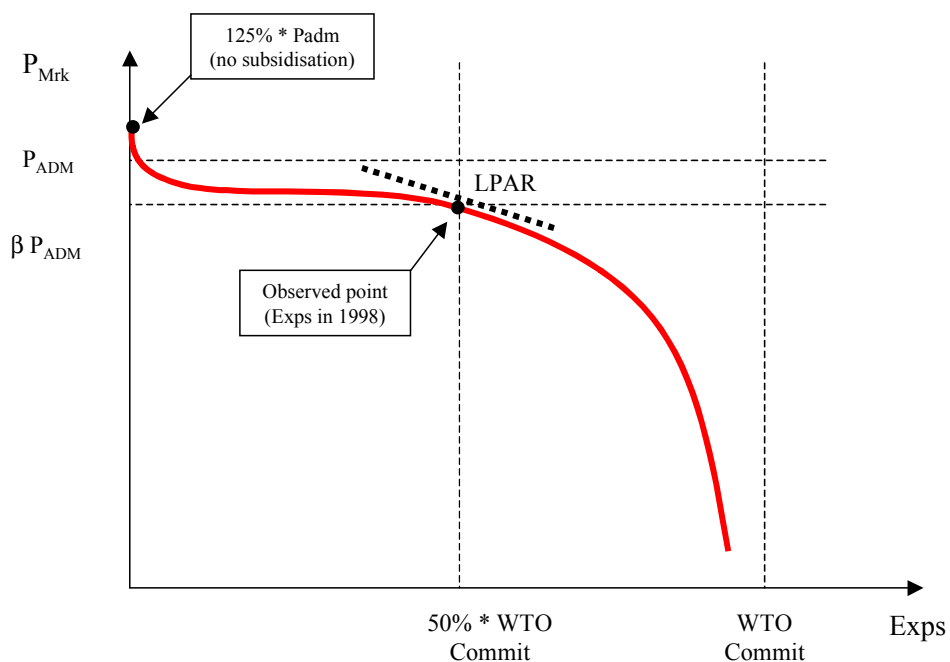
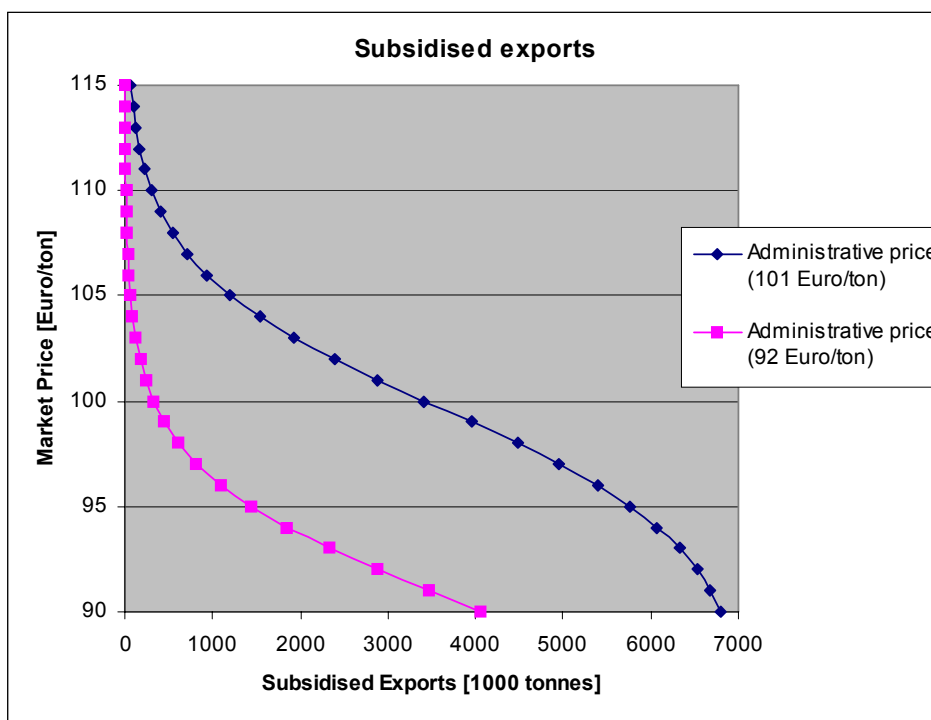


