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Future of European agriculture after the Health Check

Die Zukunft der Europäischen Landwirtschaft nach dem Health Check

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Abstract

This paper identifies major future trends and driving factors and perspectives and challenges resulting from them for European agriculture and food sectors until the year 2020. The focus of the paper is an analysis of key driving forces and the provision of a well developed reference scenario under the assumption of continued CAP reform and taking into account the framework discussions in the Doha Development Round. To assess the impact of policies the paper also examines a liberalisation (no support) and regionalisation (maximum support) scenario. In terms of policy options the paper shows that the structural change process in agriculture (measured in terms of agricultural share in GDP) is a long-term process that continues with or without policy changes. The EU is facing an increasing diversity of structure and structural adjustment. The livestock sector (especially cattle) faces important challenges and restructuring. Alternative policy settings may not produce very different effect on the overall production as factor markets adjust. However, the regional impact on the environment and on the number of farms may prove to be more significant.

Key words

economic modelling; future; CAP policy options; structural change

Zusammenfassung

Dieser Artikel arbeitet die entscheidenden Trends, die treibenden Faktoren und die sich daraus ergebenen ökonomischen Aussichten sowie Herausforderungen für den europäischen Agrar- und Nahrungsmittelsektor bis zum Jahr 2020 heraus. Der Schwerpunkt des Artikels beruht auf der Analyse der wichtigsten Determinanten der Entwicklung der europäischen Landwirtschaft sowie die Entwicklung eines Referenzszenarios, in dem die Fortführung der gegenwärtigen Gemeinsamen Agrarpolitik (GAP) der EU sowie die Folgen eines Abschluss der WTO-Verhandlungen untersucht werden. Um die Auswirkungen unterschiedlicher Politikoptionen zu analysieren, werden in zwei weiteren Szenarien weitreichende Reformmaßnahmen (‚Liberalisation') sowie die Konsequenzen der Fortsetzung der gegenwärtigen GAP ohne WTO Abschluss (‚Regionalisation') untersucht.

Dabei zeigen die Ergebnisse, dass sich der landwirtschaftliche Strukturwandel (aufgezeigt an der Veränderung des Beitrags des Agrarsektors zum BIP) unter allen Szenarien fortsetzt. Dabei wird deutlich, dass die Diversität der regionalen Agrarstrukturen und des strukturellen Wandels im Agrarsektors, insbesondere im Bereich der tierischen Produktion, deutlich steigt.

Schlüsselwörter

ökonomische Modellanalyse; Reform der EU-Agrarpolitik; landwirtschaftlicher Strukturwandel

1. Introduction

The objective of this paper is to identify major future trends and driving factors and perspectives and challenges resulting from them for European agriculture and food sectors until the year 2020. The focus of the paper is an analysis of key driving forces and the provision of a well developed reference scenario under the assumption of continued CAP reform and taking into account the framework discussions in the Doha Development Round. The paper also examines alternative relevant and consistent scenarios. This article builds upon the major findings of the Scenar 2020 study which has been a precursor of the Commission proposal for the 'Health Check' of 2008. The financial implications of these issues along with others – such as modulation – are also examined in the Scenar 2020 study (NOWICKI et al., 2006). With these dimensions the current article tries to identify the potential contribution of alternative policy options for EU agriculture and to evaluate how the process of structural change in agriculture is affected by policy reforms or driven by forces outside the scope of policy measures.

We begin this paper with a systematic review of those drivers which are endogenous or exogenous to policy decisions. Next the effects of the drivers are analysed at global and national levels taking into account general equilibrium effects of the drivers and the different policy options. This analysis at global and national levels is achieved by the LEITAP model which is a GTAP (Global Trade Analysis Project) model extended for land market and a segmented factor market for agriculture.[1] To derive a more detailed analysis of different policy options on agri-food sectors at national level and regional level the partial equilibrium models ESIM (European Simulation Model) and CAPRI (Common Agricultural Policy Regional Impact Analysis) are used here as well.

With this modelling tool the paper identifies the future trends and driving forces that is the framework for the European agricultural and rural economy on the horizon of 2020. A reference scenario ('baseline') is based on an analysis of trends from 1990 to 2005, and these trends are projected forward to 2020. Two counter-factual scenarios to the baseline scenario are defined which intend to demonstrate two reasonable variations in policy ('maximum support' and 'no support') during the coming fifteen years. With this combined analysis this paper contributes to the ongoing debate on policy options under the health check of the CAP.

The driving forces and scenarios are described in section 2. Section 3 describes the economic modelling framework and section 4 provides the modelling results. Section 5 concludes.

[1] The abbreviation LEITAP indicates the extension of the GTAP model developed at the LEI (Landbouw Economisch Instituut) in The Hague.

Table 1. Scenario assumptions

(a) Based on the exogenous drivers

Assumptions	Demographics	Macro-economic growth	Consumer preferences	Agri-technology	World markets
Baseline	Major population trends as observed in the past	Moderate growth as seen in the trends; Increasing trend for labour market liberalisation	More demand for value added and increasing absolute spending per capita; Consumption of organic and regional food as observed in the past	Continuous trends in cost saving technical progress; Biotechnology; GMO	Outcome depends on other exogenous drivers. Trends in agri-markets, generally, as observed in OECD/FAPRI studies. Change from these trends due to different assumptions on exogenous and policy-related drivers.

