Johann Heinrich
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Abbreviations and Acronyms

ACP countries	African, Caribbean and Pacific Group of States
AWU	Annual work unit
BMELV	German Ministry for Food, Agriculture and Consumer Protection
BMWi	Federal Ministry of Economics and Technology
CH_4	Methane
CO_2	Carbon dioxide
EAFRD	European Agricultural Fund for Rural Development
EBA	Everything-But-Arms Initiative
EEG	Renewable Energy Law
FADN	Farm accountancy data network
FAPRI	Food and Agricultural Policy Research Institute
FAPRI-ISU	Food and Agricultural Policy Research Institute of Iowa State University
FAPRI-MU	Food and Agricultural Policy Research Institute of Missouri University
FNVA	Farm net value added
FNVA/AWU	Farm net value added per annual work unit
GDP	Gross Domestic Product
Gg	Gigagrams
LDCs	Least Developed Countries
N	Nitrogen
NEC	National emission limits for certain air pollutants
NH_3	Ammonia
N_2O	Nitrous Oxide
NVA	Net value added at factor costs
UAA	Utilised agricultural area
USDA	United States Department of Agriculture
WTO	World Trade Organisation

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1 Introduction

This report presents selected results of the vTI-Baseline 2011 – 2021 as well as the assumptions upon which these results are based. The projections are based on data and information available as of spring 2011. At that point in time the prognoses for the development of the world economy and the prices of oil and agricultural products were marked by moderate optimism. The results of the vTI-Baseline should be considered in this context.

The vTI-Baseline projection is not a forecast about the future but rather a description of expected developments should the current agricultural policy be continued in accordance with specific assumptions about the development of exogenous influences. The vTI-Baseline thus serves as a reference scenario for analyses of the impacts of alternative policies and developments.

Five models were linked to create the vTI-Baseline: the general equilibrium model GTAP, the partial equilibrium model AGMEMOD, the model system CAPRI, the regionalised programming model RAUMIS and the farm group model FARMIS (see Annex 1). The target year of the projection is the year 2021. The presentation of the results is mainly concentrated on developments in the German agricultural sector.

The assumptions for the development of the exogenous factors and the agricultural policy conditions selected for the baseline were chosen in close consultation with experts from the German Ministry for Food, Agriculture and Consumer Protection (BMELV). The discussion of preliminary results based on model calculations was drafted with representatives from the federal states as well as with BMELV representatives. This approach enabled the integration of expert knowledge as well as the definition of a scenario that is accepted as a relevant basis for further policy impact analyses.

The vTI-Baseline is drafted and published every two years to provide a reliable and up-to-date basis for policy impact analyses of the vTI and other scientific agencies in Germany. In the case of sudden major changes in the underlying conditions, an update of the vTI-Baseline is carried out as needed. The vTI-Baseline 2011 – 2021 includes, for the first time, a separate chapter on the development of important environmental impacts of the agricultural sector and thus reflects the increasing importance of the climate-relevant impacts of agriculture as well as international obligations to reduce harmful gas emissions.

2 Assumptions

The vTI-Baseline is based on exogenous projections of general global economic development generated by the World Bank, the EU Commission and the “Project Group Common Diagnosis” commissioned on behalf of the Federal Ministry of Economics and Technology (BMWi). In addition, projections of the Food and Agricultural Policy Research Institute (FAPRI) for world agricultural prices, as well as assumptions on the development of factor prices and factor availability in German agriculture, influence the calculations. For the vTI-Baseline, current agricultural policies and the implementation of approved policy changes are assumed.

2.1 General economic framework

2.1.1 Macroeconomic developments

In the vTI-Baseline 2011 – 2021, macroeconomic developments until the year 2021 are reflected in simulations, and both historical and projected values are considered. In comparison to the vTI-Baseline 2009 – 2019 (OFFERMANN et al., 2010), the assumptions made in vTI-Baseline 2011 – 2021 diverge, particularly in the case of the Gross Domestic Product. These changes were induced by the recent recession and the subsequent recovery of the world economy.

