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Abstract

In this paper the impact of the Common Agricultural Policy (CAP) on Food and Nutrition Security (FNS) indicators in Sub-Saharan (SSA) is explored, in which both the CAP in the past, the present and the future is taken into account. FNS is approached by indicators on agricultural production, food consumption, world market prices, agricultural exports, agricultural imports and calorie intake per capita. The analysis of the impact of the past and current CAP on FNS is based on literature review; for exploring impacts of the future CAP 2020-2030 on FNS three policy scenarios are developed – a baseline scenario, a CAP Eliminating scenario and a CAP Greening scenario - which are simulated with the MAGNET model.

Our findings show that the impact of the CAP on FNS in Sub Sahara Africa (SSA) is mainly channelled via the impact of the CAP on the level of world market prices. Due to the exports of surplus production (at least partly facilitated by export subsidies) and a low import demand of the EU, CAP in the past exerted a downward pressure on world market prices, which tended to be beneficial for consumers in SSA (cheaper food) and detrimental for producers in SSA (lower prices for agricultural products). As a result of the successive CAP adjustments, under the current CAP EU agricultural commodity prices follow the fluctuations in world market prices and export subsidies have more or less dropped to zero. Hence consumers and producers in in SSA do no longer face a downwards pressure on world market prices due to CAP support. Model simulations of CAP Elimination and CAP Greening show that the future CAP might exert a slight upwards pressure on world market prices due to a small reduction in EU28 agricultural production. It also appears from the model simulations that this that this limited increase hardly provokes an increase in agricultural production in SSA and leaves consumption in SSA unaffected.

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1. Introduction

The Common Agricultural Policy (CAP) does not only affect Food and Nutrition Security (FNS) in the EU, but that outside the EU as well. Usually, FNS is considered along the dimensions of food and nutrition status (i.e. availability, access and utilization) and stability (i.e. vulnerability and resilience) (Cockx et al., 2015). CAP's impact on FNS outside the EU is mainly established by means of trade and the level of world market prices. For example, if the EU exports a large volume of cereals to the world market, this will have a decreasing effect on world market prices for cereals. Cereal consumers outside the EU may benefit from these lower prices, whereas cereal producers suffer from them as they have to sell their products at a lower price. An extensive overview of literature related to the market impacts of EU CAP in general is given by Gohin and Zheng (2016), while Boysen et al. (2014) give an overview of the literature that focusses on the impacts on developing countries.

Since the introduction of the CAP in the 1960s, it has been gradually adapted to changing circumstances. One of the reasons to change the CAP was to apply less trade distorting instruments. This is the path the EU has already chosen in the past two decades, by lowering internal prices and compensating producers for the lower prices with direct income support. The CAP agreement of 2013 (EC 2013a and 2013b) was the most recent change. This agreement is on the organization of the CAP in the period 2014-2020. It is likely that the CAP beyond 2020 will differ from its current organization, but its precise contents are not yet known. The subsequent changes in the organization of the CAP may be accompanied by changes in the impact of the CAP on FNS outside the EU.

Objective of this paper

In this paper the impact of the CAP on FNS in developing countries is explored, in which both the CAP in the past, the current CAP and the future CAP is taken into account. The impact of the future CAP especially refers to the Sub-Saharan African (SSA) countries. FNS is approached by indicators on agricultural production, food consumption, world market prices, agricultural exports, agricultural imports and calorie intake per capita. The analysis of the impact of the past and current CAP on FNS is based on literature review; for exploring impacts of the future CAP 2020-2030 on FNS three policy scenarios are developed, which are simulated with the MAGNET model (see Appendix I for a model description).

Plan of this paper

The plan of this paper is as follows. In section 2 we discuss the impact of the CAP on FNS in developing countries in the past and the present in general. In section 3 we elaborate on three policy options for the CAP beyond 2020. Three model scenarios for the period 2020-2030 are derived from these policy options and values for FNS indicators in the EU and SSA countries are calculated by using the MAGNET model. As a final step in this section, the focus is on the change in the values of the FNS indicators in the model scenarios compared to a situation with an unchanged CAP (baseline scenario). In section 4 some concluding remarks are made as well as comparison of our results with other findings reported in the literature.

2. Effects of past and current CAP on FNS indicators

In this section we discuss the impact of the CAP on FNS indicators, both in the past and the present. We especially focus on the impact on world market prices and its consequences for consumers and producers of food in developing countries.

CAP in the 1960s and 1970s

The original CAP – as designed in the 1960s – consisted of price support for agricultural commodities, subsidies for exports and tariffs on imports. Price support was given by means of guaranteeing minimum prices (the so-called intervention prices), which were well-above world market level. This price support boosted agricultural production: as the intervention price was independent from supply, it was beneficial for farmers to maximise their production. The surplus production was exported with subsidies, exerting a downwards pressure on world market prices.

Effects of lower world market prices for FNS are heterogeneous

The CAP measures have led to relatively high internal prices for major products like cereals, sugar and beef compared to world market prices. This has stimulated production, for many products beyond the level of self-sufficiency. Exporting surplus production was only possible through using export subsidies. Being a major exporter, this has lowered world market prices. Stimulating internal production through (artificially) high prices has also led to lower imports than would have been the case in a situation of free trade.

Swinnen (2015) summarizes the impact of lower world market prices for FNS in developing countries, which tends to vary from country to country, from region to region and from household to household:

1. A food price decrease is beneficial for consumers and detrimental for producers.
2. Many households in developing countries are both consumers and producers of food. The net household effect of lower food prices depends on their net consumption status.
3. The change in world market prices may differ from the change in local prices as the latter are also affected by various policies, infrastructure, institutions and the industrial organization of the food chain. These local factors may even imply that the impact of lower world market prices is different for consumers and producers prices.
4. In addition to changes in world market prices, changes in local production and local consumption may also affect local prices.
5. Short-run effects may differ from long-run effects, as pass through may take some time.

Given these reasons, it could be argued that the downward pressure of the original CAP on world market prices tends to be beneficial for consumers and detrimental for producers, but that the size of their benefits and losses is mitigated by various factors.

Adjustments of the CAP

Both internal and external pressure resulted in a number of adjustments of the original CAP. Internal pressure was induced by the high budget costs of the huge intervention stocks and substantial export subsidies and the detrimental effects of intensive modern EU agriculture on the environment and the landscape, while external pressure came from trading partners in both developed and developing countries and from international organizations accusing the EU from causing hunger and poverty in developing countries (Swinnen, 2015). In the 1980s production quota were introduced for dairy and sugar in order to stop unlimited production growth and during the so-called Mac Sharry reform in 1992 price support was replaced by payments linked to land and animals. This implied that the gap between EU market prices and world market prices, induced by the CAP, gradually disappeared and that the amount of export subsidies decreased. At the 2003 CAP reform the payments linked to land and animals were replaced by the Single Farm Payment (SFP) scheme also referred to as decoupled direct payments. Under this scheme farmers received a fixed payment per farm or a fixed hectare payment independent from the volume of production. Due to the principle of cross compliance, farmers only received SFP if they met certain environmental criteria. Via cross compliance and other more indirect channels, SFP still have an impact on production, see Appendix III of this report for more details. According to the Health Check agreement in 2008 mandatory intervention was restricted to a few products. In the most recent 2013 CAP agreement, the SFP scheme was adjusted by three principles: convergence, greening and capping in order to distribute support more equal over farms, to link support more to environmental objectives and to set a maximum ceiling of support per individual farm.