(b) Based on the policy-related drivers

Assumptions	CAP			Biofuels	Enlargement	WTO and other international agreements	Environmental policies impact on agriculture
	Market policies	Direct payments	Rural development policy				
Baseline	Balanced markets, i.e. keeping public intervention stocks at 1 to 2% of domestic consumption; if stocks are too high support prices will be decreased	Financial discipline and 25% modulation	Taking into account the new financial perspective	Continuation of EU Biofuels Strategy	EU-25 plus the accession of Bulgaria, Romania	EU offer with a removal of export subsidies, tariff cuts in four tiers: tier cut 0-30 35 30-60 45 60-90 50 90+ 60 (AGRAEUROPE, 2005)	Continuation of existing environmental legislation
Regionalisation	Existing CAP	Financial discipline and 5% modulation	Significant increase in funding of rural development through all EAFRD axes	Higher policy support to produce biofuels	Baseline	No WTO agreement, but then replaced by bilateral negotiations	Reinforcement of environmental legislation
Liberalisation	No internal support policies Abolition of production quotas	Removing direct agricultural payments	Rural development is funded according to EAFRD provisions: decrease in funding of all EAFRD axes	No per hectare subsidies for biofuels	Baseline	Removing import tariffs and TRQs	Partial withdrawal of environmental legislation

Source: own calculation

2. Driving forces and scenarios

An assumption that has guided the preparation of the Scenar 2020 scenario study is that there are two levels of drivers that will influence scenario building (NOWICKI et al., 2006). The first level is a set of *exogenous* drivers; these are drivers that are not directly influenced by policies, or at least not in the time horizon of the Scenar 2020 study (that is, up to 2020). As presented in table 1, exogenous drivers are population growth, macro-economic growth, consumer preferences, agri-technology, environmental conditions and world markets[2]. The second level is a set of *policy-related* drivers, and these will certainly have a discernable effect within the Scenar 2020 time horizon. They are EU agricultural policies, enlargement decisions and implementation, WTO and other international agreements and environmental policy.

Figure 1. Schematic overview of the models: geographical and sectoral coverage

	Agricultural	Rest of economy
Global	LEITAP-IMAGE	
EU/national	ESIM	LEITAP
NUTS2	CAPRI	TSA[1] or downscaling

[1] TSA: time series analysis

Source: own compilation

Several choices have been made for the development and analysis of scenarios. The first is to have a baseline scenario that is based on the exogenous drivers. The second is that the policy-related drivers are then coupled to the baseline

[2] World markets are partly endogenous in this study as we use a global economy-wide model in which world markets are dependent on macro-economic and population developments, preferences shifts, technological change and policy changes.

scenario in three iterations. The first iteration is the *baseline (reference) scenario*, in which current policies are considered to continue into the future, with modifications over time that are reasonably certain to happen according to the current political situation. The second iteration is a *regionalisation scenario*, in which there is a sustained policy preference to promote regional economic development and social welfare; to some extent this is also an emphasis on the maximum degree of support for agricultural supply that is possible under the current, and likely, WTO framework. The third iteration is a *liberalisation scenario*, in which policy intervention in the economy – and in social welfare, including environmental protection – is reduced to the minimum that would be socially acceptable.

3. Economic modelling

In the Scenar 2020 project the commodity focus and regional / territorial focus have to be connected. [3] The global economy-wide dimension is covered by the economic LEITAP model and the biophysical IMAGE model (figure 1). ESIM is providing more agricultural detail for the EU-27 countries and CAPRI is distributing this impact to the regional (NUTS2) level. The gap in our (and the EU research community) modelling framework is what happens with the other sectors (i.e. rest of the economy) at the regional level. This is important for rural development because an agricultural decline in a region is only causing problems when there is no absorption capacity in the other sectors of the economy for the redundant agricultural labour.[4]

Description of the chain of models: LEITAP/IMAGE – ESIM – CAPRI

LEITAP is a global computable general equilibrium model that covers the whole economy including factor markets and is often used in WTO analyses (FRANCOIS et al., 2005) and CAP analyses (MEIJL and TONGEREN, 2002). More specifically, LEITAP is a modified version of the global general equilibrium GTAP model (HERTEL, 1997). Agricultural policies are treated explicitly (e.g. production quotas, intervention prices, tariff rate quotas, (de)coupled payments). Information is used from the OECD's Policy Evaluation Model (PEM) to improve the production structure (HERTEL and KEENEY, 2006) and a new land allocation method, that takes into account the variation of substitutability between different types of land (HUANG et al., 2004), as well as a new land supply curve are introduced (MEIJL et al., 2006; EICKHOUT et al., 2007). Agricultural factor markets (labour and capital) are modelled as segmented from the non-agricultural factor markets. Therefore, prices of factors employed in agriculture can develop differently from prices of factors employed outside agriculture.

The ESIM and CAPRI models are EU-27 partial equilibrium models for the agricultural sector at respectively country and NUTS2 level with a strong focus on EU common agricultural policies. A detailed description of CAPRI can be found in (BRITZ et al., 2007).