Figure (5) Simulation example: subsidised exports of barley, depending on market prices for two different administrative price levels



Ein Paar Sätze über die Simulation

2 Agenda 2000

In the following, all elements of the policy reform Agenda 2000 will be presented, in order to give insight on how definition and implementation work in detail. The structure of the presentation of the different policy instruments is as follows: After a brief description of the instrument and how it is considered in the model, the technical realisation in the GAMS code and where it can be found will be shown.

2.1 Crop production

2.1.1 Market organisation

Administrative price for cereals

- ◆ The administrative price (PADM) for cereals (CERE) in the EU will be cut to 101,31 €/t:
- ◆ `DATA("EU000000","PADM","CERE","Y") = 101.3100000`
- ◆ in: [U:\CAPRI\gams\policy\polagnd09_padm.gms]

Monthly reports

- ◆ According to EU legislation, there will be monthly reports of 0,93 €/t (in 7 steps). Not considered!

Intervention for Cereals

- ◆ In the model there will be intervention purchases when the market price falls under the administrative price.

2.1.2 Direct payments

- ◆ Regulation No. 1251/1999, article 4
- ◆ The special regulation for oilseeds is no longer in force.

- ◆ The direct payments (DP) are calculated by multiplication of the regional historic yield (HSTY) in ton per hectare with the basic premium (€ per ton) for the respective crop:

$$\text{Direct payment per hectare} = \varnothing \text{ regional yield} * \text{basic premium per ton}$$

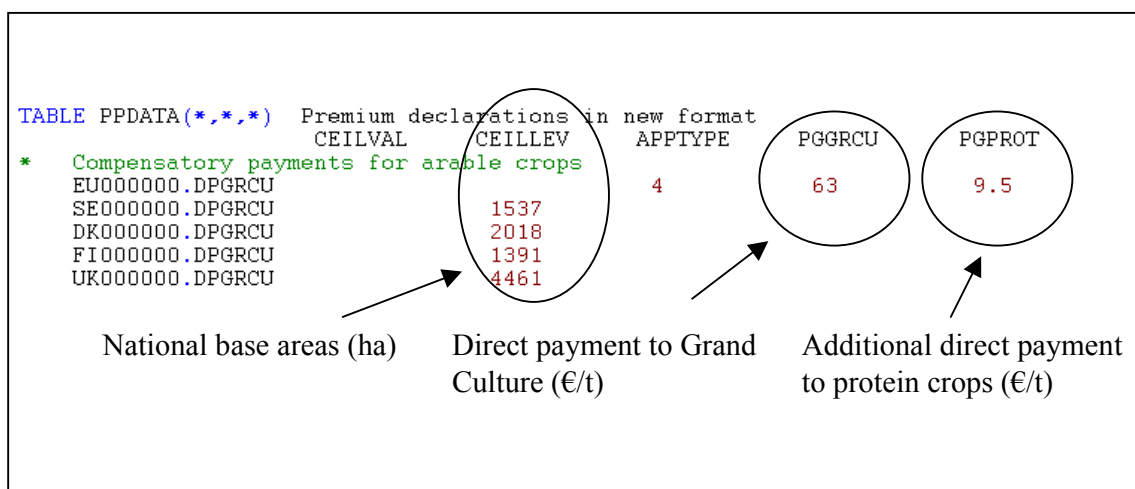
Figure (6) EU basic premium for Agenda 2000 (fully implemented):

Grande Culture (DPGRCU)	63,00 €/t
Set aside (SETA)	63,00 €/t
Protein crops (PROT)	63,00 €/t + 9,50 €/t =72,50 €/t
Durum wheat (DPDWHE)	
traditional areas (DPDWHETR)	344,50 €/ha
established areas (DPDWHEES)	138,9 €/ha
in: U:\CAPRI\gams\policy\polagnd09.gms	

Ceilings for direct payments:

- ◆ The amount of areas eligible for payments (CEILLEV) is restricted by the national base areas. If the base areas are exceeded, the areas eligible for payments will be cut down proportionally (CEILCUT).