Current EU export subsidies negligible

Due to the successive CAP adjustments, EU agriculture has gradually moved to a market based agriculture, in which SFP decoupled from production - provide basic financial security to farmers without distorting world market prices. Under the present CAP, EU agricultural commodity prices follow the fluctuations in world market prices and export subsidies have more or less dropped to zero (Figure 1). Hence consumers and producers in developing countries do no longer face a downwards pressure on world market prices due to CAP support.

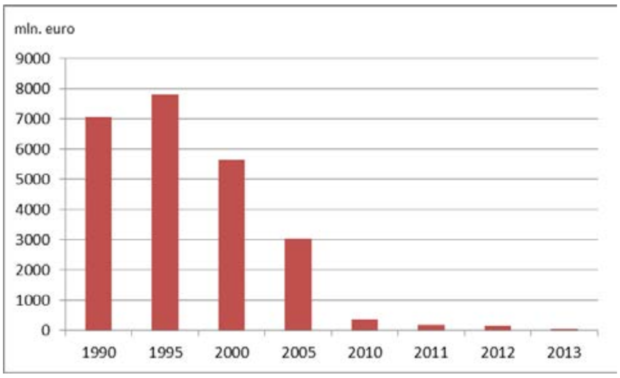

Figure 1 EU export subsidies, 1990-2013 (million. euro)

Source: Various annual reports of the EAGGF.

3. Simulations of effects of CAP on FNS indicators in Sub-Saharan Africa, 2020-2030

In this section the focus is on simulating the impact of the CAP on FNS indicators in SSA in the years 2020-2030. As the CAP beyond 2020 is not yet known, we use three policy options (Table 1). These options are translated in three model scenarios that are simulated with the MAGNET model for the period 2020-2030.

Appendix I gives a detailed description of the MAGNET model and scenario design and assumptions for the different time horizons until 2030. Table I.5 in Appendix I shows for selected sectors in the EU the average share of the CAP budget in total production value in the baseline scenario in 2030. As percentage of output value the EU CAP budget is quite equally distributed over the selected sectors[1]. Given the productivity effects of the different CAP budget measures, see appendix III, this indicates that income and production in all sectors will be affected going from the baseline to the CAP Elimination and CAP greening scenarios. Below we discuss the changes in a number of FNS indicators in 2030 in the CAP Elimination and the CAP Greening scenarios compared to their values in the baseline scenario in 2030.

Table 1 Used policy options for the CAP beyond 2020

	Option	Assumptions
1	Baseline	Business as usual = continuation of the CAP 2014-2020
2	CAP Elimination	Elimination of the CAP (both Pillar I and II)
3	CAP Greening	Coupled payments for part of the production (similar to the situation in CAP 2014-2020) and greening payments are maintained in Pillar I Decoupled SFP in Pillar I are eliminated; the budget for decoupled SFP in Pillar I in the CAP 2014-2020 is used for greening payments. This implies an increase in the budget for greening payments in Pillar I compared to the period 2014-2020 The 'greening' of Pillar I decoupled payments is modelled by characterising them in an identical fashion to Pillar II agri-environmental payments.

[1] This can be different per country. Also the EU average CAP budget share in value added or profit can be different from the corresponding share in production value per sector.

		The budget for Pillar II is used in the same way as in 2014-2020

Agricultural production in the EU28 in 2030 slightly decreases

Agricultural production in the EU28 in 2030 in the CAP Elimination and the CAP Greening scenario is slightly below that in the baseline scenario (Table 2). The decrease in production in the CAP Elimination scenario amounts to about 1-4%; the reduction in the CAP Greening scenario is somewhat smaller. The interpretation of this is that in 2030 production in the CAP Elimination scenario will be 1-4% below the production in the baseline scenario. In both scenarios the production of milk is least affected. The drop in agricultural production in the EU28 in the CAP Elimination and the CAP Greening scenario is due to the model assumption that decoupled SFP in Pillar I (which are eliminated in both scenarios) are linked to the land: a reduction of decoupled SFP implies that part of the agricultural land will no longer be used for agricultural production. It will be abandoned or used for other purposes. Less agricultural land results in a decrease in agricultural production. The more moderate decline in agricultural production in the CAP Greening scenario compared to the CAP Elimination scenario is related to the continuation of the coupled payments. Nevertheless, the greening payments in the Greening scenario have a decreasing effect on agricultural production as part of the land is more extensively used. In the EU, only the household consumption of cattle and milk in 2030 is a little below that in the baseline scenario, see table 2.

Table 2 Agricultural production and household consumption in the CAP Elimination and the CAP Greening scenarios, 2030 (% change compared to the baseline scenario)

	Production				Household consumption			
	CAP Elimination		CAP greening		CAP Elimination		CAP greening	
	EU28	SSA	EU28	SSA	EU28	SSA	EU28	SSA
Wheat	-3.9	1	-2.6	0.7	-0.1	0	0	0
Other cereals	-3.3	0	-2	0	-0.1	0	-0.1	0
Oilseeds	-2.2	0.1	-3.3	0.1	-0.1	0	0	0
Sugarbeet/ cane	-2.3	-0.1	-1.8	0	0	0	0	0
Cattle	-2.4	0.1	-1.5	0	-2.6	-0.1	-0.6	-0.1
Milk	-1	0	-0.8	0	-2.5	-0.1	-1.5	-0.1

World market prices for agricultural products in 2030 slightly increase

Less agricultural production in the EU28 results in a lower EU supply of exports to the world market or a higher EU demand for imports on the world market. These changes in the volumes of exports and imports have a small increasing effect on world market prices. In the CAP Elimination scenario real world market prices in 2030 for wheat, cattle and milk are about 1% above the level in the baseline scenario; for the other products real price changes are less than 1% (Table 3). In the CAP Greening scenario world market prices in 2030 are also less than 1% above the level of the baseline scenario. The variation in price change among the different agricultural products is related to the size of the respective world markets and the relative share of EU28 in these markets.