For the projections of population development and the availability of unskilled and skilled labour, a secondary USDA source (2011a) was incorporated. Here, macroeconomic variables from various sources, such as the “World Development Report” of the World Bank, are compiled in a common format and prepared for further use in economic models. Table 2.1 illustrates the assumptions of population development for Germany, the EU-15, the EU-12 and the world. In Germany, a drop in population is projected. In the time period from 2007 to 2010, the population in Germany dropped annually by 0.2 %. It is assumed that this trend will continue in the coming years, and from the year 2013 on, an annual population drop of 0.1 % is expected. Worldwide, population is growing annually by approximately 1 %. The growth rates of more than two percent in parts of Africa are compensated by drops in population, for example, in Russia.

Table 2.1: Assumptions for annual population growth (in %)

	2007-2010	2010-2013	2013-2021
Germany	-0.2	-0.1	-0.1
EU-15	0.3	0.2	0.2
EU-12	-0.2	-0.2	-0.3
World	1.1	0.9	1.0

Source: USDA (2011a).

Over the projection period, the real gross domestic product (GDP) in Germany fluctuates between annual rates of -0.1 and 2.0 % (Table 2.2). As a consequence of the worldwide financial and economic crisis, the GDP growth was low in the period from 2007 to 2010. For the subsequent years, from 2010 to 2013, the “Project Group Common Diagnosis” (BMWi, 2011) predicts an annual increase in the GDP of 2 % per year. Compared to the rest of Europe, Germany was less affected by the recession. For the time period from 2010 to 2013, the average annual growth rates for the EU-15 are forecasted to be slightly below the expected GDP growth of Germany. For the group of new

EU Member States, the forecasts are above the values for the EU-15; thus, a continuation of the slow harmonisation of economic performance is assumed within the EU. For the time period from 2013 to 2021, it is assumed that economic development will be largely stabilised and that the GDP for the EU-27 will increase by 2 % annually. For the time period from 2007 to 2010, the average GDP increases for all 226 countries considered in the vTI-Baseline (aggregated in Table 2.2 under the “World” category); the average GDP grew by 1.1 %, positively influenced by the growth rates in China. For the projection period of this baseline, an average worldwide increase of GDPs of 3.4 % is assumed.

Table 2.2: Assumptions for annual changes in the gross domestic products (in %)

	2007-2010	2010-2013	2013-2021
Germany	-0.1	2.1	1.6
EU-15	-0.7	1.7	1.9
EU-12	0.9	3.7	3.9
World	1.1	3.4	3.4

Source: USDA (2011b); BMWi (2011).

In addition to changes in policy framework and productivity, also the future exchange rates affect the competitiveness of imports and exports between different countries or regions. A consequence of appreciation is, ceteris paribus, that prices in a considered country increase for exports and decline for imports. Thus, the competitiveness of exports declines relative to regions with unchanged exchange rates or regions with depreciation. In contrast, countries with appreciation must spend less on imported products. Despite the international financial crisis, international transactions are always conducted in US dollars; thus, the parity of the US dollar against other currencies plays a significant role. However, changes in exchange rates are often accompanied by adjustments in the world market prices. Over the last few years, due to the fundamental changes in commodity markets, the US dollar has continually lost value against most currencies, including the Euro. For the projection time period of 2011 to 2021, it is assumed that the phase of increased volatility of the Euro-US-dollar exchange rate had not yet passed. For the projection time period, a relatively stable Euro-US-dollar exchange rate of €1.32 €/$ is assumed, with an increase to 1.50 €/$ by 2021.