Figure (7) Detail of [U:\CAPRI\gams\policy\polagnd09.gms]:



2.1.3 Set aside

- ◆ Regulation No. 1251/1999, article 6
- ◆ Producers who apply for direct payments to an area which is bigger than the one they need to produce 92 tons of cereals (calculated on base of the regional historic yield), are subject to the obligatory set aside (SETA) of 10% of the area.
- ◆ Voluntarily up to 33% of the area can be set aside (MXST).
- ◆ [U:\CAPRI\gams\supply\supply_model.gms]

2.1.4 Small producers

- ◆ Regulation No. 1251/1999, article 6
- ◆ Producers who apply for direct payment to an area which is smaller than the one needed to produce 92t of cereals are excepted from the obligatory set aside.
- ◆ Implemented in CAPRI: Adjustment of set-aside shares according to own informations about regional small producer shares in McSharry Reform. Adjusted and trend shifted for Agenda 2000 implementation period.

2.2 Animal production

2.2.1 Market organisation

Administrative prices for beef meat

- ◆ The administrative price for beef meat will be cut to 2224 €/t:
- ◆ $\text{DATA}(\text{"EU000000"}, \text{"PADM"}, \text{"BEEF"}, \text{"Y"}) = 2224.0000000$
- ◆ [U:\CAPRI\gams\policy\polagnd09_padm.gms]

Intervention Beef meat

- ◆ Legislation has been adapted to modelling system: There will be intervention purchases when the market price falls under the administrative price. No upper limits for intervention purchases.

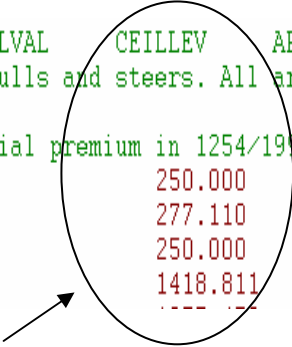
2.2.2 Premiums

Special premium to bulls and steers (DPBULF)

- ◆ Regulation No. 1254/1999 article 4 and appendix 1
- ◆ In the CAPRI model both bulls and steers are assumed to be bulls. The premium for bulls (DPBULF) will be 210 €/head when Agenda 2000 is fully implemented. The amount of premiums which can be payed is restricted for each member state (CEILLEV).
- ◆ [U:\CAPRI\gams\policy\polagnd09.gms]

Figure (8) Detail of the policy file: National ceiling levels for special bull premium

	CEILVAL	CEILLEV	APPTYPE	PGGRCU
* Special premium for bulls and steers. All are assumed to be bulls				
EU000000.DPBULF			1	
* Maximum level of special premium in 1254/1999 appendix I				
SE000000.DPBULF		250.000		
DK000000.DPBULF		277.110		
FI000000.DPBULF		250.000		
UK000000.DPBULF		1418.811		
-----		-----		



 National maximum number of
 premiums for bulls

Suckler Cow Premium (DPSCOW)

- ◆ Regulation No. 1254/1999 article 7 and appendix II
- ◆ The suckler cow premium according to the Agenda 2000 is 200 € per head and year. The number of premiums that can be paid in each member state is restricted (CEILLEV). The premium can be supplemented with a national additional premium of 50 € per head and year.
- ◆ [U:\CAPRI\gams\policy\polagnd09.gms]

Slaughtering premiums for adult cattle (DPSL_ADCT) and calves (DPSL_CALV)

- ◆ Regulation No. 1254/1999 article 11

- ◆ Is paid when the animal (bull, steer, cow, calve or heifer) is slaughtered or exported. The national upper limit (CEILVAL) is the number of exported and slaughtered animals in 1995.
- ◆ Premium when Agenda 2000 is fully implemented:
 - (DPSL_ADCT): 80 €/head
 - (DPSL_CALV): 50 €/head
- ◆ [U:\CAPRI\gams\policy\polagnd09.gms]