Table 3 World market prices for selected agricultural products in the CAP Elimination and the CAP Greening scenarios, 2030 (% change compared to the baseline scenario)

	CAP Elimination	CAP greening
Wheat	1.1	0.7
Other cereals	0.7	0.3
Oilseeds	0.4	0.3
Sugarbeet/ cane	0.3	0.3

Cattle	1.2	0.5
Milk	1.0	0.7

Production and consumption in Sub-Sahara Africa in 2030 unaffected by CAP changes

The moderate increase in world market prices in 2030 in the CAP Elimination and the CAP Greening scenarios might encourage producers in developing countries to extend their agricultural production. However, it appears that the incentive of higher world market prices does not result in a substantial increase in agricultural production in the Sub-Saharan African countries, except for wheat production (Table 2). In the CAP Elimination scenario wheat production in Sub-Sahara Africa in 2030 is 1% above that in the baseline scenario; in the CAP Greening scenario 0.7%. The slight increase in world market prices in 2030 in the CAP Elimination and the CAP Greening scenarios neither affects the consumption of agricultural products in 2030 in Sub-Sahara Africa. The limited impact on own agricultural production and consumption in Sub-Saharan African countries is also explained by trade diversion as other exporters replace the reduced EU exports to world markets. Given these minor changes in the volumes of consumption, the calorie intake per capita in 2030 in the CAP Elimination and the CAP Greening scenarios is almost unaffected in SSA as compared to the baseline scenario[2].

Sensitivity analysis

Until now it is assumed that all of the decoupled SFP in the first pillar of the EU CAP is capitalised into land and that elimination of the decoupled SFP especially affects land prices. As a sensitivity analysis we assume that the decoupled SFP is capitalised in land, labour and capital. This means that prices of land, labour and capital in agricultural will be affected in the CAP Elimination and CAP Greening scenarios (so not all adjustments via changes in land prices and land demand). On top we assume that labour, capital and land are fully mobile between all sectors[3]. The sensitivity analysis allows for a larger impact of the CAP on the FNS indicators and should be considered an extreme situation compared to the standard assumptions. To explain this a little bit more, the sensitivity analysis assumes that labour and capital can move away from EU agriculture more quickly compared to standard model outcomes, resulting in more rapid and larger changes in agricultural and (downstream) food production, consumption and world market prices.

The sensitivity analysis shows impacts of the CAP Elimination and CAP greening policy options on the FNS indicators that are two to three times larger compared to the standard outcomes presented above. In arable crop production the average effects of the CAP Elimination option in the EU28 now ranges between -6% (sugar beet, sugar cane) and -9% (wheat and oil seeds). In livestock production the average production change in the EU28 now equals -2.7% for milk and -5.2% for cattle. Production impacts in SSA now ranges from 0.1% in the primary production of wheat, other cereals, cattle and milk to 2.2% in the production of wheat. Impacts on HH consumption in SSA are still very limited, namely between 0.0 and -0.1%. Although the sensitivity analysis shows much more action on the markets, the impact on nutrition (calorie intake per capita per day) and income per capita in SSA is unchanged compared to standard outcomes.

The sensitivity analysis shows EU welfare increases in the CAP Elimination scenario, while standard outcomes shows a welfare loss. Again, in the sensitivity analysis labour and capital in agricultural sectors find higher value uses much more easily and resources are devoted to more productive activities. This has a positive impact on welfare in the EU as a whole. Of course the welfare impacts of the policy options can be different for individual countries and sectors, especially for the agricultural sector in the EU.

4. Concluding remarks

[2] A detailed description of the nutrition module in MAGNET can be found in Rutten et al. (2014).

3 Note that land is only used in agricultural sectors. In the standard version of MAGNET labour and capital are quite sticky between agricultural and non-agricultural sectors. This means that differences in income possibilities need to be large before labour and capital will move between agricultural and non-agricultural sectors.

In this paper we have explored the impact of the CAP in the past, present and future on FNS indicators in Sub-Saharan Africa. The assessment of the impact of the CAP in the past and present has been based on literature study; for assessing the impacts of the future CAP simulations with the MAGNET model have been carried out. For simulating the future CAP we have distinguished three policy options: a baseline scenario, a CAP Elimination scenario and a CAP Greening scenario. FNS indicators include agricultural production, food consumption, world market prices, agricultural exports, agricultural imports and calorie intake per capita. In this section some concluding remarks are made.

Impact of the past CAP on FNS indicators

Due to the exports of surplus production and a low import demand from the EU, CAP in the past exerted a downward pressure on world market prices, which tended to be beneficial for consumers in SSA (cheaper food) and detrimental for producers in SSA (lower prices for agricultural products).

Impact of the current CAP on FNS indicators

As a result of the successive CAP adjustments, EU agricultural commodity prices follow the fluctuations in world market prices and export subsidies have more or less dropped to zero. Hence consumers and producers in SSA no longer face a downward pressure on world market prices due to CAP support.

Impact of the future CAP on FNS indicators

The options for a future CAP (2020-2030) simulated in this paper – either an elimination of the CAP or a greening of the CAP – resulted in a small reduction in agricultural production in the EU28. This is accompanied by a lower EU supply of exports to the world market and a higher EU demand for imports on the world market. These changes in the volumes of exports and imports have a small increasing effect (less than 1%) on world market prices. However, it appears that the incentive of higher world market prices does not result in a substantial increase in agricultural production in the Sub-Saharan African countries. In addition, it turns out that the consumption of agricultural products in Sub-Sahara Africa and the calorie intake per capita are also unaffected. These results are especially explained by trade diversion. A sensitivity analysis was conducted allowing for much more production changes in agricultural sectors and non-agricultural sectors in the EU28 and world-wide under the same scenarios. Results show that although agricultural production in the EU28 is now much more affected, impacts of the policy options on production and consumption in SSA are still very limited.

Comparison to other research

Boysen et al. (2014) conclude that eliminating EU agricultural support would have marginal but positive impacts on the economy in Uganda and its poverty indicators. This is in line with our research. Further literature comparisons are difficult as recent empirical literature to the problem at hand is very limited (Boysen et al., 2014). MAGNET can be characterised as a static CGE model assuming rational price expectations. One of the advantages of the CGE approach is that markets of production factors are included. This feature has become more important in EU CAP analysis following the introduction of the decoupled SFP (Gohin and Zheng, 2015). A disadvantage of MAGNET is that it does not include dynamic and stochastic elements e.g. impacts of price volatility. Gohin and Zheng (2015) find that impacts of elimination of the decoupled SFP can be quite different if one compares the results of a static CGE with a more dynamic CGE accounting for risk averse behaviour and price volatility. Using the dynamic version, it was found that depending on the degree of price stability and risk aversion in the baseline, the impacts of elimination of decoupled SFP on wheat production in the EU28 can be -1.5% to -6.4% in the dynamic CGE. In the static CGE this was -1.3%. Although these are large differences, they are in the range of our sensitivity analysis[4], suggesting that including risk averse behaviour might not affect the conclusion put forward in this paper, namely that elimination of the decoupled SFP will have limited impacts on FNS indicators in developing countries.