2.1.2 World market prices of agricultural products

Within the partial model AGMEMOD, world market prices for agricultural products are exogenous. In the year 2011, the Food and Agricultural Policy Research Institute of Iowa State University (FAPRI-ISU) published a projection of world market prices that was used to establish the vTI-Baseline 2011 – 2021 (FAPRI-ISU, 2011).[1]

In general, current projections for the world market prices of agricultural products exceed the price levels of the year 2010. Higher economic growth implies a significantly higher demand on a world-

[1] In contrast to FAPRI-projections from previous years, this projection was not developed cooperatively with the Food and Agricultural Policy Research Institute of Missouri University (FAPRI-MU) or other institutions due to budget restrictions of the concerned institutions. A revised version of the projections for the US market was issued by FAPRI MU at the end of August but could not be considered in the vTI-Baseline (FAPRI-MU 2011). In the projections for August, the prices of plant products for the period from 2011 to 2021 are between 10 % and 20 % higher than those projected by FAPRI-ISU.

wide basis. In particular, the driving forces are the prominent economic recovery, beginning in Asian countries, tied with comparably low inflation rates. In addition, the economy in South America has begun to gain momentum, but this improvement is accompanied by higher inflation rates. A further demand factor in both the USA and the EU are the political targets for bioenergy. It is important to consider that international trading is conducted in US dollars. Concerning the future development of the exchange rate in contrast to the Euro, the FAPRI-ISU projections forecast a depreciation of the US dollar (see Chapter 2.1.1). These assumptions imply that despite increasing world market price projections in US Dollars, world market prices in Euros yield slightly lower in the second half of the projection period.

The projections provided here are not short-term forecasts but rather mid-term projections depending on the exogenous assumptions made on macroeconomic development, policy measures and average weather conditions. In reality, however, world market prices have always been affected by significant fluctuations resulting from a variety of factors: weather-influenced changes in yield deviating from long-term trends cause that supply is different than expected. Exogenous influences (e.g., financial crises) may cause faster or slower growth, and the exchange rates between the currencies may fluctuate. Worldwide policy measures in the agricultural or other policy sectors have an effect (e.g., an export stop by one country), or consumers react with reduced demand to food-related scandals or other undesirable developments. All of these factors occur in the short term and are exogenous to the system, meaning that the models employed here are unable to project them.

In this context, recent years can be seen as exemplary: the worldwide demand for bioenergy has created a further demand for raw materials in addition to the existing demands for food and feed. At times, the demand could only barely be fulfilled due to reduced stocks. However, short- to mid-term setbacks in economic development led to drops in demand. Thus, for example, the period from the beginning of 2007 to the middle of 2008 was characterised by high prices in the world agricultural markets driven by rapidly rising demand due to high economic growth in emerging countries, high energy prices and increasing inflation. However, the politically induced demand for biogenic fuels[2], in addition to weather, also induced production cutbacks by important players (e.g., milk production in Australia) and led to price peaks (Figure 2.1). Optimal weather conditions in many regions in the subsequent marketing year 2008/09 and price-induced production expansion led to an excellent harvest and an abundant supply. This high supply faced a reduced demand due to the global financial crisis. Accordingly, the price trend from 2009 to the second half of 2010 was, after the price peak, significantly downward.