Direct payment to dairy cows (*DPDCOW*)

- ◆ Regulation 1255/1999 article 16 and 18
- ◆ The premium for dairy cows contains two parts:
 1. Premium per tonne of reference quantity

Maximum amount of national direct income support (CEILVAL) is limited by national historic quota level. Converted to mio euro by multiplication with the premium paid in 2007 and subsequent years 17.24 €/t.
 2. National additional payment

The additional payment can be either linked to pasture or reference quantity. In the CAPRI model it is assumed to be linked to reference quantity in all member states.
- ◆ The total premium should not exceed the national envelopes (CEILVAL) defined in 1254/1999. Additionally, it should not exceed 41,7 €/t (nicht abgebildet).
- ◆ [U:\CAPRI\gams\policy\polagnd09.gms]

2.3 Dairy products

2.3.1 Market organisation

Administrative Prices (*PADM*) for butter (*BUTT*) and skim milk powder (*SMIP*)

- ◆ Regulation No. 1255/1999, article 4
- ◆ The administrative price for butter and skim milk powder will be cut by 15%.

- ◆ DATA("EU000000","PADM","BUTT","Y") = 2789.7;
- ◆ DATA("EU000000","PADM","SMIP","Y") = 1746.9;
- ◆ In: [U:\CAPRI\gams\policy\polagnd09_padm.gms]

2.3.2 Intervention

- ◆ Regulation No 1255/1999 article 4 and 6
- ◆ In the model there will be intervention purchases when the market price falls under the administrative price.

2.3.3 Milk quotas

- ◆ Milk quotas will be increased
- ◆ 1,5 % for all member states
- ◆ specific special increases for Greece, Spain, Ireland, Italy and UK
- ◆ The total increase of quota will be 2,4 /

3 The CAP Reform Proposal 2003 (Mid Term Review)

According to section 2 on the policy implementation of the Agenda 2000, this section presents an overview on policy changes within the CAP Reform Proposal from January 2003 of the European Commission (formerly named Mid Term Review) and their realisation in the gams code.

3.1 *The Introduction of de-coupled payments.*

3.1.1 Cut in premiums

Cereals, Oilseeds and Set-aside

- ◆ Increase to 66 €/t
- ◆ To be included in decoupled, uniform premium
- ◆ In [U/capri/gams/policy/polmtrj_09.gms]

Durum Wheat (DPDWHE)

- ◆ COM 2003 (23) final, article 60
- ◆ In traditional areas: Cut down to 250 €/ha. This payment will be included in decoupled, uniform premium.
- ◆ In established areas: no more payments
- ◆ Supplement for using selected seed (only in traditional areas): 40 €/ha⁴
This payment is not included in the decoupled, uniform premium.
- ◆ [U/capri/gams/policy/polmtrj_09.gms]

⁴ In the model the supplement has been reduced to 20 €/ha, according to commission information

Protein crops (DPPULS)

- ◆ COM 2003 (23) final
- ◆ Increase to 66 €/t. This payment will be included in decoupled, uniform premium.
- ◆ Protein Crop supplement of 55,75 €/ha (9,5 €/t * Ø yield of protein crop growing areas).

This payment is not included in the decoupled, uniform premium.

- ◆ [U/capri/gams/policy/polmtrj_09.gms]

Ceilings for direct payments:

- ◆ COM 2003 (23) final
- ◆ There is an additional restriction of 1.4 million hectare for the payment of the supplement to protein crops
- ◆ [U/capri/gams/policy/polmtrj_09.gms]

3.1.2 Dynamic Modulation

- ◆ COM(2003) 23 final
- ◆ Farms are classified in three modulation groups according to the amount of premiums received: low: 1 to 5000 Euro; middle: 5001 to 50000 Euro; high: above 50000 Euro
- ◆ Table DP_AFF contains information on the share of farms within the different payment groups (information from the Commission). Necessary information as the shares differ strongly between Member States:

Figure (9) Model code from polmtrj_09.gms containing information on shares of farms within certain limits of direct payments

TABLE DP_AFF (PSGG,ModClass,*)

		BL000000	
COP	.low	30.1	← Example: 30.1 % of the total
MILK	.low	29.7	payments to grande culture in
BEEF	.low	20.4	Belgium are in the low
OTHE	.low	36.6	modulation class
TOTAL	.low	25.9	
		BL000000	
COP	.mid	67.7	
MILK	.mid	69.2	
BEEF	.mid	74.0	
OTHE	.mid	63.4	
TOTAL	.mid	70.7	
		BL000000	
COP	.hih	2.1	
MILK	.hih	1.2	
BEEF	.hih	5.6	
OTHE	.hih	0.0	
TOTAL	.hih	3.4	

Activity Modulation class Percentage of payments to activity in modulation class

- ◆ In the simulation year 2009, subject to modulation are 0 % of the payments of farms with payments between 1-5000 € (low); subject to modulation are 9% and 14% of the payments for farms receiving between 5001-50000€ and above 50000€ respectively (code: see following table)

Figure (10) Model code containing information on percentage of modulation (again: farm groups are stored on “low”, “mid” and “hih” for convenience).

```

PARAMETER Prem_Mod (ModClass);

Prem_Mod ("Low") = 0;
Prem_Mod ("Mid") = 0.09;
Prem_Mod ("Hih") = 0.14;

```

- ◆ Finally, this allows to calculate the sum of premiums in each region (Member State), that are subject to modulation and therefore must be subtracted from the total premium sum in each region (which is stored on the parameter PP_PremSum(*)).
- ◆ [U/capri/gams/policy/polmtrj_09.gms]

3.1.3 Calculation of de-coupled uniform regional premiums

- ◆ The total amount of direct payments (after modulation) is transformed in an uniform payment based on activity level. All animal premiums are included and redistributed over arable land and permanent grassland activities. The definition of this new premium works as follows:

Figure (11) Model code for definition of new decoupled premium.

```
PSDPAY("DPMTR") = yes;
PPDATA("EU000000","DPMTR","APPTYPE") = 1;
PPDATA("EU000000","DPMTR","PGMTR") = 2000;
PPDATA(RU,"DPMTR","CEILVAL") = sum(DEC_PAY, PP_PREMSUM(RU,DEC_PAY));
```

Explanation: **Name:** DPMTR, **Definition of application type:** 1 (=on activity level), Starting value of premium: 2000€/ha (=arbitrarily set, but must be high enough so that it will be cut according to the regional ceiling value), **Definition of regional ceiling value** (=sum over all premiums subject to decoupling)

- ◆ Afterwards, the “normal” premium calculator is used.
- ◆ [U:\capri\gams\policy\polmtrj_09.gms]

3.2 Changes in administrative prices against Agenda 2000

3.2.1 Crop sector

Administrative prices for cereals

- ◆ The intervention for rye will be abolished:

```
DATA("EU000000","INTM","RYEM","Y") = 0.;
```

- ◆ The administrative price (*PADM*) for cereals (*CERE*) in the EU will be cut another 5 % to 95,35 €/t:

```
DATA("EU000000","PADM",CERE,"Y") = 95.35 - 0.025 *
DATA("EU000000","PADM",CERE,"BAS");
```

- ◆ in: [U:\CAPRI\gams\policy\polmtrj_09_padm.gms]

Monthly reports

- ◆ The monthly reports will be abolished.
- ◆ Implementation in CAPRI (according to EU Commissions information): additional 2.5% cut in intervention price.
 - ◆ $\text{DATA}(\text{"EU000000"}, \text{"PADM"}, \text{"CERE"}, \text{"Y"}) = 95.35 - 0.025 * \text{DATA}(\text{"EU000000"}, \text{"PADM"}, \text{"CERE"}, \text{"BAS"});$
 - ◆ in: [U:\CAPRI\gams\policy\polmtrj_09_padm.gms]