[4] Gohin and Zheng (2015) only focus on wheat, where all the adjustments must take place. The results should be seen as a maximum impact on wheat production. Applying the same scenario to more products and spreading the adjustments, will dampen the reported effects on wheat production in the EU28.

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Appendix I: MAGNET model description, scenario design and selected results baseline scenario in 2030[5]

Magnet model description

The MAGNET model, fully documented in Woltjer and Kuiper (2013), is an recursive dynamic variant of the well-known multi-regional neoclassical Global Trade Analysis Project (GTAP) model (Hertel, 1997) and database (Narayanan et al., 2015). The GTAP data uses a series of input-output tables for 140 countries/regions and 57 tradables (including agriculture, food, manufacturing, services, natural resources and energy), with gross bilateral trade, transport and trade policy data (i.e., ad valorem applied tariffs). In each region, both the data and the model accounting conventions ensure that the standard Keynesian macro balances are observed (i.e., zero balance of payments). The behavioural equations employ standard assumptions of neoclassical constrained optimisation, constant returns to scale technologies and perfect competition, whilst a series of market clearing equations are imposed to ensure that supply equals demand. Given its modular structure, MAGNET affords the user the flexibility to choose from a list of non-standard modules which are most pertinent to the study at hand.

In this study of special importance is the CAP module and the impact of the CAP on FNS indicators in the EU28 and a group of developing countries. A full representation of agricultural and food sectors is therefore chosen. The model explicitly treats the specificities of agricultural factor and input markets to cater for endogenous changes in regional land supply, feed and fertiliser input substitution possibilities, heterogeneous land transfer between different agricultural activities and the possibility of characterising sluggish transfer of labour and capital between agricultural and non-agricultural sectors to capture wage/rent differentials.[6] In addition, the model captures changes in the pattern of agri-food demand elasticities over time resulting from structural economic change (Woltjer and Kuiper, 2013).

Scenario design

Aggregation, Model Closure

In the real world, agricultural output is employed not only for food and feed, but also as a source of bio-mass for alternative uses such as chemical production or as an energy source. Thus, to capture these alternative channels of value added, and thereby improve model estimates of agricultural activity supply responsiveness under CAP Policy changes, a more inclusive bio-based aggregation is considered in this study. Thus, 49 tradable goods are disaggregated from the modified GTAP database, of which 39 are bio-based (see Table I.1). To maintain the model within manageable proportions, the regional disaggregation is limited to 23 regions. The selection criteria incorporates larger EU members (i.e., France, Germany, Italy, Spain, UK) whilst the specific choice of Ireland and Poland reflects the relative importance of primary agriculture in these countries. In addition, EU member state disaggregation reflected more pragmatic modelling considerations, to allow for the correct budgetary allocation to those countries which receive special dispensation under the CAP budget rebate.[7] The remaining EU27 countries are aggregated together. Lastly, as the 28th EU member state from July 1st, 2013, Croatia is treated separately to allow for its explicit inclusion within the single market (via exogenous tariff rate adjustments) and the 'own resources' of the CAP budget mechanism. In the non-EU regions, 'large players' (both net exporters and importers) on world agrofood markets are identified (see Table I.1), whilst to examine the possible impacts on impoverished partners, both the Middle East and North Africa (MENA), and Sub-Saharan African (SSA) regions are represented. All residual trade and output flows are captured within a Rest of the Word (ROW) region.

5 This Appendix is largely based on Urban and Philippidis (2016).

6 In the current study, changes to this behavioural assumption are key when modelling the allocation of CAP payments over the different fixed factors (e.g. degree of coupling of CAP payments).

7 The Netherlands and Sweden are grouped together since their modelling treatment within the own resources mechanism of the CAP budget is identical (see Boulanger and Philippidis, 2015).

Table I.1: GTAP data aggregation

Sectoral disaggregation (49 commodities):

Primary agriculture (10 commodities): wheat (wht); other grains (grain); oilseeds (oils); raw sugar (sug); vegetables, fruits and nuts (hort); other crops (crops); cattle and sheep (cattle); pigs and poultry (pigpoul); raw milk (milk); crude vegetable oil (cvol)

Food and beverages (5 commodities): meat (meat); dairy (dairy); sugar processing (sugar); vegetable oils and fats (vol); other food and beverages (ofdbv);

Other 'traditional' bio-based activities (7 Commodities): fishing (fish); forestry (frs); textiles (tex); wearing apparel (weapp); leather products (leath); wood products (wood); paper products and publishing (ppp).

Bio-mass supply (5 commodities): plantations (plan); residue processing (res); pellets (pel); agricultural residues (r_agric); forestry residues (r_frs);

Bio-based energy (5 commodities): 1st generation biodiesel (biod); 1st generation bioethanol (biog); bioelectricity (bioe); 2nd generation thermal technology biofuel (ft_fuel); 2nd generation biochemical technology biofuel (eth)

Bio-based chemicals (4 commodities): lignocelluose sugar (lsug); polylactic acid (pla); polyethylene (pe); mixed bio/fossil chemicals (f_chem)

Bio-based and non bio-based animal feeds (3 commodities): bioethanol by-product distillers dried grains and solubles (ddgs); biodiesel by-product oilcake (oilcake); animal feed (feed).

Fertiliser (1 commodity): fertiliser (fert).

Fossil fuels and energy (6 commodities): crude oil (c_oil); petroleum (petro); gas (gas); gas distribution (gas_dist); coal (coa); electricity (ely);

Other sectors (3 commodities): chemicals, rubber and plastics (crp); transport (trans); other sectors (OthSec).

Regional disaggregation (23 regions):

EU members (12 regions): United Kingdom (UK); Netherlands and Sweden (NLSWE); Denmark (DK); Germany (GER); Austria (AUT); France (FRA); Ireland (IRE); Italy (ITA); Poland (POL); Spain (SPA); Rest of the EU27 (RoEU27); Croatia (CRO)

Non EU regions (11 regions): United States of America (USA); Canada (CAN); Mercosur (MERC); Russian Federation (RUS); China (CHN); India (IND); Japan (JAP); Australia & New Zealand (AUSNZ); Middle East & North Africa (MENA); Sub-Saharan Africa (SSA); Rest of the World (ROW).

In terms of the model closure, all primary factor endowments (except land) and policy variables (ad valorem taxes and tariffs) are assumed exogenous. In neoclassical CGE models, technical change is traditionally treated as exogenous, although output- and input-augmenting technical changes in relation to Pillar II expenditures are treated endogenously (Woltjer and Kuiper, 2013). To ensure macro closure, withdrawals (savings (S), imports (M) and CAP contributions (CC)) must equal injections (investment (I), exports (X) and CAP receipts (CR)).[8] Under conditions of fixed savings rates and steady state investment behaviour, as well as marginal changes in net CAP budget contributions (i.e., CC – CR) by member states, the trade balance adjusts to ensure a fully closed macroeconomic circular flow.