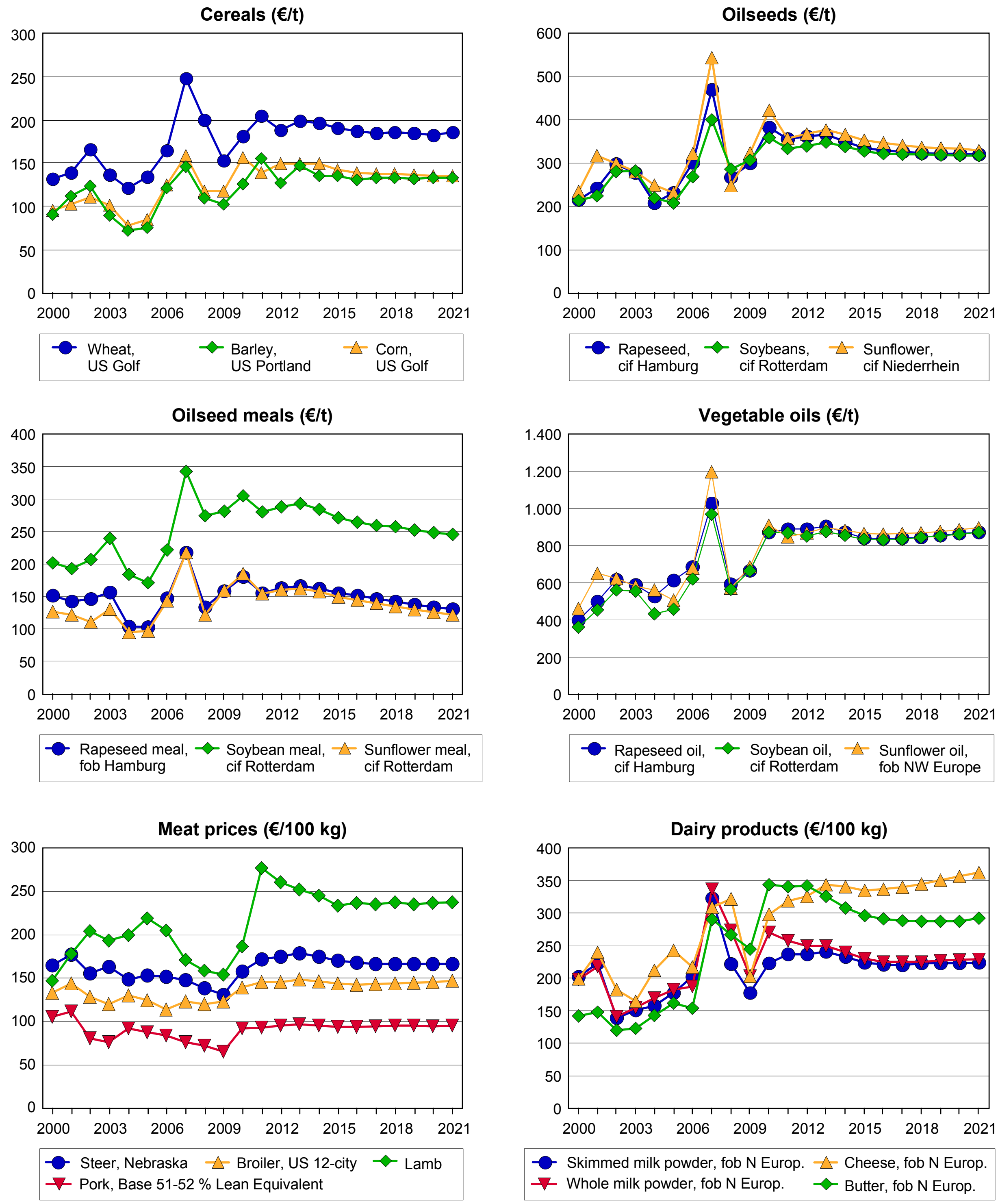
In contrast, the world market prices for oil seeds increased in 2010/11 because in some important production regions (e.g., soybeans in Argentina, Brazil and the USA; rapeseed in the EU), production was limited due to weather influences such that, globally, it could not catch up with the growing demand. A recovery of the yields and a minimal price-based area expansion led to weak expectations for oil seeds in 2011/12. This development was compensated for by the increasingly dynamic economy in 2011/12.[3] In the mid- to long term, the demand, and thus prices, remain at a relatively high level. The high demand for vegetable oils for food and biodiesel precipitated an accordingly high processing rate of oil seed and accordingly high prices in US dollars, which, due to the ex-

2 This demand led to a high level of competition between food and non-food production in agricultural areas.
3 The assumptions on economic growth do not reflect any future impacts of the national debt crisis.

change rate development, did not result in increases in Euro prices. Due to the high prices, a large amount of oil meal, especially rape meal, is available. Additionally, the production expansion in the animal sector led to an increasing demand for feed but only if the prices for oil meals dropped below average in contrast to those for vegetable oils. Due to the existing demand for the use of soy meal in feeding, soy meal prices were higher than the prices of rape or sunflower meal. The prices for oil seeds are derived from the prices for their oil and protein components, which leads the prices for rapeseed to be somewhere between the prices for sunflower seeds and soy beans because soy meal is valued more highly. Prices in Euros are expected to decrease in 2013/14 due to currency influences.

