vTI-Baseline 2009 to 2019: Agri-economic projections for Germany

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Abstract

This article presents selected results of the vTI-Baseline as well as the underlying assumptions. The vTI-Baseline is established using and combining four models (GTAP, AGMEMOD, RAUMIS, FARMIS) of the vTI model network. It provides a reference scenario for the analysis of the impacts of alternative policies and developments.

The projections are based on data and information available in summer 2009 and are thus characterised by the recession following the global financial crisis. The baseline assumes a continuation of the current policy framework and the implementation of the already agreed upon policy changes, respectively. According to the projections, the EU share in global agricultural trade rises from 16 % in 2004 to 19 % in 2019. Due to the reduced policy interventions in the milk market, the projected low world market prices for milk products affect the milk farm gate price in Germany, which in the baseline is 27 Euro/100 kg (3.7 % fat, excl. VAT) in 2019. Prices for other livestock products increase slightly. The prices for crop products benefit from a policy-induced demand for bioenergy, and while lower than the high prices observed in 2008, they will remain above the 2003 to 2005 period. In Germany, policy support for biomass production is the main driver for changes in agricultural land use. In the baseline, 1.2 million hectares are used for growing energy maize in 2019, at the expense of land subject to obligatory set-aside until 2007 as well as cereals and oilseeds. Milk production is slightly increasing because of milk quota abolishment. In comparison to the base period 2006 to 2008, farm net value added per work unit stagnates in real terms, and thus remains slightly above the average level observed during the last decade. Income in dairy farms (-6 %) and other grazing livestock farms (-6 %) decreases, while pig farms (+21 %) benefit from rising pork prices and lower feeding costs.

Keywords: agricultural policy, impact assessment, modelling, Germany

Zusammenfassung

vTI-Baseline 2009 bis 2019: Agrarökonomische Projektionen für Deutschland

Die vTI-Baseline ist eine auf den deutschen Agrarsektor fokussierte modellgestützte Projektion der erwarteten Entwicklungen auf der Grundlage der im Sommer 2009 vorliegenden Daten und Informationen. Die vTI-Baseline stellt eine Referenzsituation für die Analyse von Auswirkungen alternativer Politiken und Entwicklungen dar.

Die Projektion für den Zeitraum 2009 bis 2019 steht im Zeichen der Rezession infolge der Finanzkrise und einem anschließend gemäßigten Wirtschafts- und Nachfragewachstum. Der Anteil der EU am Weltagrarhandel steigt von 2004 bis 2019 von 16 auf 19 %. Aus externen Projektionen der Weltmarktpreisentwicklungen leiten sich für Deutschland niedrige Erzeugerpreise für Milch (3,7 % Fett, ohne MwSt.) von knapp 27 Euro/100 kg ab; dennoch wird die Milcherzeugung bis 2019 nicht zuletzt durch den Wegfall der Quotenregelung leicht ausgedehnt. Die politisch induzierte Nachfrage nach Bioenergie stabilisiert die Preise in den pflanzlichen Sektoren. Hinzu kommt in Deutschland die Förderung des Biomasseanbaus zur Energiegewinnung infolgedessen nach den Modellergebnissen bis 2019 etwa 1,2 Mio. ha für den Energiemaisanbau genutzt werden. Rund die Hälfte der hierzu benötigten Fläche kann durch den Wegfall der bis 2007 obligatorischen Flächenstilllegung gedeckt werden. Weitere rund 600.000 ha gehen hauptsächlich zulasten der Getreide- und Ölsaatenfläche. Im Vergleich zum Basisjahrzeitraum (2006 bis 2008) stagniert das durchschnittliche Betriebseinkommen pro Arbeitskraft. Es liegt damit leicht über dem mittleren Niveau der letzten zehn Jahre. Die Einkommensentwicklung weist Unterschiede zwischen den Betriebsformen auf. Während die Einkommen in Milchviehbetrieben (-6 %) und sonstigen Futterbaubetriebe (-5 %) rückläufig sind, profitieren Veredlungsbetriebe (+21 %) von steigenden Schweinefleischpreisen und günstigeren Futtermitteln.

Schlüsselwörter: Agrarpolitik, Politikfolgenabschätzung, Modellierung, Deutschland

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1 Introduction

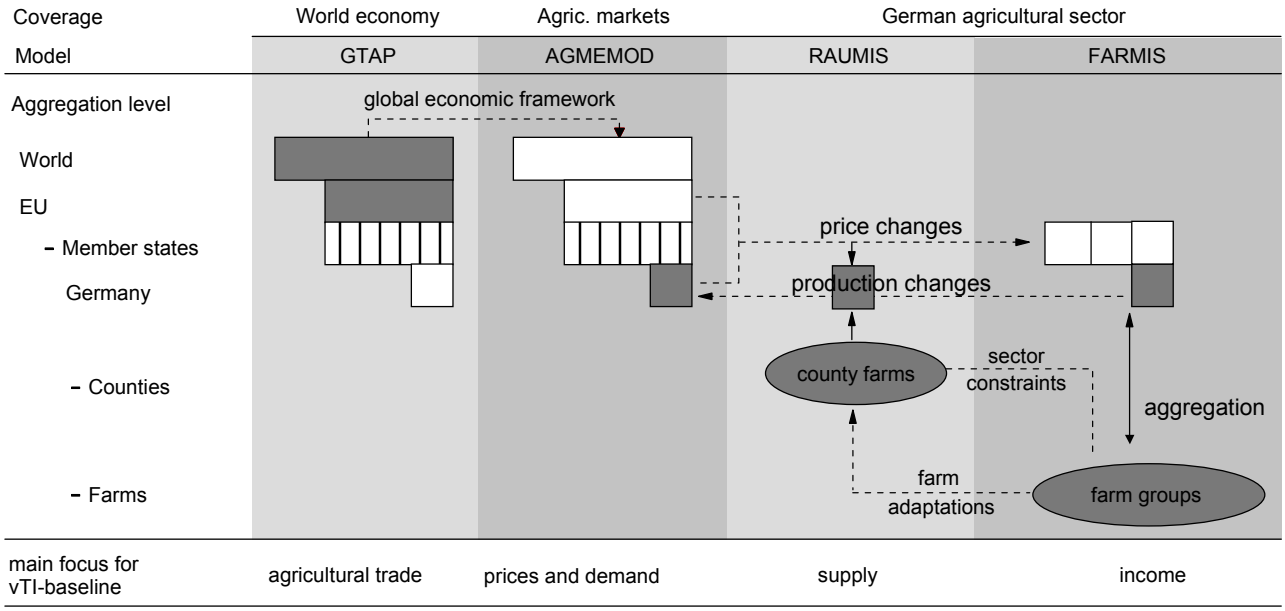
Many international organisations regularly publish baseline reports (e.g., the agricultural outlook reports of the European Commission, 2009 and the OECD/FAO, 2009). However, the term 'baseline' is often misunderstood, and the frequently lengthy preambles in respective reports explaining what a baseline is (or rather what it is not) are evidence to the existing ambiguities. It is therefore important to stress that the vTI-Baseline is not a forecast about the future. Rather, the baseline describes expected developments when maintaining current policies under an explicit set of assumptions with respect to the development of exogenous factors. The vTI-Baseline thus provides a reference for the analysis of alternative policies and developments.

This article presents and discusses selected results of the vTI-Baseline 2009 to 2019 as well as the underlying assumptions.[1] The projections are based on data and information available in summer 2009. At that time, the projections on the developments of the global economy and the prices for oil and agricultural products were characterised by the – still partly unforeseeable – impacts of the global financial crisis. The results of the vTI-Baseline 2009 to 2019 and the differences compared to the vTI-Baseline 2008 (Offermann et al., 2008) need to be interpreted against this background.

The assumptions regarding the development of exogenous factors and the policy framework in the baseline were defined in close cooperation with experts from the German Ministry of Food, Agriculture and Consumer Protection, and preliminary baseline results were discussed in a circle of representatives from the federal as well as Laender ministries. Besides using expert knowledge for the establishment of the vTI-Baseline, the main goal of this procedure is to define a baseline scenario that is widely accepted as a basis for subsequent policy impact analyses.