[8] In the non-EU regions, both CR and CC are zero

CAP baseline scenario (2007-2013-2020-2030)

As a basis to analyse the impact of the CAP on FNS indicators for a group of developing countries over a medium terms time horizon, it is necessary to implement a 'baseline' which captures market developments under a business as usual set of assumptions conditioned by macroeconomic, technological and biophysical developments. Thus, in the first instance, projections are calculated for two periods. The choice of time intervals for both periods (i.e., 2007-2013, 2013-2020) is motivated by the need to reconcile Croatian accession to the EU and the multiannual financial framework (MFF). A full description of all of the shocks over the two periods is given in table I.2.

As a global benchmark, the Agricultural Model Intercomparison and Improvement Project (AgMIP) (von Lampe et al., 2014) considers a range of scenarios or narratives projecting up to 2050 with the objective of identifying how variation in the underlying macroeconomic, technological and biophysical drivers under different future pathways lead to differing market developments in the long-run (2050) and very long (2100).

Since the current research focus is on the influence of government policy rather than projections, the experiments in the current study borrow AgMIP estimates of developments in real GDP growth and population characteristic of shared socio-economic pathway 2 (SSP2). These assumptions reflect a status quo vision of the world and are assumed common to each of the policy narratives in the current study.

Table I.2: Assumptions shaping the 'status quo' CAP baseline scenario (2007-2013-2020-2030)

a) 2007-2013 period

Projections

- Skilled and unskilled labour, capital, natural resources, population, and macro growth (SSP2)

Agricultural Policy (including 2008 Health Check reforms)

- Phasing in of decoupled SFP for 2004 and 2007 accession members
- Targeted removal of specific Pillar I coupled support payments: Arable crops, olives and hops to be fully decoupled from 2010; Seeds, beef and veal payments (except the suckler cow premium) decoupled by 2012, Protein crops, rice and nuts will be decoupled by 1 January 2012, Abolish the energy crop premium in 2010
- Re-coupling of support under the article 68 provision: Member states may use up to 10 per cent of their financial ceiling to grant measures to address disadvantages for farmers in certain regions specialising in dairy, beef, goat and sheep meat, and rice farming
- Pillar II payments to the EU27 under the financial framework
- Cumulative shocks for milk quotas rise of 1 per cent annually from 2009 to 2013
- Projected reduction in CAP expenditure share of the EU budget
- Change in Swedish and Dutch lump sum rebates corresponding to CAP expenditure share of EU budget

Fossil Fuel Prices

- Impose historical changes in world prices for coal, gas and crude oil

b) 2013-2020 period

Projections

- Skilled and unskilled labour, capital, natural resources, population, and real GDP (SSP2)

Agricultural Policy

- Pillar I and Pillar II nominal expenditures are cut 13% and 18%, respectively (European Council, 2013). This corresponds to a 15.2% cut in nominal CAP budgetary funding.
- Phasing in of decoupled SFP for 2007 accession members and Croatia
- Greening of 30% of first pillar payments, represented as pillar two agro-environmental payments
- Pillar II payments extended to Croatia
- Abolition of raw milk (2015) and raw sugar (2017) quotas
- Croatia incorporated within the CAP budget and UK rebate mechanism
- Projected reduction in CAP expenditure share of the EU budget consistent with 15.2% cut in nominal CAP budget reduction
- Change in Swedish, Dutch and Danish lump sum rebates corresponding to CAP expenditure share in EU budget. UK rebate is maintained (European Council, 2013)

Fossil Fuel Prices

- Impose projections of expected changes in world prices for coal, gas and crude oil

Annual rates of population and real growth consistent with SSP2 are compounded over the two periods and implemented into MAGNET (Table I.3); labour projections are assumed to follow regional population trends; capital endowment shocks are equal to regional macro growth forecasts (i.e., one assumes a fixed medium to long-run capital-output ratio) and natural resources are assumed to grow at one quarter the rate of the change in the capital stock. In the case of the labour market, one is effectively assuming that the participation rate of the workforce remains unchanged, which at the same time is theoretically consistent with a medium to longer term assumption of a fixed 'natural rate of unemployment'.

Table I.3: Real GDP and Population shocks, percentages, consistent with SSP2

	2007-2013	**2007-2013**	**2013-2020**	**2013-2020**
	POP	**GDP**	**POP**	**GDP**
UK	4.00	0.46	4.54	17.83
NLSWE	3.20	5.53	3.88	15.32
DK	2.87	-1.77	3.20	13.06
GER	-0.38	4.75	-0.35	10.14
AUT	2.32	6.47	2.28	14.00
FRA	3.64	1.99	4.16	12.47
IRE	8.38	-5.37	8.30	18.77
ITA	2.83	-3.99	0.85	8.14
SPA	5.80	-0.18	3.34	8.94
POL	0.43	21.92	0.14	23.77
RoEU27	0.46	0.84	0.16	15.90
CRO	-0.92	-3.88	-1.05	13.20
USA	5.14	5.51	5.64	22.25
CAN	6.48	7.95	7.54	19.29
MERC	5.86	24.54	5.90	29.31
RUS	-0.33	13.66	-0.60	29.56
CHN	2.54	71.05	1.79	72.72
IND	8.59	51.82	8.89	57.37
JPN	-0.13	0.63	-1.22	7.51
AUSNZ	10.08	15.89	10.50	25.45
MENA	11.72	26.22	11.42	37.54
SSA	15.72	31.25	17.23	46.85
ROW	6.98	20.95	7.33	33.00

Source: Von Lampe et al. (2014)

For both time periods contemplated within this study, historical and projections shocks to coal, crude oil and gas prices are also implemented. In 2007, the coal price was 65.7$ per metric tonne, the oil price was 71.1$ per barrel and the average gas price was $7.7 per million British Thermal Units (BTU). The assumptions on fossil fuel prices across both periods are detailed in Table I.4.

Table I.4: World fossil fuel price shocks, percentages (World Bank projections)

	2007-2013	**2013-2020**
Coal	28.64	-11.66
Crude oil	46.34	-30.92
Gas	31.20	-7.4

Source: World Bank, 2015

Finally, in addition to the projections, productivity and world energy price shocks, a common agricultural policy baseline is added. Thus, the 2007-2013 period incorporates detailed sector and region specific Pillar I and 2 'actual' expenditures (i.e., not ceiling limits) up to 2011, taken from the CATS database, see Appendix II. Over the 2007-2013 period, EU28 expenditures on decoupled SFP increase, largely due to the gradual implementation of the CAP to the new member states (2004 and 2007 accessions), whilst in the case of France, Italy and Spain, rises in SFP expenditures over this period are also due to the (partial or full) decoupling of payments on (inter alia) fruit and vegetables; arable crops; olive hops; seeds; and beef and veal (except suckler payments).