3.2.2 Animal production**Administrative prices for beef meat**

- ◆ No change

Administrative prices for dairy products

- ◆ COM(2003) 23 final
- ◆ The administrative price (PADM) for skim milk powder (SMIP) will be cut by 17,5 % (5 years x 3.5 %):

$$\text{DATA}(\text{"EU000000"}, \text{"PADM"}, \text{"SMIP"}, \text{"Y"}) = \text{DATA}(\text{"EU000000"}, \text{"PADM"}, \text{"SMIP"}, \text{"BAS"}) * (1.-0.175);$$
- ◆ The administrative price for butter (BUTT) will be cut by 35% (5 years x 7.0 %):

$$\text{DATA}(\text{"EU000000"}, \text{"PADM"}, \text{"BUTT"}, \text{"Y"}) = \text{DATA}(\text{"EU000000"}, \text{"PADM"}, \text{"BUTT"}, \text{"BAS"}) * (1.-0.35);$$
 - ◆ in: [U:\CAPRI\gams\policy\polmtrj_09_padm.gms]

3.3 Additional changes**3.3.1 Set aside**

- ◆ No change

3.3.2 Small producers

- ◆ No change

3.3.3 Milk quotas

- ◆ Increase of 1 % per year in 2007 and 2008, based on quantities after full implementation of Agenda 2000 :

$$PP_QUOTASw(MS, "MILK") = PP_QUOTASw(MS, "MILK") * 1.02;$$

- ◆ in:[U:\CAPRI\gams\policy\polmtrj_09_padm.gms]

4 Trade policy

In this section an overview of the main trade policy instruments used for base year, reference run and to simulate the new proposals in world trade liberalisation are presented.

4.1 Tariffs and Tariff Rate Quotas (TRQ)

4.1.1 Tariffs and TRQs in the model

In following table tariff rate quotas, preferential tariffs and MFN tariffs for the different country aggregates are shown.

Figure (12) Table: global TRQs and Tariffs per country aggregate.

	Tariff rate quota	Preferential Tariffs		MFN Tariffs		Source
		Specific	Ad valorem	Specific	Ad valorem	
ACP	X	-	X	-	X	UCL, Belgium
ANZ	X	X	-	X	-	AGLINK Model, OECD / IAP, Germany
CAD	X	-	X	-	X	UCL, Belgium
CAN	X	-	X	X	X	AGLINK Model / IAP, Germany
CEE	X	-	X	-	X	UCL, Belgium
CHN	X	-	X	-	X	IAP, Germany / UCL, Belgium
CHN	X	X	-	X	-	AGLINK Model, OECD
EU	X	X	X	X	X	AGLINK Model, OECD / IAP, Germany
HIT	X	-	X	X	X	AGLINK Model, OECD / IAP, Germany
IND	X	-	X	-	X	IAP, Germany
MED	X	-	X	-	X	UCL, Belgium
ROW	X	-	X	-	X	UCL, Belgium
USA	X	X	X	X	X	AGLINK Model, OECD / IAP, Germany
UCL: Catholic University of Louvain, data in: U:\CAPRI\gams\arm\TRQ_UCL.gms						
AGLINK: model run by the OECD, data in: U:\CAPRI\gams\arm\trq_aglink.gms						
IAP: Institute for Agricultural Policy, data in:U:\CAPRI\gams\arm\trq_iap.gms						