2 Methodology

The vTI-Baseline is established using and combining four models of the vTI model network (Bertelsmeier et al., 2003). This network consists of mathematical-economic simulation models covering different levels and aspects of the agricultural sector (Figure 1).



Source: Own illustration.

Figure 1:
The use of models of the vTI model network for the establishment of the vTI-Baseline 2009 to 2019

[1] The full report with detailed results is published as Offermann et al. (2010), and is available with coloured graphs for download.

The GTAP model is a multi regional general equilibrium (GE) model for comparative static analyses. It provides a detailed representation of the economy of a country or group of countries including the linkages between farming, agribusiness, industrial and service sectors of the economy.[2] The standard GTAP model is complemented with an explicit modelling of the instruments related to the Mid Term Review (MTR) reform of the EU (Brockmeier and Pelikan, 2008). Following the approach of Brockmeier (2005) the EU budget is included which covers the expenditures and revenues of the European Agricultural Guidance and Guarantee Fund (EAGGF). Version 7.0 of the GTAP database is applied for the analysis at hand. This version contains complete bilateral trade information, transport and protection data of 113 regions for 57 commodities from the year 2004.

AGMEMOD is a partial equilibrium (PE) model capturing the heterogeneity of European agriculture across Member States (MS) while at the same time enabling projections and simulations of the Common Agricultural Policy (CAP) as well as of national agricultural policies in a consistent and harmonized way for the whole EU (Salamon et al., 2008; Chantreuil, 2005). Individual econometric or synthetic models of the EU Member States or likely accession countries are linked-up to provide an integrated model for the whole EU. Each country model has been built up and verified by multidisciplinary teams based on common rules for data, model design and underlying assumptions. Based on this concept, annual projections for each commodity for a ten-year horizon, for each country, and for the whole EU are generated.

The regionalized agricultural and environmental information system RAUMIS (Henrichsmeyer et al., 1996; Kreins et al., 2010) is employed to analyse medium and long-term agricultural and environmental policy impacts. The model consolidates various agricultural data sources with the national agricultural accounts as a framework of consistency. It comprises of more than 50 agricultural products, 40 inputs with exogenously determined prices, and reflects the German agricultural sector with its sector linkages. According to data availability, the spatial differentiation is based on administrative bodies, i.e., 326 regions (NUTS III level) treated as single "region farms." Production adjustments caused by changes in the general framework conditions such as agricultural policies are determined by using a mathematical programming approach (Howitt, 1995) with a non-linear objective function that maximizes the regional farm income (Cypris, 2000).

Farm level aspects are covered by FARMIS, a process-analytical programming model for farm groups (Osterburg et al., 2001; Bertelsmeier, 2005; Offermann et al., 2005) based on information from the farm accountancy data network (FADN). Production is differentiated for 27 crop and 15 livestock activities, and the model is calibrated to observed production decisions using a positive mathematical programming approach. For this study, the model specification is based on data from the accounting years 2005/06, 2006/07 and 2007/08. The farm sample was stratified by region, type, system and size, resulting in 631 farm group models. Results are aggregated to the sector using farm group specific weighting factors.

[2] The framework of the standard GTAP model is well documented in Hertel and Tsigas (1997) and available on the Internet (www.gtap.agecon.purdue.edu).

3 Assumptions

The vTI-Baseline uses forecasts of the global economic development provided by the World Bank (2009), the EU Commission (2009) and a project group of the German Federal Ministry of Economics and Technology (BMWi, 2009). In addition, projections of the Food and Agricultural Policy Research Institutes (FAPRI, 2009) are employed for the assumptions of world market prices as well as the development of factor prices and factor endowments of the German agricultural sector.

3.1 General economic framework

The vTI-Baseline 2009 builds on external projections for macroeconomic developments from 2009 to 2019. Here, the growth rates of the gross domestic product (GDP), the population growth, the capital growth and the development of skilled and unskilled labour are taken into account. Methodology and data used for this study are based on Walmsley et al (2006) and were adjusted mainly with respect to the development of the GDP necessary to account for the recession of the world economy.

During 2009 to 2019, it is assumed that the exchange rate is between 1.47 Dollar/Euro and 1.39 Dollar/Euro and the average inflation in Germany is about 1.6 %. For the agricultural factor endowments in Germany an annual reduction of -0.1 % for the area of land, -3.9 % for family labour and -3.4 % for the number of farm holdings is assumed. Furthermore, most agricultural input assumptions are based on historical trends from 1991 to 2008. For energy inputs, the oil price projections used in the FAPRI-outlook (FAPRI, 2009) are applied. Because of the extreme price volatilities during the last two years, nitrogen fertilizers are also linked to the price forecasts of oil. The same assumptions on factor endowments and structural changes are made for conventional and organic farming. While it is assumed that the price gap between prices of organic and conventional plant products decreases, the price gap between organic and conventional animal products increases.

3.2 World market prices for agricultural products

Exogenous world market price projections[3] from the 2009 FAPRI outlook[4] (FAPRI 2009) are used as a basis for the calculation of price figures in AGMEMOD for the vTI-Baseline 2009 to 2019. In general, world market price projections in the 2009 Outlook, but also the new 2010 Outlook (FAPRI 2010), are lower than in the previous year. Whereas in 2007, and up to the middle of 2008, prices had been booming driven by high economic growth and by an additional policy-induced bioenergy demand as well as by some production shortages (e.g., milk). Ample worldwide supplies and lower demand, still shaped by the economic crisis, curbed the consumption prospects, although additional policy-driven bioenergy demand affects arable sectors. Prices differ markedly between the different types of cereals in the FAPRI projections, especially when it comes to wheat and coarse grains. The leading price is wheat followed by lower maize prices contrasting the additional demand for bio ethanol. Due to an increased competition in land use induced by bio energy targets, prices for cereals and oilseeds, respectively vegetable oils, will rise over the mid-term, hence, prices for oil meals will evolve less distinctively as feed demand will not increase as strongly.

Not only lower demand by reduced economic growth but other factors like sanitary trade measures, aspects of food risks and traceability, as well as higher supplies, affect the international markets of animal products towards a down-grading of international prices following the hype in 2007 and 2008. In general, the fall of prices in 2008/09 was less pronounced for meat than for crop and dairy products. In the mid-term, slightly higher feed and opportunity costs for land as well as the likely economic recovery induce slightly higher world market prices for animal products. In contrast to the arable crops, no additional demand for renewable production is expected, limiting the scope for price increases. Hence, in the 2009 FAPRI Outlook, international markets of dairy products faced a worldwide production expansion and weakness in demand after the shortage driven peak in 2007 and 2008. Thus, the dairy sector experienced the biggest price drop but the projections indicate a recovery of international prices in the medium term. Prices of products with higher protein content (cheese) were expected to list higher than products with a greater fat content. Considering butter and skimmed milk powder, the calculated world market price of milk in 2019 would be 20 Euro/100 kg. Hence, as in some regions production does not come up to expectations, and demand recovery was stronger in the emerging countries in the 2010 Outlook the prices have been revised upwards. In all, due to the more rapid economic recovery the applied exogenous price projection can be characterized as the lower end of a likely price band.