To perform the analysis, a modelling framework is constructed, existing of three economic models (LEITAP, ESIM, and CAPRI), a more ecological-environmental based model framework (IMAGE) and a land use allocation model (CLUE-s) to disaggregate the outcomes to the landscape level. In this modelling framework the long-term economic and environmental consequences of different scenarios are quantified and analysed, starting from 2005 up to 2020, for several regions in the world and all 25 EU countries. The LEITAP main contribution is in the WTO policies (affects all sectors not only agriculture) and the interaction with the rest of the economy (other industries and factor markets). ESIM's main contribution is the projection of developments in EU agricultural markets into the future. ESIM is also the only model in which we model the production of biofuels. CAPRI's main contribution is changes in CAP policies and the regional impact (NUTS2 level) and environmental impact of the scenarios.

For this article the different equilibrium models, LEITAP, ESIM and CAPRI were combined but not formally linked interactively. All scenarios are calculated for both the general and the partial equilibrium models. Basic assumptions on economic growth and annual increase in population are the same in all models, as well as assumption on the productivity growth rates which differ between countries and commodities. Changes in factor prices and world market prices are transferred from LEITAP to ESIM. Therefore, both models are based on similar assumptions with regard to policy changes. However, both models have been applied independently from each other. While the general direction of supply response is similar, some differences remain in the results of the models applied here.

4. Results

4.1 National level

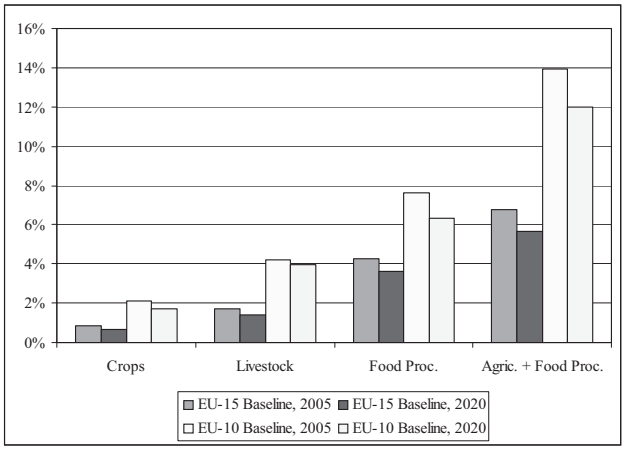
The results – from the general equilibrium model LEITAP – indicate that the structural changes, i.e. decline of agricultural contribution to total income and employment, will continue at national level. In the baseline scenario the process of structural change continues in the near future in the EU-27.

The share of agriculture and food processing industries in total income continues to fall until 2020 (see figure 2). A low income elasticity of demand (people do not eat much more if income increases) and a high rate of technical change (you need less production factors to produce a certain output) are important characteristics of the market that lead to a lower share of agriculture in GDP in a growing economy. Compared to the EU-15, the macro-economic significance of primary agriculture is higher in the EU-10 in the initial situation. Therefore, the structural change process is more severe in the EU-10 than in the EU-15 countries.

[3] Complete sets of detailed regional data were not available for the two new member states, Bulgaria and Romania, during the period of preparing data for use in the modelling exercise, and the results presented reflect this fact; thus these two countries are presented separately when the data for them have been available for analysis.

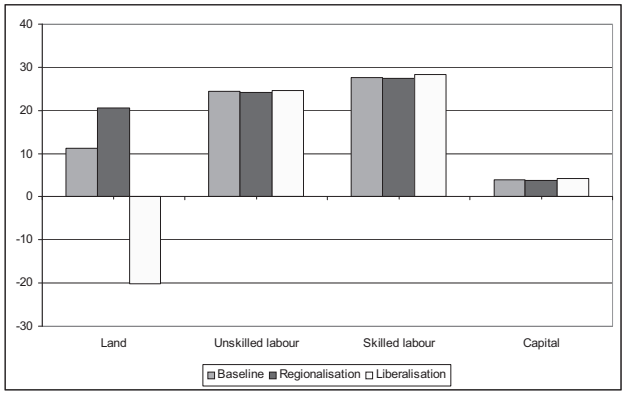
[4] In the Scenar 2020 project this gap is covered by combining empirical information on the regional (NUTS2/3 & HARM2) level from the past and projections at the national level produced by the modelling framework. It uses time series analyses to identify relations in the past and to identify relations between the national and the regional level. In this paper we do not take these effects into account.

Figure 2. Share of agriculture and food processing industries in the EU-15 and EU-10 in gross value added, 2005 and 2020 (in %)



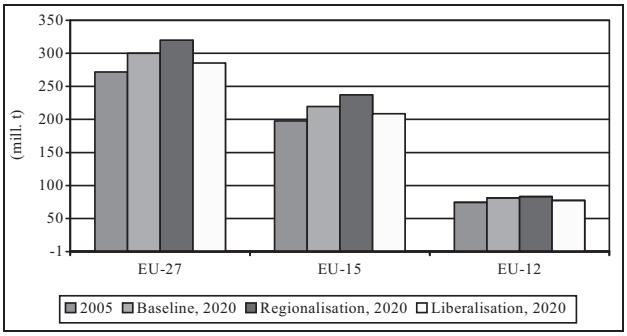
Source: own calculation

Figure 3. Development real factor prices in the EU-15, 2005-2020 (in %)



Source: own calculation

Figure 4. Production of cereals under the different scenarios in the EU, 2005 and 2020 (in mill. t)



Source: own calculation

The strong decline in contribution of agro-food industries in the EU-10 implies that more labour will be released from the agri-food sectors in these countries. Regions with high shares of agriculture and food processing industries may be vulnerable to this process with regard to employment and income growth, as the structural change process is often characterised by adjustment processes and related costs.