4.1.2 Products with TRQs

Figure (13) Information on products and country aggregates with global TRQs

ACP	ANZ	CAD	CAN	CEE	CHN	EU	HIT	IND	MED	ROW ¹	USA
BARL	CHES	BARL*	BEFM	BARL	CGRA*	BARL	BARL	MAIZ	BARL	BARL	BEFM
BEFM		BEFM	BTCR	BEFM	MAIZ*	BEFM	BTCR	MILS	BEFM	BEFM	BTCR
BTCR		BTCR	CHES	BTCR	ORAP	BTCR	MILS	ORAP	BTCR*	CHES	CHES
CHES*		CHES		CHES	OSOY*	CHES	RICE	OSUN	CHES	CSOY	MILS
CSOY		CSOY		EGGS	RICE*	EGGS	WHEA		CSUN*	MAIZ	SUGA
CSUN		EGGS		MAIZ	SUGA	MAIZ			MAIZ	MEAO	
EGGS		MAIZ		MEAO*	WHEA	MEAO			MEAO	MILS	
MAIZ		MEAO		MILS		MILS			MILS	OCES	
MEAO		MILS		OCES		OCES			OCES	ORAP	
ORAP		OCES*		ORAP		PMEA			ORAP*	OSOY	
OSOY		ORAP*		OSOY		POUL			OSOY*	OSUN	
OSUN		OSOY		OSUN		RICE			OSUN*	PMEA	
POUL*		OSUN		PMEA		WHEA			POUL*	POUL	
RAPE		PMEA*		POUL					RAPE*	RAPE	
SOYA		POUL*		PULS					RICE*	RICE	
SUGA		PULS		RAPE					SOYA*	SOYA	
WHEA		RAPE*		RICE					SUGA	SUGA	
		RICE*		SUGA					WHEA	SUNF	
		SOYA*		SUNF						WHEA	
		SUGA		WHEA						WMLK	
		WHEA*		WMLK*							

Source

UCL	Aglink / IAP	UCL	Aglink / IAP	UCL	Aglink / IAP		Aglink / IAP	IAP	UCL	UCL	Aglink / IAP
-----	--------------	-----	--------------	-----	--------------	--	--------------	-----	-----	-----	--------------

UCL: in U:/CAPRI/gams/arm/TRQ_UCL.gms

IAP: in U:/CAPRI/gams/arm/trq_iap.gms

Aglink: in U:/CAPRI/gams/arm/trq_aglink.gms

¹ Data for ROW available but not used in the simulation

* Data for TRQs received but not consistent with the definition (preferential rates greater or equal than MFN)

4.2 Bilateral trade instruments

4.2.1 Bilateral TRQs of EU

Figure (14) Information on products and country aggregates with bilateral TRQs

Imports from:	Products:
ACP	RICE, SUGA
ANZ	BTCR, MEAO, WHEA
CAN	WHEA
IND	RICE, SUGA
ROW	SUGA
USA	WHEA
in: U:\CAPRI\gams\arm\trq_iap.gms	

4.2.2 Bilateral agreements

Figure (15) Data on bilateral agreements

Agreement	Country aggregate (origin):	Country aggregate (beneficiary)	Trade exception	Products:
Double-Zero Agreement ¹	EU	CEE	Zero tariffs, no quota	All
	CEE	EU	Zero tariffs, no quota	All
North American Free Trade Agreement ²	US	CAN	Zero tariffs, no quota	All
	CAN	USA	Zero tariffs, no quota	All
Lomé Agreement ³	EU	ACP	Preferential specific tariff (MFN tariff - 92%)	Beef
^{1,2} in:U:\CAPRI\gams\arm\trq.gms and ..\data_cal.gms				
³ in:U:\CAPRI\gams\arm\trq.gms and ..\trq_iap.gms				

4.3 Export subsidies, subsidised exports and intervention purchases for European Union

Figure (16) Data on export subsidies, subsidised exports and intervention stocks

Subsidised exports ¹		Export Subsidies ²	Intervention Purchases ²
Notified (base year 3-year average 98)	Commitments (simulation: 2002 WTO estimations)		
WHEA	WHEA	SWHE	SWHE
COAR	COAR	BARL	BARL
RICE	RICE	DWHE	DWHE
RAPE	RAPE	OCER	OCER
OLIO	OLIO	CERE	BUTT
SUGA	SUGA	SUGA	SMIP
BUTT	BUTT	BUTT	CHES
SMIP	SMIP	SMIP	RICE
CHES	CHES	CHES	BEEF
BEEF	BEEF	OLIO	
PORK	PORK	WINE	
POUM	POUM	RICE	
POUM	POUM	PORK	
		EGGS	
		POUM	
		BEEF	
¹ in:U:\CAPRI\gams\arm\policy.dat			
² in:U:\CAPRI\gams\arm\feoga.gms			