3.3 Policy framework

The baseline assumes a continuation of the current policy framework and the implementation of the already agreed upon policy changes, respectively. This implies mainly the implementation of the Health Check decisions and other context-related policy measures. The most important policy assumptions of the baseline can be summarized as follows:

- Trade policy framework: The adjustment of the trade policy conditions comprises the EU accession of Bulgaria and Romania in 2007 as well the WTO accession of Ukraine in 2008. Furthermore, it is assumed that the Everything-But-Arms (EBA) initiative of the EU is fully implemented by 2010.
- Price policies: In the baseline, the market policies agreed upon in the 2003 CAP reform are fully implemented. This implies a reduction of the reference price for butter and skimmed milk powder. Internal disposal aids for dairy products and intervention prices for maize and barley are reduced to zero.
- Quota policies: The baseline takes into consideration a 2 % increase in milk quotas from April 2008 as well as a further increase of 5 % between 2009/10 and 2013/14. In view of the current policy positions, it is assumed that the milk quota will be phased-out in 2015. The baseline also takes into consideration the renouncement of sugar quotas within the restructuring scheme.
- Direct payments of the first CAP pillar: By 2013, the existing German hybrid model will be transferred to a regional flat rate model with an expected average payment of 344 EUR/ha varying from 259 EUR/ha in Saarland to 368 EUR/ha in Lower-Saxony. The baseline is based on the assumption that the corresponding budgetary funds are not reduced until 2019 so that the area payments will not change between 2013 and 2019. Modulation is implemented as agreed in the Health Check.
- Support measures of the second CAP pillar: Trend coefficients have been derived for the baseline by comparing the expenditures of the past support period from 2000 to 2006 with the planned expenditures of the current programming period. The baseline takes into consideration additional EU-funds for EAFRD measures as agreed in the Health Check. On average, it is assumed that investment aids increase by 41 % compared to average yearly expenditures between 2000 to 2006,

[3] All price developments refer to nominal prices.

[4] Recently a new FAPRI Outlook (2010) was made available and major differences are briefly discussed.

while LFA and agri-environmental measures decrease by 12 % and 8 %, respectively. Changes in payment rates may however vary substantially between individual federal states.

– Support for bioenergy: Electricity stemming from biogas is supported in Germany by the Renewable Energy Sources Act (EEG), which guarantees a certain price for electricity generated from renewable energy sources. It is expected that the regulations and guarantees in force at the beginning of 2009 are still valid in the target year of the analysis. Furthermore, it is assumed that the target of 10 % for the share of biofuels is achieved by 2019, resulting in an additional demand for energy crops such as wheat and rapeseed.

4 Results

4.1 Changes in agricultural trade pattern

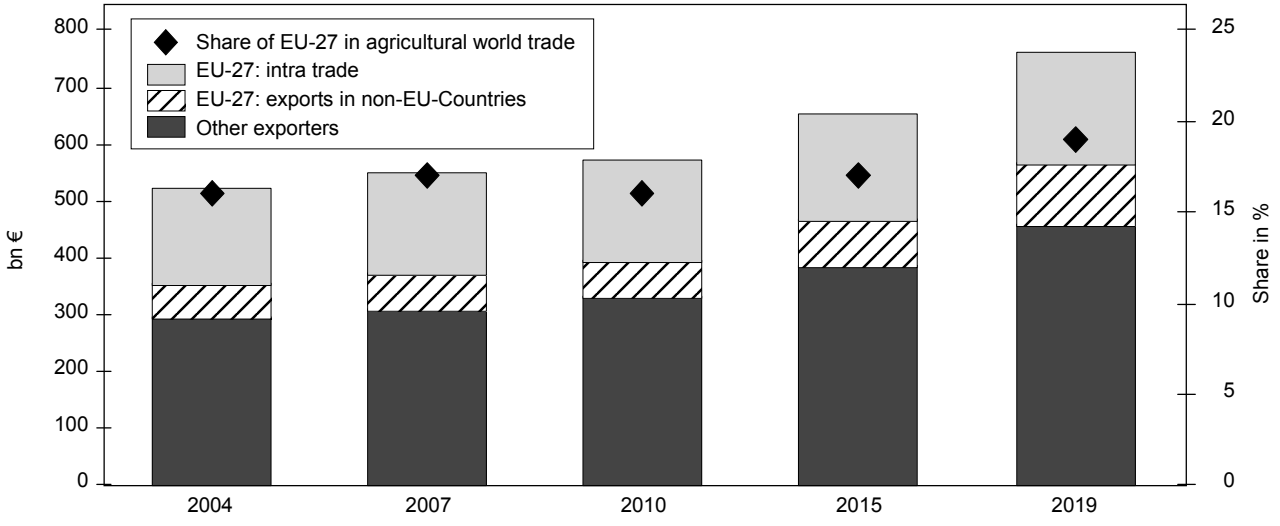
The implementation of trade policies and the assumptions on the macroeconomic development lead to changing trade flows in the baseline. Figure 2 shows how world agricultural trade evolves from 2004 to 2019. Here, the exports of the EU are presented as a share of the trade values of all exporters. In addition, it is distinguished between intra-EU trade and exports of the EU to other countries. In the base year 2004 the intra-EU trade is three times larger than the trade with non-EU countries.

While in 2004 the value of EU exports agricultural products was about 56 billion Euro, this value rises up to 109.7 billion Euro in 2019. Herewith, the export share of the EU in world agricultural trade rises from 16 to 19 %. How can the projected export growth in the EU be explained? Figure 3 presents countries and regions that are destinations of EU exports. In 2004, the USA and the group of the developing countries (rWTO_DC) are the most important importers of agricultural commodities produced in the EU. In the ten-year time period trade with some countries strongly increases, while trade with other countries remains at a relatively constant level or even decreases.

Until 2019, the exports from the EU increase particularly, to the group of developing countries (rWTO_DC) and to China. A sector specific disaggregation of agricultural trade shows that the substantial export growth to these countries is based on their increasing demand for poultry, pork meet as well as beef. The group of developing countries (rWTO_DC) will additionally increase their imports of milk products and wheat from the EU.

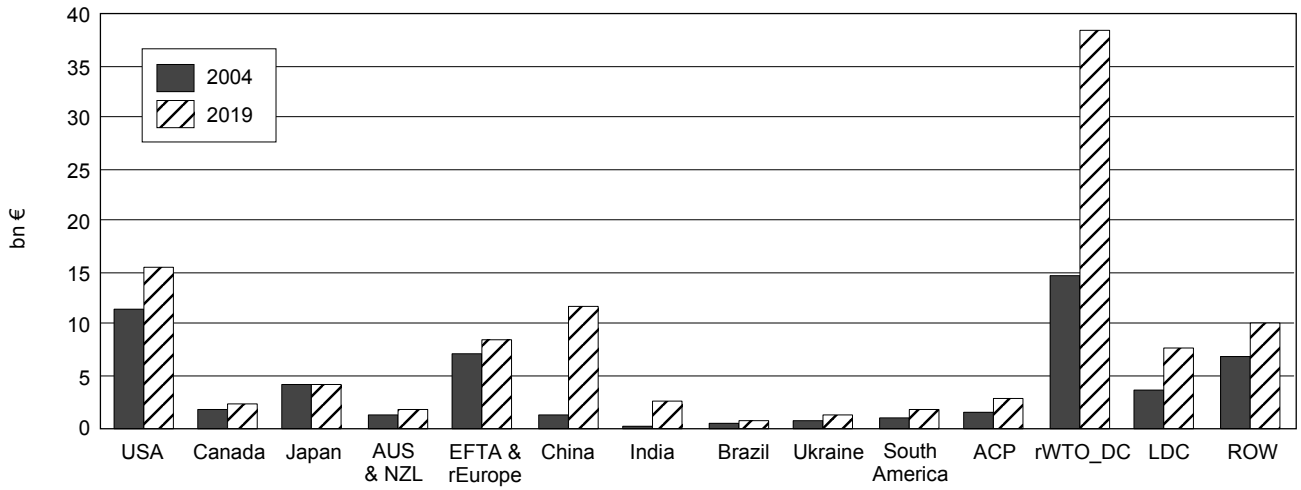
A clear increase in the value of EU exports can also be observed to the USA, to the Least Developed Countries (LDCs) and the rest of the world (ROW). While the LDCs and the rest of the world increase their imports of EU meat products and other processed food, the export growth to the USA is mainly due to „other crops". Under this category fall, for example, green plants, cut flowers or seeds.

Imports from almost all countries to the EU decrease. This effect is caused by various assumptions in the baseline. For example, negative population growth within the EU leads to a reduced import value. Only the LDCs can increase their exports to the EU as a result of the EBA initiative.



Source: Own calculations with GTAP (2009).

Figure 2:
Share of EU-27 in agricultural world trade (exports without EU-27 intra-trade)



1) AUS & NZL: Australia and New Zealand; EFTA: European Free Trade Association; ACP: Countries of the African, Caribbean and Pacific Group; rWTO_DC: Countries in the WTO with developing country status less the countries that are presented separately; LDC: Least Developed Countries; ROW: Rest of the World, Countries without WTO membership.