Pillar II payments are aggregated to the five categories employed within the MAGNET model ('agri-environmental schemes'; 'least favoured areas'; 'physical capital'; 'human capital' and 'wider rural development'), see Appendix II for a more detailed description of the initial CAP budget data in MAGNET. Given the 'co-financed' nature of Pillar II support between EU and individual member state budgets, policy shocks to national government Pillar II spending are also implemented in the first period based on the CATS data.

In the 2013-2020 period, it is assumed that the structure of Pillar I payments (decoupled SFP/coupled), Pillar II co-finance rates and the distribution of Pillar II expenditures in member states remain the same at the end of the first period. Payment totals for Croatia in the second period are taken from the European Commission (2009), whilst exogenous spending limit reductions for the CAP budget over the 2014-2020 MFF are taken from the European Commission (2011). Finally, in light of recent CAP reforms, the ‘greening’ of 30% of Pillar I decoupled SFP is modelled by characterising them in an identical fashion to Pillar II agri-environmental payments.

Baseline scenario in 2030

Given the mechanisms of the model, impacts per sector per member state are largely driven by the importance of decoupled SFP and coupled payments in production value (VOA) in the baseline scenario in 2030, see table I.5. The larger these shares, the larger the sector impacts of changes in the CAP budget. As expected table I.5 shows that the share of coupled payments in output is relatively large in the cattle sector. For historical reasons decoupled SFP are relatively large in the milk sector and sugar sector. As percentage of output value, second pillar payments are quite comparable between livestock and crop and horticulture sectors, although differences between individual sectors can be larger. Of course the production effects of the policy options depend on other model parameters as well, like parameters that determine implicit supply and demand elasticities in MAGNET.

Table I.5: average shares of first and second pillar EU CAP budget per measure per sector in EU28 in 2030 baseline (percentages of production value (VOA))

	Coupled	Decoupled SFP	total	Investment in physical capital	investment in human capital	wider rural development	lfa	agri-environmental measures	Total
Crops and horticulture	**0.7**	**11.9**	**12.6**	**0.7**	**0.3**	**0.6**	**0.6**	**1.1**	**3.3**
o.w. wht	0.0	11.3	11.4	0.6	0.3	0.6	0.6	1.1	3.2
o.w. grain	0.1	12.4	12.5	0.7	0.3	0.6	0.7	1.3	3.6
o.w oils	0.2	12.3	12.6	0.7	0.3	0.6	0.5	1.0	3.2
o.w. sug	2.1	11.2	13.3	0.7	0.3	0.6	0.2	0.3	2.1
Livestock	**1.2**	**9.5**	**10.7**	**0.7**	**0.3**	**0.6**	**0.7**	**1.3**	**3.5**
o.w. cattle	4.0	7.9	11.9	0.3	0.3	0.6	0.5	0.9	2.7
o.w. milk	0.3	13.1	13.4	0.6	0.3	0.6	0.8	1.4	3.7

Appendix II: The CAP budget in MAGNET. Basic data[9]

An additional module in MAGNET characterizes a CAP baseline which captures the splits between coupled and decoupled Pillar I payments (both national and EU sourced), and different categories of Pillar II payments (including co-finance rates) (Boulanger and Philippidis, 2015). This so-called CAP module focusses on the modelling of production, trade and income impacts of agricultural support payments under both pillars (Pillar I and Pillar II) of the CAP[10], see Appendix III for a detailed description. Here we present a more detailed description of the underlying initial CAP budget data and distribution. The CAP budget (first pillar, second pillar budgets per measure, co-financing rates) in MAGNET was substantially updated by JRC-IPTS (Boulanger and Philippidis, 2014 and 2015). This work and the underlying knowledge and code has been made available for the Food Secure team at LEI as well.

CAP budget updates

The update of first and second pillar budgets and payments in MAGNET are described in detail in Boulanger and Philippidis (2014 and 2015). These authors started from examining the relevant part of the GTAP database (version 8.1). The first step was to extract a fully detailed categorization of all agricultural domestic support payments which are allocated across the tax wedges corresponding to:

- the factors of production (factor subsidy),
- output (output subsidy) and
- intermediate inputs (intermediate input subsidy).

This task served as a starting point for (i) examining the comprehensiveness of the EU domestic support data in GTAP and (ii) designing a detailed CAP policy baseline post-2007 (GTAP benchmark year) targeting detailed payment changes within the specific tax wedges of the GTAP data.

In the GTAP documentation and associated excel spread sheets, Jensen (2010, 2009) splits agricultural support payments for each of the EU27 members following the OECD classification of single commodity transfers (SCT); all commodity transfers (ACT); group commodity transfers (GCT) and other transfer payments (OTP). Within each of these 4 classifications, one can find a rich but not exhaustive array of different support payments (i.e., 'decoupled direct payments'; 'coupled direct payments'; 'market measures'; 'additional direct transfers'; 'other EAGF payments'; 'agri-monetary transfers'; 'rural development Axis 1 and 2 payments' and 'national payments').

Since by their very nature, SCTs are commodity specific support payments, it is possible to see the exact amount of each type of SCT payment which corresponds to each agricultural activity in each EU region in the GTAP database. Unfortunately, by their very nature, one cannot directly extract the value of GCT (Group Commodity Transfers) or ACT (All commodity transfers) type payments by activity. Consequently, to disentangle these values, we followed the approach of Jensen (2010, 2009) by employing detailed output share data for 2007 from Eurostat's economic accounts for agriculture. So basically, GCT and ACT are distributed over sectors via output shares. This yielded a full classification of GCT and ACT agricultural domestic support payments by type, activity and respective GTAP support wedge (i.e., factor subsidy; output subsidy; or intermediate input subsidy). Column GTAP v.8 data in Table II.1 shows the results of step 1 (aggregated to the EU27).

In table II.1, Market measures include (i.e., storage, export refunds, other direct aids) although in the GTAP data, export refunds are represented explicitly in another wedge (i.e., on exports), so this wedge is really only storage and other direct aids. In MAGNET market measures work out as capital, land and intermediate input subsidy.

[9] This Appendix is largely based on Boulanger and Philippidis (2015).
10 Other aspects of the CAP are steered by other MAGNET modules (e.g. production quotas) or not included e.g. detailed measures to facilitate producer cooperation "to boost the competitiveness of farming by reducing costs, improving access to credit and adding value to the primary sector (EC, 2013)."

Pillar II payments are aggregated to investments in physical capital (Axis 1 of Pillar II), investments in human capacity (Axis 1), wider rural development (Axis 3), LFA's (Axis 2) and Agri-environmental measures (Axis 2). These components and the productivity effects are described in the Appendix.