These employment projections heavily depend on the way labour markets for agriculture and for the rest of the economy are presented in the model. We assume that factor markets for agriculture are not fully integrated with the rest of the economy. This presentation leads to a 'stickiness' in the reaction of employment with regard to changes in wages inside and outside agriculture. Reasons for such labour market segmentation can be differences in skill levels and professional education which do not allow farmers to enter new jobs outside agriculture easily. Preferences for working in agriculture can also be a reason to assume labour market segmentation in the model.

The employment figures are in line with the autonomous structural change process. Employment in the agri-food and manufacturing industries decreases whereas it increases in the services sectors. Table 2 shows that employment effects in protected sectors (grains, sugar, beef and dairy) are more pronounced in the EU-10 countries because the higher rate of structural changes the process of catching leads to higher GDP growth rates. The impact of liberalisation is especially negative on employment in the protected sectors.

Table 2. Change in sectoral employment in the EU, 2005-2020 (in %)

	Baseline		Regionalisation		Liberalisation	
	EU-10	EU-15	EU-10	EU-15	EU-10	EU-15
Agriculture						
protected	-31.2	-8.1	-29.1	-6.7	-34.2	-10.7
unprotected	-4.1	-1.8	-4.2	-1.7	-4.7	-2.0
total	-9.6	-3.7	-9.2	-3.2	-10.7	-4.5
Industries	-13.5	-9.1	-13.3	-9.2	-14.5	-8.9
Services	5.9	8.3	5.8	8.3	6.1	8.3

Source: own calculation

The development of factor prices in figure 3 shows that, in line with historical trends, the wages of skilled labour increase more than the wage of unskilled labour and the wages in general increase relative to the rental rate of land and especially capital. The rental rate of capital rises not as quickly as the capital stock will be augmented with investments (it will not become as scarce as labour). Increase in wages is a bit higher in the liberalisation scenario and lower in the regionalisation scenario relative to the baseline scenario.

The land price is very dependent on the policy scenario. The direct payments and profitability of agriculture accrue partly in the price of the fixed factor land. In the regionalisation scenario direct payments stay highest and agriculture is more profitable relative to the other scenarios: land prices are highest. In the liberalisation scenario land prices decline fast as all direct payments are abolished and profitability in agriculture is low. The land market will have an important buffer function easing the adjustment of production.

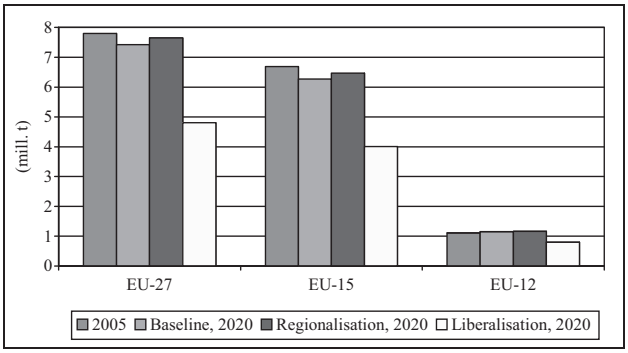
4.2 Sectoral level

Between 2005 and 2020, cereal production in the EU-27 increases by over 10 % in the baseline scenario, which is equivalent to 28.5 mill. t (see figure 4). Within cereals, wheat production grows by over 13 % (equivalent to 14 mill. t). For the

cereal market the implementation of the EU October 2005 offer leads to a further reduction in price, which predominantly affects coarse grain production, e.g., barley and rye. In order to balance domestic markets, the level of intervention prices for barley is reduced under the baseline scenario. However, the consequence of trade liberalisation is not a decline in coarse grain production but a constant production level. The falling land prices help to limit the production decline.

The general trends in livestock market in the EU-15 are similar to those at EU-27 level (see figure 5). Beef production declines slightly between 2005 and 2020 which is caused by the decline in consumption following the long-term trend. In total, beef production declines by 0.4 mill. t, i.e. 5 %. The projection indicates a slight increase in EU-15 cheese production by 0.2 mill. t. EU-15 poultry production increases by almost 10 %. On the consumption side, total meat consumption per capita increases by almost 3 % in the EU-15; but the share of beef decreases relative to pork and poultry, which is consistent with an observed shift in consumer preference.

Figure 5. Production of beef under the different scenarios in the EU, 2005 and 2020 (in mill. t)



Source: own calculation

The production results indicate a slight decline in the EU-12 cheese production under the baseline scenario (see figure 7). However, beef production is relatively constant at 1.1 mill. t in the baseline scenario and poultry production declines by 0.3 mill. t, i.e. 14 %. This different development in the EU-12 compared to the EU-15 is due to different assumptions on the rate of technical progress and on different reactions to cross price effects.