Source: Own calculations with GTAP (2009).

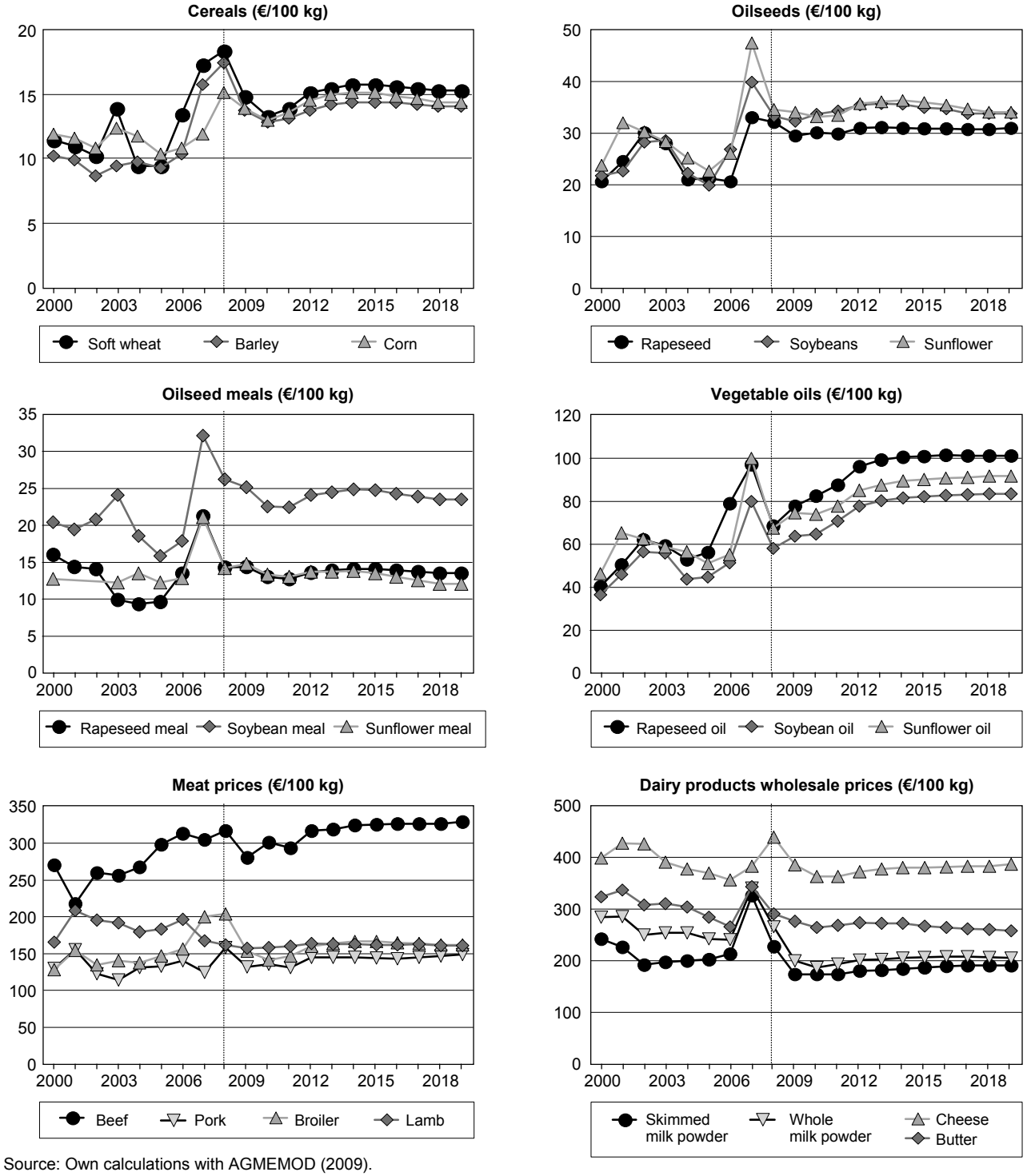
Figure 3:
Agricultural exports of EU-27 in 2004 and 2019

By interpreting these results it should be noted that solely the already agreed trade policies are considered in the baseline. Therefore, the WTO negotiations of the Doha Round, for example, were not implemented yet. Hence, the baseline reflects a situation in which the EU still pays export subsidies and implements tariffs, e.g., on an average of 134 % on sugar or 66 % on beef imports. By maintaining this level of protection, the EU can increase exports for most agricultural products. With ongoing trade liberalization, the EU will only be able to export those commodities that are produced at competitive costs.

4.2 Farm gate prices

In general, the vTI-Baseline 2009 to 2019 has been driven by a slump in demand due to the financial crisis and the relatively low prices on world markets. Notwithstanding lower energy prices, German arable sectors are heavily influenced by the politically induced demand of feedstocks of biofuels, through the obligatory blending of biofuels into fossil fuel, and the fixed remuneration for electricity stemming from biogas plants according to the EEG. In Germany the main feedstock currently used is rapeseed for biodiesel, while silage corn is used for biogas and wheat in ethanol processing. Compared to previous years, when those additionally demanded quantities induced price increases, in the 2009 baseline, the additional demand stabilized prices of crops in the course of the economic crisis. In the mid-term, one can expect an increase of domestic prices following the world market prices prevailing higher than intervention price (Westhoff et al., 2008), but they will not be lower than in the 2008 baseline (Figure 4). Since 2008, the price levels of all cereals have declined markedly in Germany. Following a consolidation of two or three years, the prices increase again with the economic recovery whereas wheat prices are especially positively influenced by the demand of ethanol processing, as the use of ethanol in fuels has lagged behind and will have to catch up in order to reach targets. By contrast, the prices for coarse grain increase less. In principle, the situation in the German oilseed market is comparable except for the fact that processing of biodiesel is much closer to the mandates specified by the Biofuel Quota Act broken down to distinct feedstocks. Already in recent years mandates induced very high prices for vegetable oils, and especially for rape oil. However, the scope for over-proportional price increases is limited because imports of required quantities of oilseed or oils are easily possible due to broad substitution between oil types and negligible trade measures. Lower demand potentials of oil meals compared vegetable oils narrow prospective for prices increases in meals, and at the same time for the oilseed themselves.