In the year 2011/12, the greater demand for grains in Asia is linked to a reduced supply because the US crop production, particularly of wheat, did not meet expectations due to floods and drought. This situation implies increasing prices for wheat. In comparison, the corn prices will drop in 2011/12. However, due to changes in the exchange rate, the impact in Euros will be relatively low. Over the mid- and long term, the grain prices in US dollars will remain high, whereas the price in Euros will decline in 2013/14. A price difference between wheat and the coarse grains maize and barley continues over the long term. In the areas of feeding, coarse grains may substitute partially for meals and vice versa. In contrast, in the case of maize, there is also competition between the use of raw material for food processing, animal feed and ethanol as a biofuel; thus, depending on economic developments, the prices may also tend to follow wheat prices.

Figure 2.1: Projections of world market prices by FAPRI



Source: FAPRI (2011).

Following the financial crisis of 2007/08[4], increasing income and worldwide population growth led to higher demand for all animal products. Especially prominent were the production and demand increases in pork. Rising production costs due to higher cereal and soy meal prices, as well as increasing opportunity costs for land, induced, in the mid-term, higher prices for animal products worldwide. However, the price increases in Euros were comparably moderate; accordingly, the profit margins for producers were under pressure. Thus, in animal breeding, the prices in the projection period drop only temporarily in 2014 and 2015. In contrast, the price increases for ruminants are somewhat higher and drop in Euros, similar to the developments in the plant sector, after 2013.

Clearly defined are the mid-term increases in the global milk product prices. For most dairy products (with the exception of butter), the prices in Euros through 2013 remain at a high level. After 2013, prices drop due to currency effects until 2017, but they remain at a high level compared to the period from 2000 to 2006. This trend also holds true for butter, for which the Euro prices, which begin at a very high level, drop by the end of the projection period. In accordance with demand, the prices for products with higher protein content, such as cheeses, are higher than for products with higher fat content, such as butter. Due to the demand from Asian countries, the prices for whole milk powder are higher than those for skim milk powder. World market prices of milk derived from butter and skim milk powder are projected to be approximately 30 €/100 kg for 2021. However, this price calculation does not consider better returns from other milk usages. In recent years, the world market prices for milk products were marked by significant price fluctuations within one year. These price fluctuations were often due to yield fluctuations caused by weather conditions in regions more dependent on their roughage basis. The price increases induce production expansions in other regions; however, fluctuations within a single year cannot be adequately projected within the models currently available.