These differences between the EU-15 and the EU-12 are also reflected in the development on the consumption side (see table 3). While total per capita meat consumption increases slightly in the EU-15, per capita meat consumption increases in the EU-12 by over 14 % between 2005 and 2020.

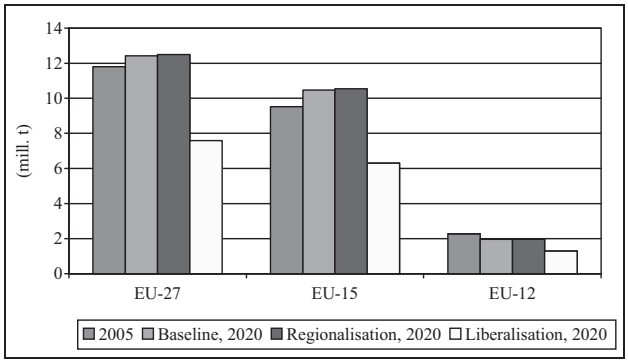
Full liberalisation with no distorting trade policy measures and a phasing out of quota restrictions leads to a significant reduction in beef and poultry meat productions. Beef production is almost 35 % less than under the baseline scenario (see figure 5). The reduction in poultry meat production of over 37 % is even more severe than under the baseline (see figure 6). The strong decline in poultry production is due to the fact that the tariff cuts for poultry under the baseline were less compared to tariff cuts for beef. The phasing out of quota regulation in combination with the reduction in the

Table 3. Consumption of meat per capita in the EU, 2005 and 2020 (in kg/capita)

		EU-27	EU-15	EU-12
Beef	2005	17.1	19.0	7.3
	2020	15.7	17.0	8.2
Butter	2005	4.4	4.5	3.6
	2020	4.2	4.4	3.4
Cheese	2005	16.9	18.1	10.8
	2020	17.3	18.3	11.7
Poultry	2005	22.6	23.1	19.6
	2020	25.4	25.5	24.5
Pork	2005	43.4	42.5	48.1
	2020	45.8	44.4	53.2

Source: own calculation

Figure 6. Production of poultry meat under the different scenarios in the EU, 2005 and 2020 (in mill. t)

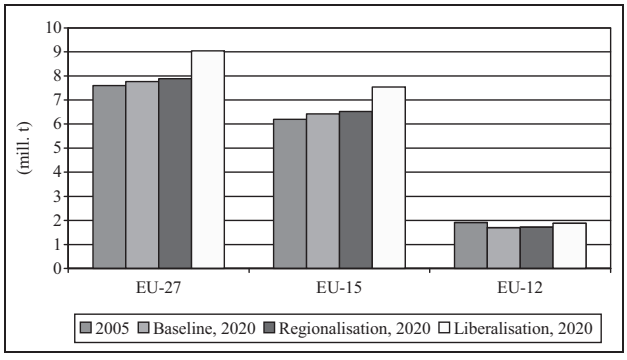


Source: own calculation

TRQ quantities results in an increase in cheese production of over 15 % in the EU-27. Milk production in the EU-15 is around 12 % higher than in the baseline, where milk quota is binding. In the EU-12, however, milk production declines after abolition of milk quotas.

With the increase in milk production in the EU-15, the production of dairy products also increases. However, cheese production expands further than butter and SMP. Therefore, some (high value added) sectors would benefit from a process of liberalisation (see figure 7). The relative

Figure 7. Production of cheese under the different scenarios in the EU, 2005 and 2020 (in mill. t)



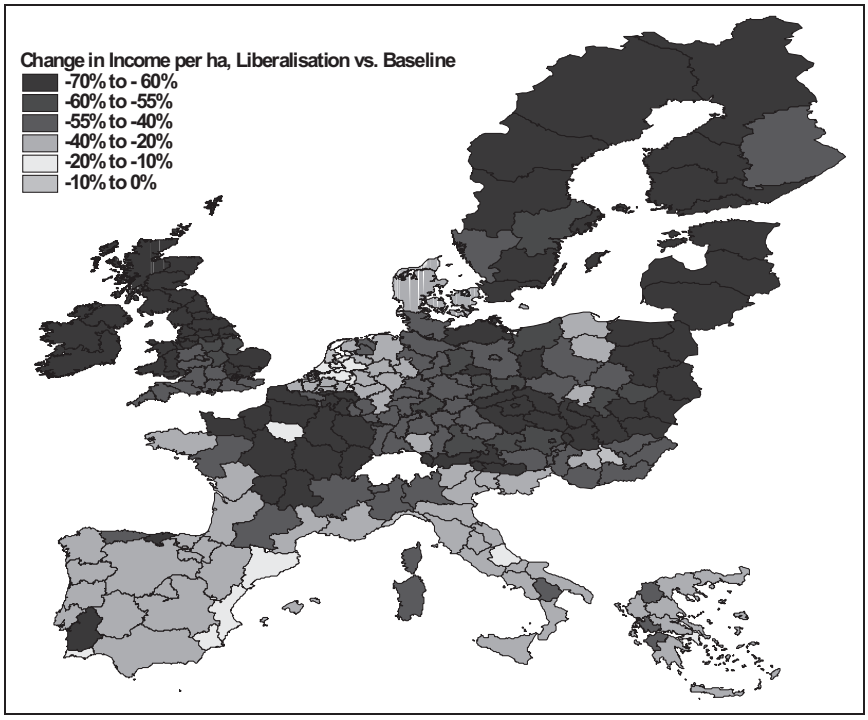
Source: own calculation

constant cheese production in the EU-12 is due to the slight decline in milk supply after abolition of milk quotas.