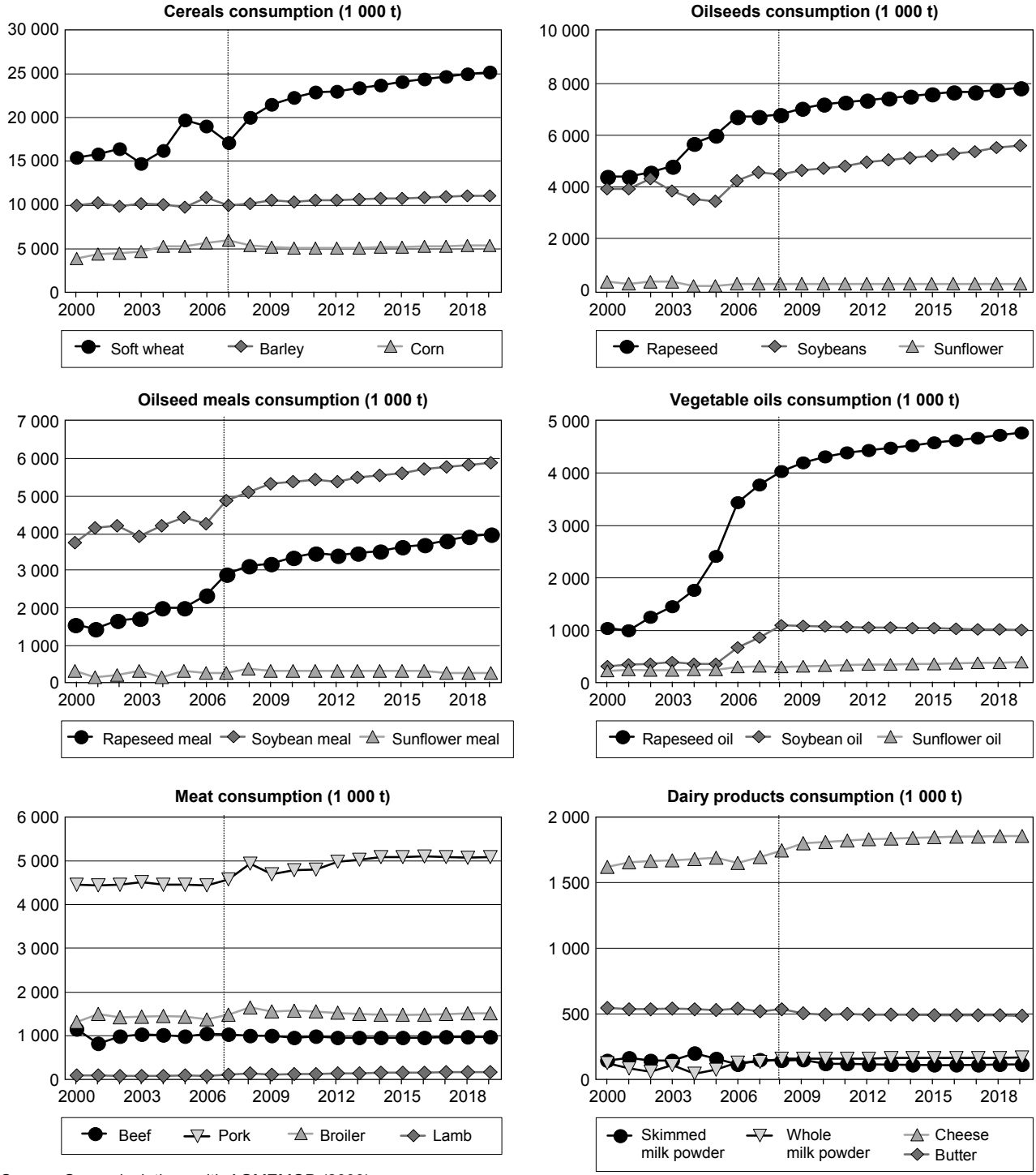
Among the German sectors of animal products, the dairy sector was affected most prevalently by demand cutbacks and deterioration of international prices, but at the same time by some production increases occurred by a more intensive use of the milk quota. Curbed domestic and international demand, the cut in the intervention pric-



Source: Own calculations with AGMEMOD (2009).

Figure 4:
Development of farm gate prices in Germany

es and a very restrictive deployment of export refunds lead to a comparably low price of raw milk of about 26.8 Euro per 100 kg milk with 3.7 % fat and 3.4 % protein (excluding VAT) in 2019. For producers the price is 28.3 cent per kg with natural fat and protein content whereas reduced prices for inputs also reduce production cost compared to 2007/08. In general, the price decline following the recession is stabilised by the price of protein as the world market price of skimmed milk powder will exceed the EU intervention price. Processing of dairy products follows



Source: Own calculations with AGMEMOD (2009).

Figure 5:
Development of domestic consumption of agricultural products in Germany

demand, consequently manufacturing of fresh milk products and cheese is expanded while production of other products is reduced or remains unchanged. In the other animal sectors, prices are less strongly affected by the recession. Following the long-term trend, declining numbers of dairy cows reduce the beef supplies in Germany slightly stronger than a cutback in demand implying a very slight price recovery. Except for sheep meat, intensive technical progress characterises the other meat sectors, which enables production growth and price reductions. Favourable

feed prices and increased piglet imports from European neighbours like the Netherlands and Denmark allow expansions in production. Despite positive demand developments, these production increases likewise curb prospects for price rises with pigs and poultry.

4.3 Demand

In Germany, declining population and recession implies only a very slight demand growth for most product groups. By contrast, demand for wheat rises strongly due to the policy induced feedstuff demand in processing of bioethanol while demand for maize and especially barley is evolving restrainedly. Hence, one has to keep in mind that targets for renewable energy have been broken down by fixed shares with some expert adjustments. In the midterm, usage shares of different cereals in ethanol processing will be distributed more equally than now anticipated, whereas technical presuppositions still need to be created. Nevertheless, raw material or processed bioenergy products can either be produced domestically or be imported. Rising demand for bio ethanol dramatically reduces the scope for wheat exports while wheat imports increase (Figure 5). As Germany captures only a limited share in the EU wheat market, its impact on the EU price formation of additional wheat use is restricted, but a price decline to the intervention price level is prevented. Compared to the cereal sector, in the German oilseed complex, domestic rape seed had already been used in bio diesel manufacturing in the past due to tax reduction on biofuels and then later due to obligatory blending rates, where not only domestic grown seeds were used but also imported seeds or processed oils. Until 2019, all three sources of rape oil expand but with the domestic crushing of rapeseeds, the supply of rape meal also grows. Due to quality aspects of rape meal, only a certain share can be fed in a diet, therefore it has to be marketed at lower prices. Moreover, due to the high substitution possibilities, rape oil prices are transmitted to most other vegetable oils

All animal products depict a slightly increased demand in Germany with the exception of beef, which is characterised by a further marginal decline but affects the trade position so that Germany remains net exporter. By contrast, demand of pig meat and especially poultry shows further expansions although rates are lower than in recent years due to recession. Price rises based on production costs may also add to the effect. A relatively continuous demand growth is projected for cheese and fresh dairy products. With regard to the disposal of skimmed milk powder and whole milk powder, some uncertainties related to the probable usage shares exist. A likely scenario comprises low sale of skimmed milk powder for feed with no aid in fodder processing. Domestic sales of butter per head are projected to remain stable but total demand reflects declining population.

4.4 Agricultural production

Sectoral developments to the year 2019 are presented in Table 1. Despite the expected increase in cereal prices of between 2005/06 and 2019 by 15 %, the cereal areas decline. This is mainly a result of the high competiveness of energy maize crops for biogas production (Gömann et al., 2007).The area with energy maize crops increase to about 1.2 million ha in the vTI-Baseline. The drop in root crops and legumes is mainly due to a reduction in sugar beet crops, which can be explained by the reduction in quotas resulting in lower producer price for sugar beets. Because of higher prices for agricultural commodities and the abolition of the set aside scheme, arable land is used more intensively. Set aside areas are being farmed again across the country. This is also the case for set aside land in less-favoured areas (e.g. in Brandenburg) that is voluntarily taken out of production in the base year period and farmed again in the target year.

Despite the lower milk price, milk production expand to about 29.5 million tons by the year 2019. This is an increase of about four percent in milk production vs. the years 2005 to 2007. From the beginning of the 1990s up until 2005/07, the dairy cow population decreased by more than one quarter from 5.6 to 4.1 million due to the annual milk yield increase. A comparable increase in dairy performance can also be expected for the coming years contributing to a further reduction in the dairy cattle population (Kreins and Gömann, 2008). According to the model analyses, the number of dairy cattle decrease by 200 000 animals to 3.8 million dairy cows in 2019. The number of other types of cattle drops by about 15 % by 2019. Above average is the decrease in the suckling and nursing cow husbandry as well as calf breeding, thus in the processes that only account for a relatively low portion of the beef production, so that this is only reduced by 5 %. The drop in the dairy cow population has only a small impact on land use. Because of the increasing competitiveness of energy crops, areas with silage maize increase at the expense of other arable feed crops.