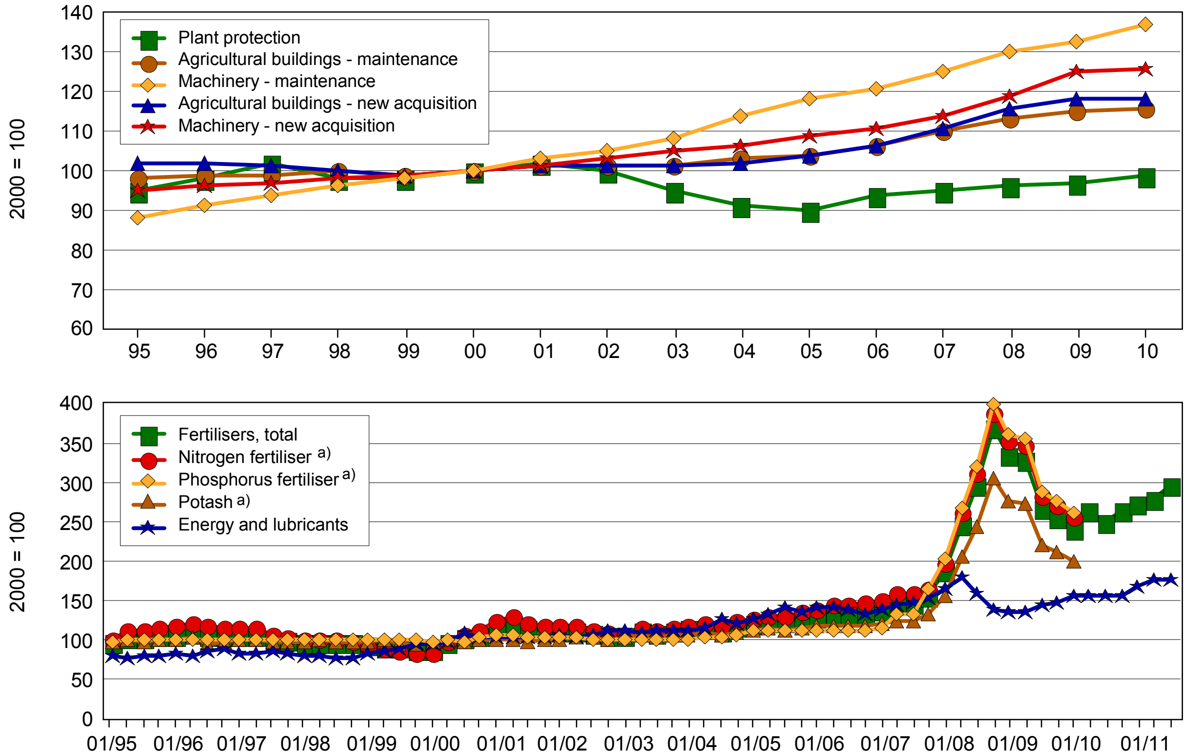
In summary, international prices, noted in Euros, will plateau at comparably high levels.

2.1.3 Price developments for agricultural inputs in Germany

The development of prices for agricultural inputs in the past differed greatly depending on product group (Figure 2.2). Energy prices have increased disproportionately for several years. These increases have impacted the prices of other production factors, especially fertilisers, in recent years. In addition, in the past few years, the increase in producer prices for agricultural products has led to an increase in the demand for agricultural inputs, which, in turn, increased the prices of these inputs.

4 The national debt crisis is not yet reflected in the projections.

Figure 2.2: Index of the purchase prices of agricultural inputs



a) Publication of price indices of single nutrient fertilisers was discontinued in 1/2010.
Source: Stat. Bundesamt (diff. years), own assumptions and calculations.

A projection of the prices for farm inputs in future years is extremely difficult in light of existing multiple uncertainties, for example with regard to crude oil prices and energy policies. For the vTI-Baseline 2011 – 2021, a pragmatic trend projection on the basis of the period from 2000 to 2010 was selected for most farm inputs. For energy, the price developments were coupled to the crude oil price projections by FAPRI. A different approach was selected for fertilisers because their extreme price fluctuations in recent years do not make a trend projection seem reasonable. For the price development of fertilisers, it was assumed that, over the long term, fertiliser prices will follow the increasing prices of energy because energy costs make up the greater part of the manufacturing costs for nitrogen fertilisers.