4.3 Regional level

The following remarks describe the results of the analysis at regional level based on the CAPRI model. Under the liberalisation scenario income decreases in all EU member states as compared to income levels in 2020 in the baseline scenario (see figure 8). The largest decreases are found in the Eastern European countries (Czech Republic, Estonia, Lithuania, Slovak Republic, Latvia), but also in Ireland, Sweden, Finland and parts of France and Germany. Abolition of farm payments and increased competition in the liberalisation scenario especially affect income in the crop and beef cattle sectors, which are important in the above-mentioned countries. The lowest impact is found in countries of the EU-15. The reasons are the specialisation in vegetables and permanent crops, other animals than beef and to a lesser extent is related to dairy cow activities. For the Netherlands, for example, the relatively large share of income from nursery crops and flowers, which are not affected by the scenarios, can be mentioned. In the northern part of Portugal the income effect is much less negative than in the south of Portugal. This is due to high income shares from intensive livestock activities and vegetables and permanent crops in this region.

Figure 8. Changes in farm income per ha: liberalisation versus baseline scenario (in %)



Source: own calculation

At this point it is also important to note that within countries and regions there are certainly large differences in income changes per farm type specialising in different types of agricultural activities. The following table 4 shows the results with respect to the number of farms per sub-sector or farm type for the EU-25. The number of farms in 2003 is taken from the Farm Structure Survey (FSS) of the Eurostat database. In the baseline scenario the number of farms in 2020 is based on extrapolation of adjusted yearly trends per country and aggregation over all countries. For the EU-12 Member States we took the annual growth rate between 1990 and 2000. The annual growth rate of the other 13 countries is based on the change between 2003 and 2005. Because of the short period this approach resulted for a lot of regions and sub-sectors into unlikely results. In these cases we decided to take two times the average annual growth of the EU-15.

The difference in the number of farms per sub-sector in 2020 in the liberalisation scenario compared to the baseline scenario is derived from income changes from CAPRI per group of activities. Activities in CAPRI are grouped according to the main activities of the sub-sector. Next, a fixed ratio between percentage change in the income per region and sub-sector and the percentage change in the number of farms per region and sub-sector is considered. This ratio is based on assumptions with respect of the fixed costs per farm and share of fixed costs in total costs.[5] It is likely that the ratio will be different per region and sub-sector. However, for reason of simplicity a uniform ratio of 1.5 is applied.

Table 4 shows that in 2003 there are about 10 mill. farms in the EU-25. More than 50% of these farms are classified as arable or vegetables and crop farms, in other words belonging to the arable or vegetables and crop sub-sector. Table 4 also shows that in the baseline the number of farms will decrease in all sub-sectors. The only exception is the other animals sub-sector. The later is especially explained by the increase in the EU-10. In the baseline the decrease in the number of farms is especially strong in the mixed livestock and the mixed crop sub-sectors. This could be explained by the tendency to specialise in a limited number of production lines as showed by the increase in the number of other animal farms. In the baseline the total number of farms in the EU-25 decreases by about 25%.

As could be expected the liberalisation scenario has a large effect on the number of farms. Compared to the baseline scenario the number of farms in 2020 will be almost 30% lower. Here again, it is expected that liberalisation results into a further increase in the number of farms specialising in the other animals sub-sector. The largest decreases in the

[5] The results of table 4 can not be compared with the employment changes from LEITAP. First of all development of the number of workers per farm can be different from the development of the number of farms. Next, results in table 4 are e.g. based on the assumption that fixed costs per farm are constant. Given e.g. the large decrease in land prices in the liberalization scenario this assumes quite some structural change. This requires time and the results in table 4 should be viewed at as number of farms in the liberalisation scenario in the somewhat longer term (after 2020).

Table 4. Number of farms per sub-sector in 2003 and in 2020 in different scenarios (in mill. farms)

Sub-sector	2003	2020		Difference (%)		
		Baseline	Liberalisation	Baseline	Liberalisation	Liberalisation
	(in mill. farms)			vs. 2003	vs. baseline	vs. 2003
Arable crops	2.3	1.4	0.9	-37.4	-35.4	-59.6
Vegetables and permanent crops	2.8	2.6	2.1	-7.9	-19.1	-25.4
Cattle activities	1.8	1.5	0.7	-19.6	-53.0	-62.2
Other animals	0.4	0.6	0.7	74.3	15.5	101.3
Mixed livestock farms	0.7	0.2	0.2	-64.4	-30.4	-75.2
Mixed crop farms	0.8	0.1	0.1	-88.1	-18.8	-90.3
Other livestock and crop farms	1.2	1.0	0.6	-15.3	-39.9	-49.1
Total	10.0	7.5	5.3	-25.4	-29.1	-47.1

Source: own calculation

number of farms are found in the cattle activities and the mixed livestock and crop sub-sectors.