As a consequence of the promotion of renewable resources, the maize area planted for biogas production significantly expands in the baseline. This especially holds true in the arable crop regions of Lower Saxony, Saxony-Anhalt, Thuringia and Saxony, which have a high portion of cereals and oilseeds in the crop rotation. In contrast, the set aside areas drop. In contrast to arable land, the usage possibilities in grassland are limited. In Germany, grassland is generally used for feeding areas for cattle husbandry, primarily dairy cows. Since the cattle populations, above

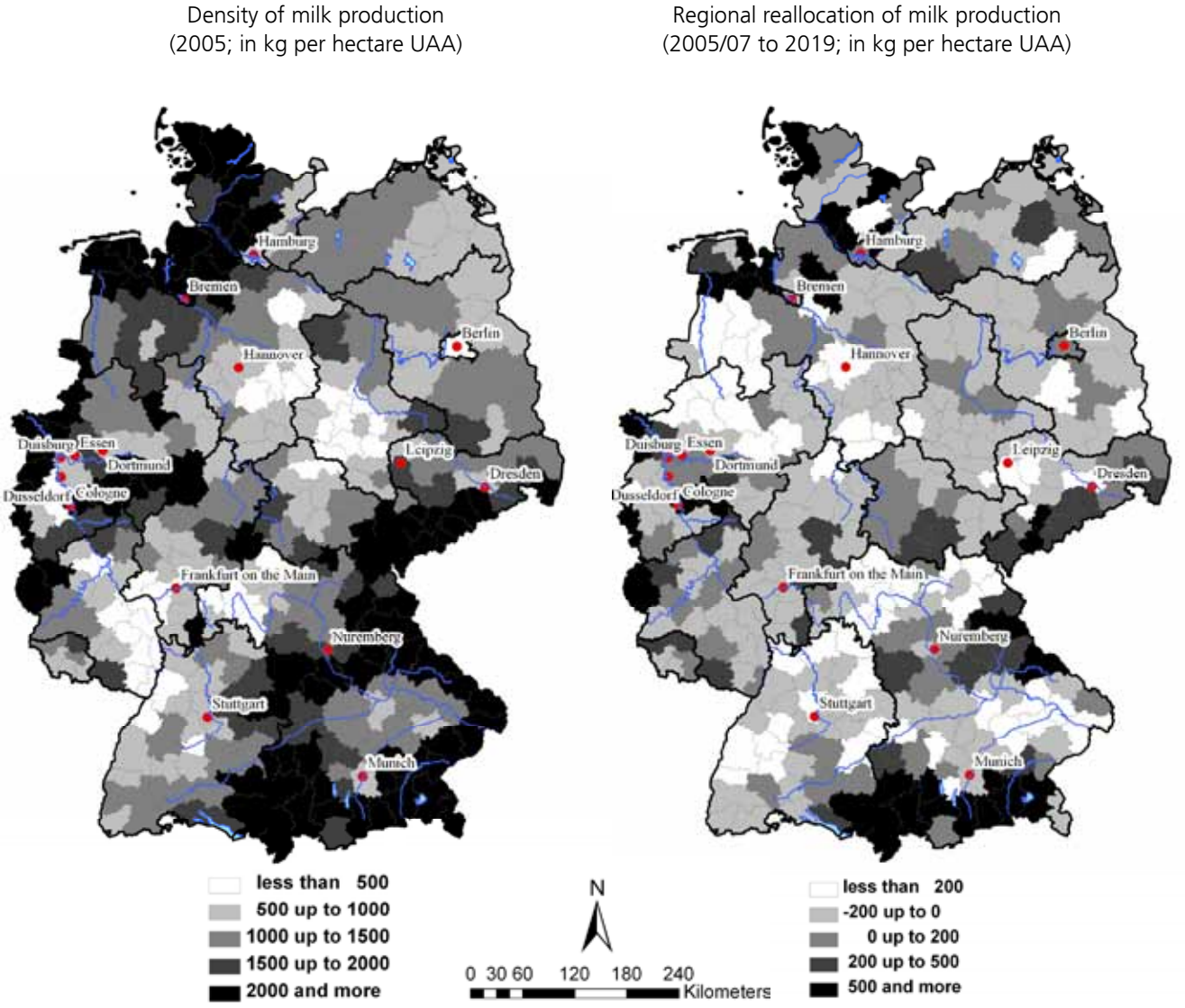
Table 1:
Development of production, land use and income in German agriculture

	Unit	Base year 1999 absolute	2005/07 absolute	Baseline 2019 absolute	Baseline vs. 2005/07 in %
Land use					
Cereals	1 000 ha	6 840	6 704	6 148	-8
Wheat	1 000 ha	2 706	3 093	2 752	-11
Barley	1 000 ha	2 196	1 963	1 987	1
Rye	1 000 ha	851	586	661	13
Oil seeds (incl. renewables	1 000 ha	1 137	1 466	1 552	6
Potatoes	1 000 ha	298	275	277	1
Pulse and root crops	1 000 ha	1 012	818	586	-28
Silage maize	1 000 ha	1 203	1 010	1 022	1
Other arable fodder	1 000 ha	469	550	535	-3
Maize for biogas[1)]	1 000 ha	51	370	1 202	225
Set aside	1 000 ha	720	727	96	-87
Cattle stock	1 000 St	14 896	12 823	10 903	-15
Dairy cows	1 000 St	4 765	4 102	3 913	-5
Milk supply[2)]	1 000 t	26 768	28 283	29 543	4
Beef- and veal production	1 000 t	1 396	1 164	1 100	-5
Net value added	Mio €	10 737	12 200	13 186	8
Labour force	1 000 AWU[3)]	648	544	413	-24
Net value added/labour unit	1 000 €/AWU	17	27	32	17
Subsidies	Mio €	5 152	6 302	6 600	5

[1)] Estimated.
[2)] Actual fat and protein content.
[3)] Annual work unit.
Source: RAUMIS (2009).

all as a consequence of the expected drop in suckling and nursing cows, heifer fattening and dairy cow-keeping, reduce by a total of about 15 % to 2019 in contrast to 2005/07, continuously less grassland will be required for feeding.

The observable trends in the ex post development of a regional concentration of dairy production (see Kreins and Gömann, 2008) are accelerated through the elimination of the dairy quota system. An expansion of the dairy production takes place according to the model results, above all in the coastal regions and in the lower Rhine region, in some middle mountain areas, as well as in the Allgaeu and pre Alpine regions (Map 1, left). This grassland, or rather, lower yielding arable crop areas, have proven to be particularly competitive in dairy production and are already marked at present by high dairy production densities. A withdrawal from dairy production can in particular be found on arable locations, such as for example the Cologne-Aachen area, the Hildesheim plain, favourable sites in Bavaria as well as the breeding areas in western Lower Saxony and in the north of North Rhine Westphalia (Map 1, right). In addition, some other grassland sites loose parts of their dairy production. This affects, for example, the Black Forest as well as parts of Hesse, thus the grassland regions that have proven to be less competitive for dairy production in the past and in which the dairy production is limited. These regions are to be found in the vicinity of urban centres in which comparatively good non agricultural opportunities exist and in which the significance of agro-tourism is increasing.



Source: Own calculations based on RAUMIS (2009).

Map 1:
Regional relevance and reallocation of milk production in Germany

4.5 Income

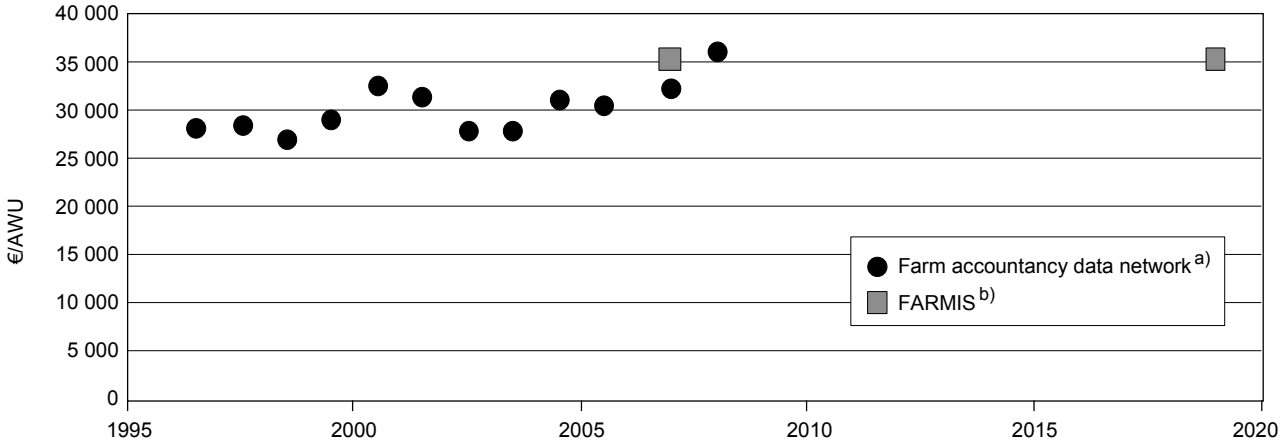
The following analysis of income developments at the farm level is based on the indicator 'farm net value added (FNVA) per agricultural working unit (AWU)'. FNVA measures the return to the factors land, labour and capital, and is here related to the amount of labour input to account for differences and changes in farm size. All income figures are adjusted for inflation and refer to 2007 prices.