Table 2.3: Assumptions for the price developments of agricultural inputs in Germany

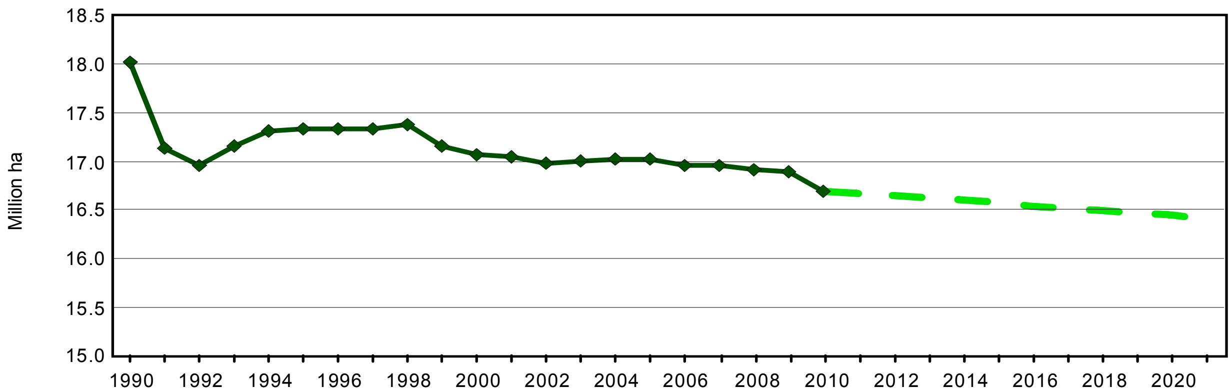
	Observed	Assumption	vTI-Baseline	
	2000-2010	2011-2021	2021 zu 2006-08	
	% p.a.	% p.a.	% p.a.	% total
Consumer price index (inflation rate)	1.6	1.6	1.5	24
Plant protection	-0.3	0.0	0.3	4
Agricultural buildings - new acquisition	1.9	2.2	2.2	36
Machinery - new acquisition	2.4	2.2	2.4	40
Agricultural buildings - maintenance	1.6	2.5	2.4	40
Machinery - maintenance	3.3	2.5	2.6	44
Energy	Crude oil 103 $/bbl in 2021		2.4	40
Nitrogen fertiliser		2.8 [a)]	3.9	70
Phosphorus fertiliser		2.8 [a)]	4.7	89
Potash		2.8 [a)]	3.8	68
Other fertiliser		2.8 [a)]	4.0	72

Prices of all other inputs and wages projected to increase with inflation rate.
a) From 1/2010.
Source: Stat. Bundesamt (diff. years), own assumptions and calculations.

2.1.4 Input endowment and structural changes in German agriculture

The utilised agricultural area (UAA) in Germany in the period from 1999 to 2009 showed a continuous decline of approximately 26,200 ha annually. Because the lowest limit for farm documentation in the framework of the agricultural survey in 1999 and 2010 was increased from 1 to 2 ha and then from 2 to 5 ha, approximately 200,000 ha and then 160,000 ha of UAA were no longer documented. The documented UAA in 2010 overall was approximately 16.7 million ha (Figure 2.3). Should the average annual decline of 26,200 ha in the period from 2009 to 2021 continue, the expected UAA will be approximately 16.5 million ha in 2021.

Figure 2.3: The development of utilised agricultural area in Germany



Source: Federal Statistic Agency; own assumptions and calculations.

The structural change in agriculture can be seen in the constantly decreasing number of farms and farm employees. Thus, the number of farms in the former German states over the past 30 years has declined annually by 3.4 %, and the number of family members working on the farms has dropped annually by 3.2 %. However, great differences exist depending on region, farm size, and farm type. The structural change is thus differentiated in the vTI-Baseline scenario according to federal state, size, and main production type and based on the continuation of existing trends. For farms represented by the farm accountancy data network, this approach results in an annual decrease in the number of farms of 2 % overall.

2.1.5 Assumptions for organic farming

For the vTI-Baseline 2011 – 2021, expert estimates were used to develop specific assumptions about the development of important exogenous model parameters for organic farming.[5] The focus was on future yield and price development for organic products in Germany. According to expert estimates, the development of the yield gap between conventional and organic farming depends primarily on incentives for the intensification or extensification of conventional farming as well as on advances in organic plant breeding. For the vTI-Baseline scenario, experts developed the following assumptions with regard to yield development in organic farming:

– For plant products, yield increases are 50 % lower than in conventional farming (exceptions: oilseed and legumes, with 25 % lower yield increases).
– For egg-laying performance, yield increases are 25 % less than in conventional farming.
– Milk yield increase depends on the initial milk yield level (higher yield increase for low initial levels).