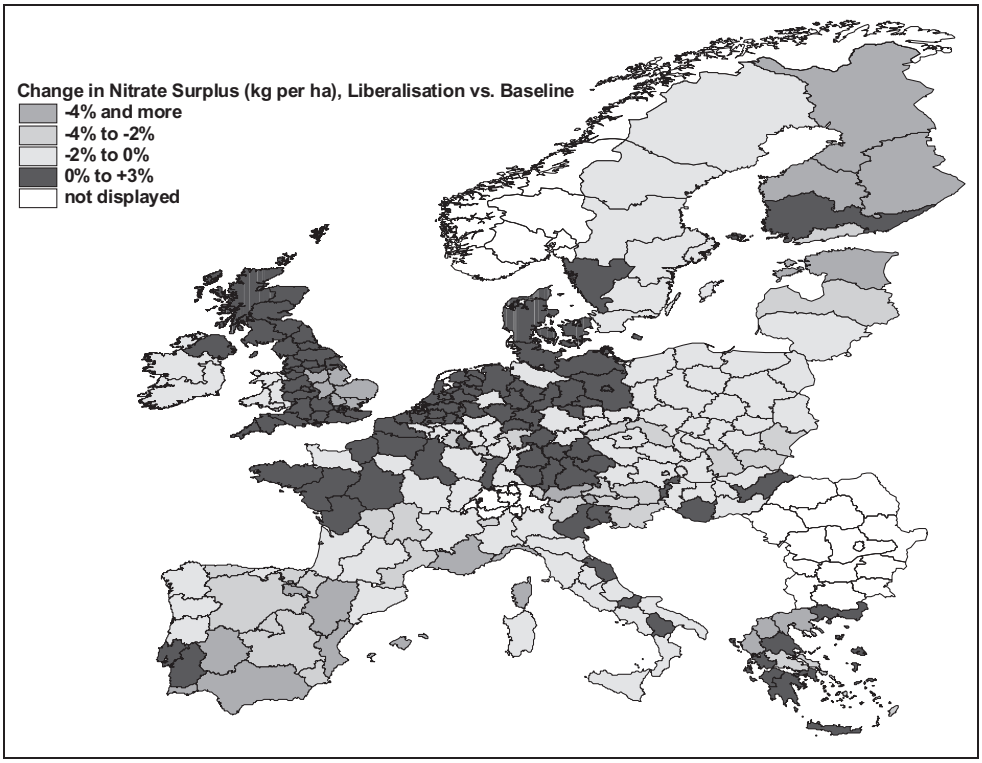
The effect of the scenarios on the nitrate balance as compared to the baseline is limited for the EU-25. Figure 9 shows the effects of the liberalisation scenario. The regional picture is rather diverse and complex. An increase is expected in northwest Europe, including the Netherlands, Belgium, parts of Sweden and parts of France and United Kingdom. Also in parts of Italy, a limited increase in nitrate surplus per ha is expected. In general the explanation is the increased application of nutrients from animal manure and mineral fertiliser. Increased application of nutrients from animal manure follows the increased livestock densities regionally (other animals, and dairy cows due to quota abolition). In the Netherlands, East Anglia (United Kingdom) and Norra Mellansverige (Sweden) the application of nutrients is further stimulated by a technology switch from extensive grassland to intensive grassland.

In the rest of Europe a decrease in nitrate surplus per ha is expected. Here the application on nutrients from animal manure decreases as the decrease in the number of beef cattle outweighs the increase in the number of other animals and possibly dairy cows. Moreover, regions with decreasing nitrate surpluses per ha experience a relatively large increase in low input crops, including fallow land.

4.4. Impact of border and domestic support on production and income

The following figure presents the results of the decomposition of the production growth for relatively protected agricultural products. The decomposition method enables to identify the impact of changes in specific assumptions. For this analysis the focus is on the impact of changes in domestic (e.g. direct payments) and border support (import tariffs and export subsidies) on production while all the other assumptions are aggregated in a third category. In figure 10 production growth of protected products (grains, oilseeds, sugar, beef and dairy) is 4.9% in the base scenario. The contribution of domestic policies is -0.5% and of border policies is -2.4%. The contribution of the changes in all other assumptions (e.g. macro shocks such as growth in technological change and endowments) is 7.7%.