An overview of the development of the average FNVA/AWU in the past as well as in the baseline is given in Figure 6. Compared to the base period 2006 to 2008, average FNVA/AWU is stagnating, and is thus slightly higher than average income during the last ten years. The decrease of farm gate prices in real terms is partly offset by

- The continuing structural change, with high exit rates especially of small farms with below-average income potential
- The resulting opportunity for growth for remaining farms
- The reduced labour requirements as a consequence of technical change
- Improvements in crop and dairy yields

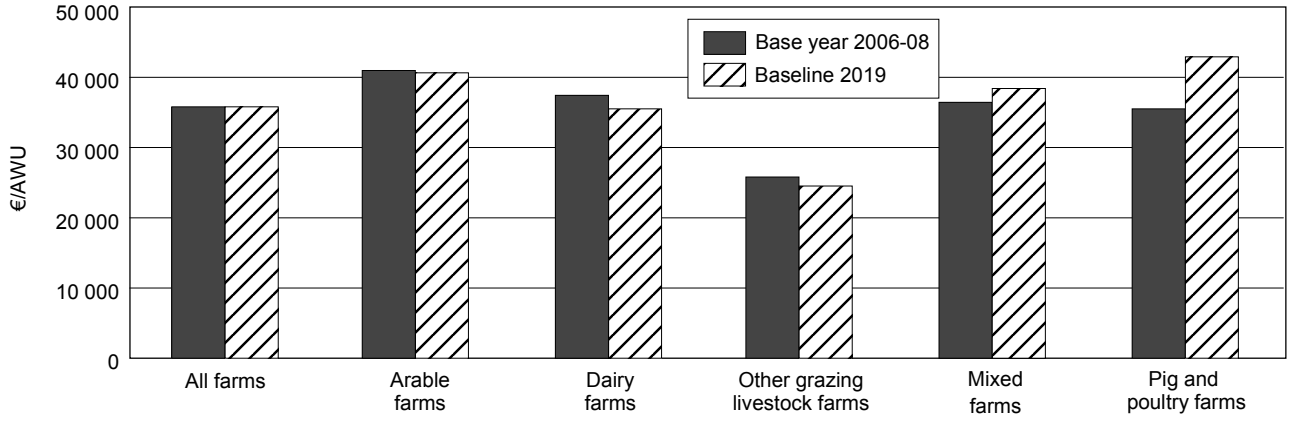
Income developments differ by farm type (Figure 7), which can mainly be attributed to the divergent price developments for agricultural products (Section 4.2). In addition, the full transformation of the single farm payment to regional flat rate premiums and the increase in the modulation result in changes in payments; the size and direction of these changes depend strongly on farm individual characteristics (i.e., historical stocking rates and share of grassland; total volume of payments).

Arable farms can maintain their comparatively high income level of the base year due to the nominally increasing prices for cereals and oilseeds, and the new income opportunities from the growing of energy maize. Dairy farms, despite the significant growth of average herd sizes and the elimination of quota costs, face a reduction of income by 6 % compared to the base period as a consequence of the relatively low milk prices (28.3 cent/kg at real fat content). However, the income level of dairy farms is still above the average income realised during the last eight years. In other grazing livestock farms, income decreases slightly by 5 % despite the positive developments of beef prices, which is due to the increase in prices for



a) Full time farms.
b) Base year: All FADN farms, average of 2005/06 to 2007/08.
Source: Agrarbericht (BMELV, diff. years) and own calculations based on FARMIS (2009).

Figure 6:
Development of farm net value added per agricultural work unit (in real terms in prices of 2007)

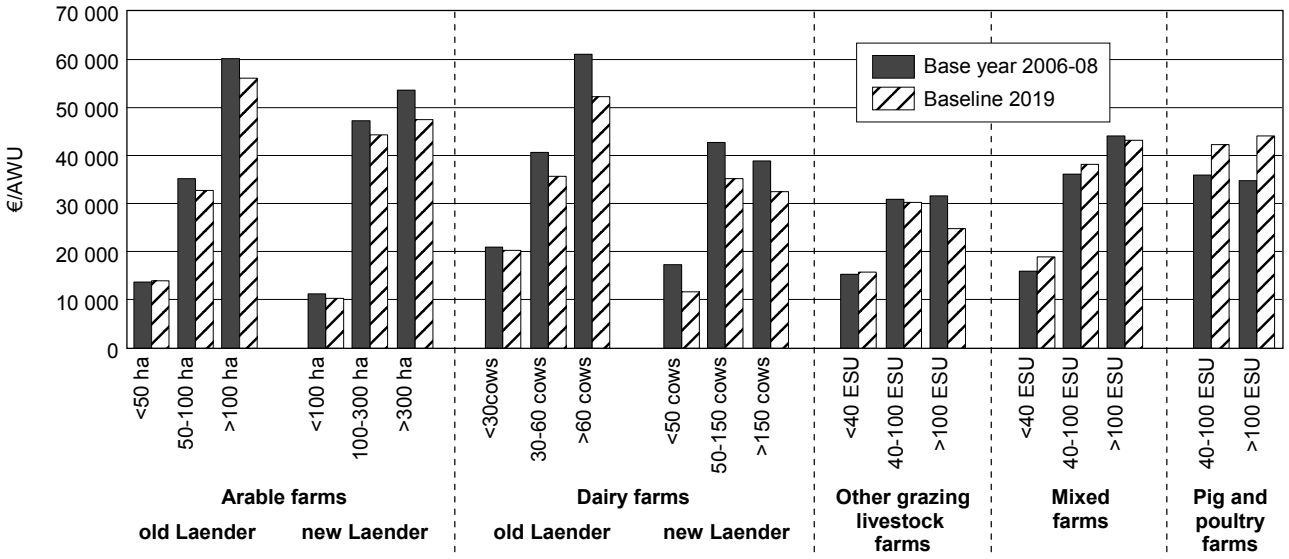


Source: Own calculations based on FARMIS (2009).

Figure 7:
Development of farm net value added per agricultural work unit by farm type (in real terms in prices of 2007)

farm inputs. Thus, these farms achieve an income in the target year that is comparable to the average income level of the last eight years. Pig farms benefit from the increase of pork prices and the decrease of the prices for some feeding stuffs. Their income is 19 % higher in the baseline than in the base period.

For the interpretation, it is important to note that the increase of average income is partly due to a statistical effect: due to the exit of small farms with lower incomes, the average income in the sector increases. To eliminate or reduce this effect, Figure 8 provides a differentiated picture of income developments by farm size. The results highlight that FNVA/AWU decreases in medium-sized and large farms of all farm types with the exception of pig and poultry farms. Especially large other grazing livestock farms in the new Laender as well as large specialised dairy farms face a significant reduction in income compared to the base period. However, these results should be seen



Source: Own calculations based on FARMIS (2009).