For the purposes of accuracy, all agricultural support payments originating from national governments do not pass through the CAP budget accounting structure. These national payments, which sum to €10,446 million (in 2007 prices at the 2007 €:$ exchange rate (0.7305)), are also identified by GTAP activity and support wedge.

Table II.1: Total Pillar I and 2 CAP expenditures (€ millions in current prices).

PILLAR I	GTAP v.8 data	CATS data 2007	CATS data 2011 (2013 baseline)
Market measures (05_02)	729.5	729.5	729.5
Decoupled direct payments (05_03_01)	31527	31527	37970.1
Coupled direct payments (05_03_02)	5510.7	5510.7	1718.8
Additional direct payments (05_03_03)	533.9	533.9	443.2
Other EAGF	245.9	245.9	245.9
Agri-monetary	-14.5	-14.5	-14.5
1. Total Pillar I	38532.5	38532.5	41093
PILLAR II (EU sourced):			
Investment in physical capital	1338.5	872.8	2525.5
Investment in human capacity	31.6	686.7	1043.9
Wider rural development	0	337.9	2226.4
LFAs	1169.6	2010.5	1908.6
Agri-environmental measures	1574.5	2823.6	3521.3
2. Sub-total	4114.2	6731.5	11225.7
PILLAR II (Nationally sourced):			

Investment in physical capital	1977.8	1600.3	4178.5
Investment in human capacity	1090	1077.2	1608.5
Wider rural development	0	519.8	3321.5
LFAs	1596.4	3369.2	3305.2
Agri-environmental measures	2731.6	4871.8	5794.3
3. Sub-total	7395.7	11438.4	18208
4. Total Pillar II	11509.9	18169.9	29433.7
Total CAP expenditure (1 + 4)	50042.5	56702.4	70526.7

*Due to their nature, the budget allocated to market measures, other EAGF and agri-monetary payments are left unchanged in the baseline and subsequent time period. These payments have a small share in total Pillar I budget (approximately 2%).

A second step involved cross-checking the GTAP agricultural domestic support payments/support database, generated in step 1. To accomplish this, the European Commission's principle database for the statistical recording and auditing of CAP payments, known as the Clearance Audit Trail System (CATS) database, is employed. Table II.1 shows a summary comparison (aggregated to the EU27) between the CATS data and the GTAP version 8 data in 2007 and complete CATS data for the latest year (2011) at the time the work from Boulanger and Philippidis (2015) was conducted.

A comparison of the two datasets reveals that the degree of coverage of Pillar II payments in the GTAP data is incomplete when compared with the CATS data. In the GTAP database, there is coverage of most Axis 1 (investments in physical and human capital) and Axis 2 (least favoured area and agri-environmental) payments. On the other hand, GTAP data has no coverage of Axis 3 (wider rural development measures), Axis 4 (local development strategies) and Axis 5 (technical assistance). As a result, in the GTAP database, Pillar II expenditures total €11,510 million, compared with €18,170 million in the CATS dataset.

In third column of Table II.1, CAP expenditures for 2011 are presented which are employed as a basis for the agricultural baseline of this study. The important point here is the change in the decomposition of CAP support both in terms of the distribution between pillars 1 and 2, as well as the ongoing shift in Pillar I expenditures toward decoupled support (at the aggregated EU27 level, it is not possible to see the importance of article 68 (recoupled) payments in those member states which use this option (e.g., France, Italy or Spain).

Appendix III: Modelling first and second pillar productivity effects in MAGNET[11]

Pillar I payments and productivity effects

Modelling decoupled Single Farm Payments (SFP) or decoupled direct payments in Pillar I of the EU CAP in market models is challenging as the impact of decoupling per agricultural commodity is not yet empirically known. The way that direct payments have been dealt with in MAGNET is based on the general logic of intervention for direct payments as explained in Nowicki et al. (2009).

Decoupled SFP or direct payments, according to the provisions of the EC regulation 1782/2003, are by definition not linked to a particular agricultural sector and hence should not influence a farmer's decision on what and how much to produce. There is, however, a weak *direct* production link still in place via restrictions on which land is eligible to receive payments. Land entitled for payments must be kept in "good agricultural and environmental condition", i.e. land cannot be abandoned or its use changed into non-agricultural land. Furthermore, there may be an *indirect* effect via income: theoretically, a lump sum payment has no influence on production decisions, if farmers operate in a perfect market with no risk and uncertainty. These are however rather strong assumptions and Woltjer and Kuiper (2013, chapter 12) discusses different channels how direct payments affect production decisions. This discussion is not repeated here. Notwithstanding the theoretical arguments, there is no convincing evidence to what degree the decoupled SFP are linked to production factors other than land (Urban and Philippidis, 2016; Helming et al., 2010a). Given these considerations, decoupled SFP are modelled as factor payments to land in MAGNET. It is assumed that all land in agricultural sectors that are eligible for the SFP, receive the same payment rate e.g. equal payment or land subsidy rate to the production factor land for eligible sectors measured in value terms (equal ad valorem subsidies for land for eligible sectors). Therefore, payments have no effect on the choice between eligible crops within agriculture and no effect on the choice of which production factor to use in production. However, in this economy wide model, payments favor agricultural sectors relative to manufacturing and service sectors, in line with the purpose of these measures. Due to the payments, farm income increases and more production factors stay within the agricultural sector and thus, for example, land abandonment decreases.

Box 1 summarizes how Pillar I payments are modelled in MAGNET.

Box 1: Treatment-Implementation of Direct Payments (Pillar I) in MAGNET

- Coupled direct payments are directly coupled to sectors.
- Decoupled SFP are implemented as an equal payment rate to land in all eligible sectors. Accordingly, this option favors land over other production factors and does not provide an incentive to switch land between eligible sectors.

Second pillar payments and productivity effects[12]

Investments in human capital are likely to lead to an overall increase in productivity; higher levels of knowledge may lead to better use of machinery and handling of cattle, better fertiliser, pesticide and feed use, more efficient organisation of work and more efficient use of land (for example through better timing, producing higher quality products). Thus, human capital investments result in a general

[11] This appendix is largely based on Chapter 12: EU Common Agricultural Policy IN Woltjer and Kuiper (2013, chapter 12).
12 Taken from Helming et al., 2010b.

productivity increase. MAGNET includes a direct link between human capital payments and technological change. As we have no empirical information from the literature about the factor bias or effectiveness of human capital expenditure within the rural development programmes, we assume that they have a similar rate of return as other general human capital investments and we therefore assume a Hicks neutral rate of technological change (all production factors and inputs will be reduced with the same rate of technological change). A review of other sources of literature suggests that the rate of return on investment in education is 0.40, implying that investment of one dollar per unit of output increases output productivity by 0.40% (Evenson, 2001). So, if the investment in education is €1,000 and if the total output value is €1,000,000, then the total output productivity increases by 1,000/1,000,000*0.4%, which is 0.001*0.4% and the result is 0.0004%.