4.4 PSEs and CSEs

Figure (17) Data on CSEs

ACP	ANZ	CAD	CAN	CEE	CHN	EU	HIT	IND	MED	ROW	USA
	WHEA		WHEA	WHEA		WHEA	WHEA		MAIZ*	WHEA	WHEA
	OCES		BARL	BARL		BARL	BARL		RAPE *	BARL	BARL
	RICE		RAPE	OCES		MAIZ	MAIZ		SUNF*	MAIZ	MAIZ
	SUGA		BEFM	SUGA		OCES	OCES		SOYA*	OCES	OCES
	BEFM		POUL	RAPE		RICE	RICE		EGGS *	RICE	RICE
	PMEA		EGGS	BEFM		SUGA	SUGA		SUGA*	SUGA	SUGA
	MEAO		WMLK	PMEA		SOYA	BEFM		BEFM*	RAPE	SOYA
	EGGS			MEAO		SUNF	PMEA		WHEA *	BEFM	BEFM
	WMLK			POUL		RAPE	MEAO		OCES*	PMEA	PMEA
				EGGS		BEFM	POUL		POUL*	MEAO	MEAO
				WMLK		PMEA	EGGS		WMLK*	POUL	POUL
				MAIZ*		MEAO	WMLK			EGGS	EGGS
				SUNF*		POUL				WMLK	WMLK
				SOYA*		EGGS				SUNF*	
						WMLK				SOYA*	

Source: OECD countries → WATSIM Modelling system, Non-OECD countries → UCL

For OECD countries: in U:\CAPRI\gams\arm\conb.gms (in Euro per tonne)

For Non-OECD countries: in U:\CAPRI\gams\arm\C_PSE_NO.gms (in percentage)

* Data not included in the model

Figure (18) Data on PSEs

ACP	ANZ	CAD	CAN	CEE	CHN	EU	HIT	IND	MED	ROW	USA
	WHEA		WHEA	WHEA	RAPE *	WHEA	WHEA		BARL*	WHEA	WHEA
	BARL		BARL	BARL	SUNF *	BARL	BARL		MAIZ *	BARL	BARL
	MAIZ		MAIZ	MAIZ	SOYA *	MAIZ	MAIZ		RAPE *	MAIZ	MAIZ
	OCES		SUGA	OCES	EGGS *	OCES	OCES		SUNF *	OCES	OCES
	RICE		SOYA	SUGA	RICE *	RICE	RICE		SOYA *	SUGA	RICE
	SUGA		RAPE	SUNF	SUGA *	SUGA	SUGA		EGGS *	RAPE	SUGA
	SOYA		BEFM	RAPE	BEFM *	SOYA	SOYA		SUGA *	BEFM	SOYA
	SUNF		PMEA	BEFM	WHEA *	SUNF	BEFM		BEFM *	PMEA	BEFM
	RAPE		POUL	PMEA	PMEA *	RAPE	PMEA		WHEA*	MEAO	PMEA
	BEFM		EGGS	MEAO	MEAO *	BEFM	MEAO		OCES*	POUL	MEAO
	PMEA		WMLK	POUL	POUL *	PMEA	POUL		POUL *	EGGS	POUL
	MEAO			EGGS		MEAO	EGGS		WMLK*	WMLK	EGGS
	POUL			WMLK		POUL	WMLK			RAPE*	WMLK
	EGGS			RICE *		EGGS				SUNF *	
	WMLK			SUNF *		WMLK				SOYA*	
				SOYA *							

Source: OECD countries → WATSIM Modelling system, Non-OECD countries → UCL

For OECD countries: in U:\CAPRI\gams\arm\conb.gms (in Euro per tonne)

For Non-OECD countries: in U:\CAPRI\gams\arm\C_PSE_NO.gms (in percentage)

* Data not included in the model