Figure 8:
Development of farm net value added per agricultural work unit by farm type and size (in real terms in prices of 2007)

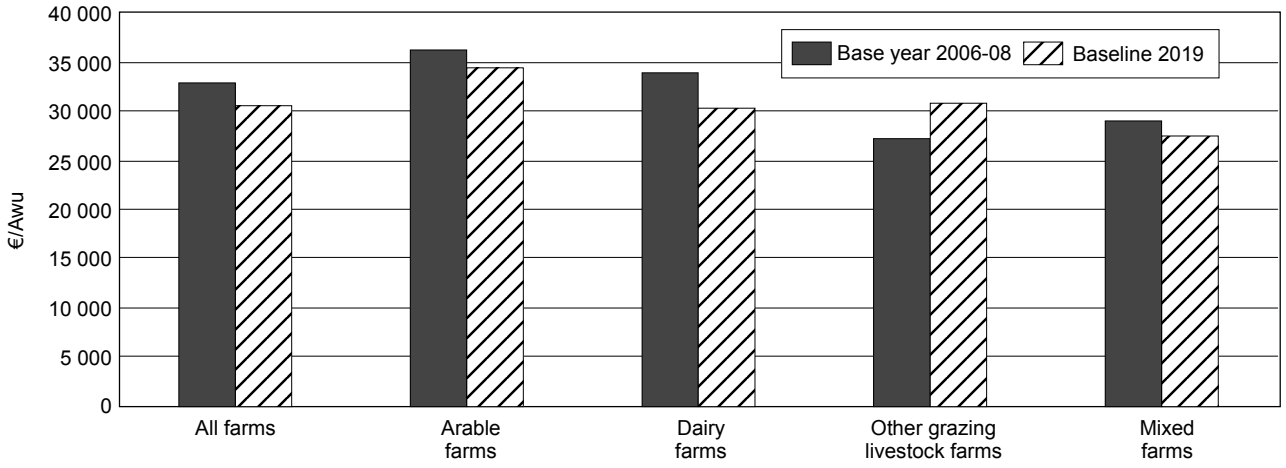


Figure 9:
Development of farm net value added per agricultural work unit in organic farms (in real terms in prices of 2007)

against the background of often quite favourable financial results during the base period 2006 to 2008.

The FNVA per AWU of organically managed farms declines in the baseline compared to the base year period 2006 to 2008 as shown in Figure 9. The decline is mainly a result of the lower organic milk price in the baseline. Since the number of organic dairy farms is relatively high, the average profitability of organic farms is particularly affected by changes in the milk price. Different income developments can be observed for individual organic farm types. The farm income per AWU declines particularly on organic dairy farms. In contrast, organic beef farms benefit from higher beef prices and the standardized single farm payments. Differences between organic and conventional farms are mainly because conventional farms benefit more from higher prices for pork meat and wheat, whereas organic farms are more negatively affected by the decline in milk prices. It is however important to note that the results are not directly comparable due to structural differences between both farming systems in the farm sample.

5 Discussion

5.1 The vTI-Baseline in the context of projections from other institutions

A currently difficult economic environment impedes the establishment of reliable projections for markets and prices, as the latest experiences indicate, in which price peaks in 2007/08 and price collapses in the second half 2008 could not be projected adequately. To get an impression, price projections of the FAPRI (2009) and the OECD (2009) will briefly be compared to projections of the vTI-Baseline. The vTI-Baseline published reflects only Germany while the FAPRI and the OECD-Baseline capture the EU. Furthermore the FAPRI world market price projections serve as exogenous variables for the vTI-Baseline. In all cases product aggregations may also differ and thus only comparable products are regarded. According to the FAPRI and OECD projections, wheat prices will vary between 120 and 150 Euro per ton in the mid-term, with slight increases until 2015. Greater price differences are found in OECD projections between wheat and coarse grain which will reach only 100 Euro per ton in 2017, while FAPRI maize price will be 140 Euro per ton. The vTI price for wheat and barley is projected to range between 120 and 130 Euro per ton with some distinction between wheat and coarse grains. The deviations can be explained by the underlying assumptions in the vTI-Baseline concerning feedstock use in biofuels processing. However, one has to keep in mind that the presumed exchange rate between the Euro and US-dollar overshoots the current rates and will have an important impact on the price formation. Differences are even greater with regard to oilseeds, meals and oils, whereas OECD only considers an aggregate. Concerning rape oil, vTI-projections for Germany exceed FAPRI's price projections, and can be induced by fulfilment of blend rates for bioenergy mandates, which in turn trigger a demand pull. Nevertheless, due to substitution between energy sources, reactions may be more complex in reality.

Meat products have been marked less extremely by the spike and following collapse in prices than the plant crops, but high input and production costs have also affected animal production. Considering beef the projection of the FAPRI and the vTI beef prices depart a bit more with marginal higher prices in the vTI projection. Hence, the OECD projection will be 30 to 50 Euro per 100 kg lower and will remain below the price level 2006 to 2009 throughout the projection period, which may be caused by lower feed and other production costs. Great differences occur in the projection of producer prices of milk, as the FAPRI projections indicate only a very small price decline in 2009 and 2010. Consequently, producer prices of 32 Euro per 100 kg outstrip prices of the base period 2005 to 2008. In 2009 OECD price projections fall somewhat below levels of 2005/06 and will reach 29 Euro per 100 kg in 2018 while the vTI prices are projected to decline even more to 25 Euro per 100 kg in 2009 and then will go up to 27 Euro per 100 kg in 2019. Differences may be driven by applied quota rents, exchange rates and economic growth perspectives but also by production growth in the process of quota abolition. OECD and FAPRI price projections for pig meat converge.

5.2 Reflections of assumptions and restrictions of the used models

The vTI-Baseline relies on a number of assumptions concerning the development of factors and variables not explicitly covered in the models used. Some of the areas concerned are characterised by high uncertainties:

- The extent and duration of the financial crisis and its impacts on the future development of the global economy were unforeseeable at the time of the establishment of the projections. Even now, uncertainties remain, especially with respect to the speed of recovery. There are signs of a quicker-than-feared recovery of economy and demand, with respective implications for the prices of agricultural products.
- Uncertainty also exists with respect to the development of the oil price, which affects the prices of agricultural inputs as well as, via the so-called 'bushel-barrel-correlation,' the level of world market prices for agricultural products.

– As movements of the exchange rate between Euro and the US-dollar normally add to the price fluctuations, future exchange rates will also play an important part in future price volatility of nearly all traded products. As the past has shown, the development of exchange rates is subject to considerable uncertainties.

Specific challenges are incurred in the projections for the milk market sector:

– The development of global demand, supply and prices for milk (products) is subject to considerable uncertainty. The financial crisis has dampened demand in the short-term, while supply reactions are often slow and lagging. In addition, climatic variations can have a lasting effect on milk supply in Oceanic countries, which plays an important role for world market prices.
– The abolishment of the quota regime, which restricted milk quantities in the EU for 30 years, constitutes a structural break, which is difficult to model. The level of quota rents imputed in the models has a significant impact on results. Existing econometric estimations as well as attempts to derive rents from past observation of prices at quota markets are subject to many uncertainties, as the decision calculus and horizon of farmers are unknown. Adjustments in production also depend on the length of the time period modelled. In the short term, an increase of production may be possible for many farmers at variable costs (e.g., if free stable places exists), and be larger than in the long-term, when investment decisions are more oriented at full cost considerations.

All the models used for this study are based on a detailed depiction of policies and economic relationships and interdependencies in agricultural production. They have successfully been applied for many policy impact analyses (e.g., Isermeyer et al., 2006; Gömann et al., 2008; Pelikan et al., 2010), and are continuously developed further. Still, due to specific model characteristics and restricted data availability, it is inevitable that some policy instruments or new technical developments cannot be modelled, or only in a simplified way. The most important restrictions in this respect are:

– The static models are not explicitly taking into account short-term fluctuations, e.g., of world market prices. As the baseline involves cuts in intervention prices and a suspension of refunds, world market price fluctuations will be transmitted to domestic EU prices to a larger extent than in the past.
– The trade analysis with GTAP does not explicitly take impacts of growing bioenergy demand and production into account.
– Demand for energy maize is not explicitly modelled. The supply of energy maize as given by RAUMIS thus indicates supply potential for a given set of prices, and reflects the relative competiveness of energy maize to alternative arable crops. The amendment of the EEG as of 2009 is not modelled for the baseline scenario.

6 Outlook

The vTI-Baseline 2009-2019 provides the basis for subsequent policy impact analysis: a recent study examined the effects of an implementation of a new WTO agreement (Pelikan et. al., 2010), and other future studies will, for example, analyse the consequences of more uniform direct payment rates within the EU, or the impacts of a further increase in biomass demand. A new vTI-Baseline is planned for 2011.

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