Nowicki et al. (2009) indicate that in some cases (for example in relation to the early retirement measure), investments may also have been undertaken in the absence of Pillar II funding for human capital. In economic terms, there is a crowding out or deadweight effect. Precise estimates on the magnitude of this do not exist and we have therefore taken a crude assumption that 50% of the funds used for investments in human capital will in fact fund investments that would have been carried out anyway. The deadweight element of the payments for human capital investments are considered as an income payment. In MAGNET this part of the payment has no consequences for behaviour, but increases GVA and family farm income.

Physical capital investments

Extra capital investment may renew the capital stock and therefore achieve an increase in productivity because of capital embodied technology. In the implementation, we performed a very simple experiment. We assumed that extra capital goods replace 15 year old capital goods and that output augmenting capital embodied technological change is 3% per year. This implies that the productivity of the new machines is 55% (=1.03^15) higher than the productivity of the replaced machines and about half as high again as the average machines (the newest machine is 55% more productive than the oldest one, so roughly speaking 0.5*55% more productive than the average machine). So we assume that an extra investment of 1% of the capital stock generates an increase in output productivity of 0.5*0.55*1%=0.275%. This implies that an investment of one dollar per 100 dollars of physical capital stock increases output productivity by 0.275%. Moreover, we also assumed that 50% of the subsidies generated extra capital goods (deadweight effect). Therefore in MAGNET output, productivity will be increased by 50% (because 50% of the payments are assumed to be effective) of 0.275%. The other part of the payment has no consequences for behaviour, but increases farm income.

LFA land use support

LFA payments provide compensation for production under less efficient circumstances, with the aim of keeping land in marginal areas under production. Pufahl and Weiss (2009) have analyzed the effects of LFA payments schemes in Germany by comparing similar farms with and without LFA payments. They find that LFA payments keep land in production and have a small positive production effect.

Natura 2000 payments on agricultural land

In MAGNET, a land payment is used as a proxy for Natura 2000 payments as in the case of LFA payments.

Agri-environment payments

The agri-environment measures aim to encourage farmers and other land managers to introduce or maintain production methods compatible with the protection of the environment, the landscape and its features, natural resources, the soil and genetic diversity that go beyond mandatory standards. In terms of public funding, they accounted for the largest proportion of expenditures within Pillar II (see, Nowicki et al. 2009). They provide compensation for income foregone as a consequence of lower land productivity, extra labor and other costs. Pufahl and Weiss (2009) show that agri-environment payments can generate an increase in land use and, in particular, in marginal land that might otherwise have gone out of production. Furthermore, the share of grassland increases. The use of the agri-environment measures results in a rather diverse set of schemes and management options being implemented in individual Member States.

In MAGNET, a payment to land is used as a proxy for agri-environment payments. In contrast with the LFA payments, agri-environment measures will reduce labor and capital productivity. In order to capture the productivity effect, we assume in MAGNET that labor and capital productivity decreases by 10% of the increase in land payment rate.

Wider rural development schemes

Finally, wider rural development schemes encapsulate a broad variety of initiatives to reverse economic and social decline in rural areas by promoting innovation and creating employment opportunities in rural areas, thereby promoting output productivity change not only in agriculture but also in the wider rural economy. By way of assumption (Woltjer and Kuiper, 2013), MAGNET employs the same rate of return as that used for physical capital investments (i.e., 30%).

Box 2 summarizes how Pillar II payments are implemented in MAGNET

Box 2: Treatment of Rural Development measures*

01 – Human Capital Investment [111-115, 131-133]:

- Payments influencing the total factor productivity in agriculture.
- Rate of return on investment is 40% (Nowicki et al., 2009 based on Evenson, 2001)

02 – Physical Capital Investment [121-126]:

- Payments which influence the total factor productivity due to capital investments in all agricultural sectors.
- Rate of return on investment is 30% (Nowicki et al., 2009)

03 – LFA Land Use Support [211, 212]:

- Income payments linked to land in agricultural sector.

04 – Natura 2000 [213]:

- Income support linked to land in agricultural sector.

05 – Agri-Environment measures [214-216]:

- On the one hand, income support linked to land in agricultural sector and on the other hand a yield and labor productivity loss.

Regional payments i.e. 06 – Forestry [221-227], 07 – Diversification [311-313], 08 – General rural development [321-323, 331, 341], 09 – LEADER [411-413, 421, 431], 10 – Technical assistance [511, 611]:

- Investment support for non-agricultural activities that increase productivity.
- Rate of return on investment is 30%.
- Deadweight loss is assumed to be zero (we recommend sensitivity analysis for example with 25%, 50% etc.)

** The RD measure numbers are indicated between square brackets [#].*

General limitations to the modelling methodology

Box 3 summarizes general limitations of modelling CAP measures in CGE models such as MAGNET.

Box 3: Overview and limitations to the modelling methodology (based on Nowicki, et al. 2009)

1. Empirical information about the impact of especially the impact of second pillar measures is very scarce. Therefore, ex-post information hardly exists.
2. Public goods are not included in the modelling, although they are an important part of the second pillar.
3. Environmental impacts are difficult to generalise as the impacts vary locally.
4. Pillar II measures are complex and have different impacts depending on how they are implemented. Therefore, only a stylised approach for each measure can be implemented, and the approach taken includes grouping the measures (see Box 2).
5. Lack of empirical information about deadweight losses.
6. Transaction costs have not been addressed.

FOODSECURE

FOR POLICIES THAT MATTER

The FOODSECURE project in a nutshell

Title	FOODSECURE – Exploring the future of global food and nutrition security
Funding scheme	7th framework program, theme Socioeconomic sciences and the humanities
Type of project	Large-scale collaborative research project
Project Coordinator	Hans van Meijl (LEI Wageningen UR)
Scientific Coordinator	Joachim von Braun (ZEF, Center for Development Research, University of Bonn)
Duration	2012 - 2017 (60 months)
Short description	In the future, excessively high food prices may frequently reoccur, with severe impact on the poor and vulnerable. Given the long lead time of the social and technological solutions for a more stable food system, a long-term policy framework on global food and nutrition security is urgently needed. The general objective of the FOODSECURE project is to design effective and sustainable strategies for assessing and addressing the challenges of food and nutrition security. FOODSECURE provides a set of analytical instruments to experiment, analyse, and coordinate the effects of short and long term policies related to achieving food security. FOODSECURE impact lies in the knowledge base to support EU policy makers and other stakeholders in the design of consistent, coherent, long-term policy strategies for improving food and nutrition security.
EU Contribution	€ 8 million
Research team	19 partners from 13 countries

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SEVENTH FRAMEWORK PROGRAMME