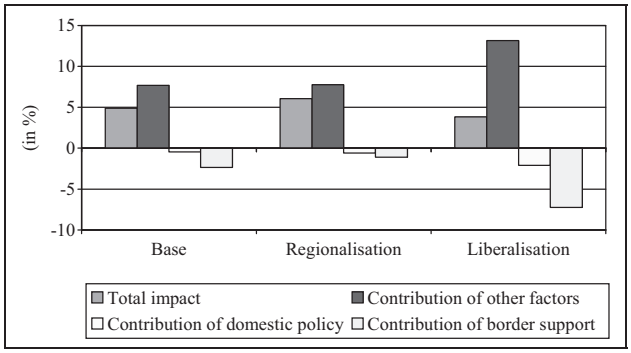
Figure 9. Changes in nitrate surplus (kg per ha): liberalisation vs. baseline *(in %)*



Source: own calculation

In general, EU-15 production growth of products with protection is low in all three scenarios. This is mainly due to the low income elasticity of demand. The production growth of protected products is highest in the regionalisation scenario and rather small in the liberalisation scenario. The contribution of changes in *domestic* support is negative in all scenarios. In the base and regionalisation scenario this is due to de-

Figure 10. Decomposition of production growth of protected agricultural products, EU-15, 2005-2020 (in %)



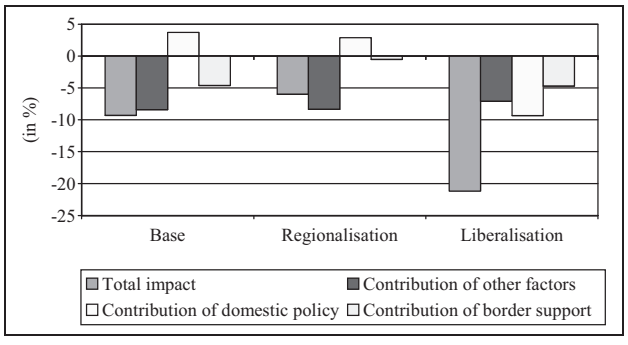
Source: own calculation

coupling that partly redistributes payments from protected commodities to less protected commodities and give them a competitive advantage. In the liberalisation scenario the negative impact is even higher due the complete withdrawal of all domestic support. The contribution of changes in *border* support (export subsidies and import tariffs) is negative in all three scenarios. The impact is limited in the regionalisation scenario for the EU-15 countries because the only change in border support is due to the enlargement, Mid-Term Review of 2003 and the sugar reform. In the base and liberalisation scenario the impact is more pronounced due to global liberalisation agreements. In the base scenario border support is reduced according to the EU WTO offer and in the liberalisation scenario all border support is abolished. The latter has a severe negative impact for the production of protected commodities. The decomposition of these effects clearly identifies that the abolition of border support has a higher impact on production than the abolition of domestic or income support.

In the EU-15 income growth in the crops sectors is negative within the period 2005 to 2020 (see figure 11). This development is mainly determined by policy changes and other factors such as technical progress. The decline in real prices is caused by a relatively high rate of technical progress and by an inelastic demand for these commodities. The strong decline in farm income under the liberalisation scenario is mainly caused by the withdrawal of income support.

In the base and regionalisation scenarios the impact of domestic support is limited because of continued income

Figure 11. Sector income growth for crop sectors in EU-15, 2005-2020



Source: own calculation

support in these two scenarios (this is the case although modulation occurs in the baseline scenario as it is assumed that second pillar payments continue to be distributed within the agricultural sector). The positive impact is caused by the introduction of dairy and sugar payments and decoupling. Similar to the development in the crops sectors, income from livestock production declines in all scenarios in the EU-15. Under the baseline scenario the decline in income for livestock products in the EU-15 is due to the cut in border support. Other factor and domestic policy measures have only a limited impact on the development of income for the livestock sector in the EU-15. The higher border protection assumed under the regionalisation scenario contributes to a smaller decline in income from livestock. The abolishment of direct payment under the liberalisation scenario contributes significantly to the decline in income for this commodity group.

4. Conclusion

In terms of policy option the paper shows that structural change process in agriculture is a long-term process that continues even under a scenario with minor policy changes as modelled under the regionalisation scenario. A low income elasticity of demand and high rate of technical change lead to a lower share of agriculture in GDP and less but bigger farmers in a growing economy. Under a more advanced policy reform scenario, such as the liberalisation scenario, EU agriculture is facing an increasing diversity of structure and structural adjustment. The livestock sector faces important challenges and restructuring. Alternative policy settings may not produce very different effects on the overall production as the labour and especially land markets ease the process of adjustment. Land prices will decline and keep production therefore relatively competitive.

The results show that the reduction of border support has a higher impact on agricultural production than the reduction of domestic income support. On the other hand, reducing domestic income support has a larger impact on farm income than the reduction of border support. The process of liberalisation has a greater impact on agricultural income than on agricultural production and land use; this fact consolidates the structural pressure throughout Europe to decrease labour in farming and to increase the average farm size

The development of world market prices and bio-energy are identified as two crucial uncertainties for the future in Scenar 2020. It should be mentioned that none of the model results is based on the assumption of the current prices for inputs, such as fossil energy and agricultural output. The results of the partial equilibrium models applied here (ESIM and CAPRI) are based on long-term price projection which does not assume a persistence of high agricultural prices until 2020.

A methodological limitation is that the models in are only "loosely" linked in this paper. A formal linking of partial and general equilibrium models might be desired in the future to increase the consistency of results. Another important limitation is related to the economic development of non-agricultural sectors at regional level. More qualified quantitative models are required to address the questions whether region with a high labour surplus from structural

change in agriculture will be able to absorb this capacity at regional level or not. This analysis could be bases on regional input/output models or on regional general equilibrium models which explicitly cover non-agricultural sectors.

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