With regard to future price developments, the experts assumed that the very high price difference between organic and conventionally produced products seen in 2008 would not be maintained and that, essentially, the prices for organically produced products can be assumed to develop in parallel to the prices of conventionally produced products over the mid- and long term.

On the basis of expert discussions and a subsequent written survey of market experts in the field of organic products, a slight reduction of the price premium for crops was assumed for the vTI-Baseline in general, and an increase in price premiums (or, rather, the share of organically produced products that can be marketed with a price premium) was assumed for animal products. Table 2.4 presents an overview of the assumptions for producer price developments of important organic products in the vTI-Baseline scenario.

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5 The expert based projections of yield and price developments in organic farming were established within the research project „Economic performance of organic farming in Germany under changed agricultural policy framework conditions" (supported within the federal programme for organic farming, project 06OE224).

Table 2.4 Assumptions for the development of producer price premiums (price differences) for organic products in comparison to conventionally produced products

	Price premium in 2005-2007	Assumption on price premium in the baseline
Wheat	100 %	100 %
Rye	76 %	70 %
Barley	55 %	50 %
Beef	10 %	20 %
Milk	24 %	28 %

Source: National FADN and Sanders et al., 2011.

No differences were assumed between organic and conventional farm groups with respect to technical progress, resource availability and structural change. With regard to structural change, this means that the conversion from previously conventional farms to organic farms is not explicitly considered. The absolute number of organic farms drops by 1,100 farms in the vTI-Baseline from the basis period. In contrast, the relative share of organic farms in all agricultural holdings increases by 0.2 %.

2.2 Policy framework conditions

2.2.1 Trade policy framework conditions

Only slight adjustments in trade policy conditions were made in the context of this vTI-Baseline for the EU, for which the expansion to 27 Member States concluded in 2007, and also for the WTO. The adjustments in the vTI-Baseline were concentrated on trade policies that directly affect the EU-27. In addition, the accession of the Ukraine to the WTO is considered because the EU is the most important trading partner for the Ukraine. Through its accession on February 5, 2008, the Ukraine obligated itself to decrease its tariffs stepwise until the year 2013. Through the opening of the Ukraine market, trade-diverting and -creating impacts influenced world agricultural markets that were already considered in the vTI-Baseline 2009 – 2019 and also in the current vTI-Baseline.

In addition, it is assumed that the 2010 Everything-But-Arms Initiative (EBA-Initiative) was completely implemented. Since 2001, the EU has provided the 49 poorest countries in the world (LDCs, Least Developed Countries) with tariff and quota-free market access for all products (except weapons) in the context of this initiative. For bananas, sugar and rice, the temporary privileges expired in 2009.[6.]

[6] As the EU has not yet finalised treaties with all countries in Africa and the Caribbean and Pacific region (ACP countries), the baseline assumes that no quota- and tariff free access between the EU and the ACP exists in 2021.

2.2.2 Price policy

Interventions for pork, corn and barley have been eliminated, or, rather, the intervention amounts have been reduced to zero. Due to the market conditions at this time, the export-promoting measures for the dairy sector were removed from the vTI-Baseline; however, should world market prices drop, these measures can be re-activated. In regard to the substitution of normal fuels with biofuels, it was assumed that the goal of 10 % of total fuel use to be biofuels would be reached by 2021 under the new framework conditions for the field of liquid biofuels.[7]

2.2.3 Quotas and production limits

The vTI-Baseline scenario considers the increase of milk quotas by 2 percent from April 1, 2008, as well as the further stepwise increases by a total of 5 percent mandated by the Health Check in the time periods of 2009/10 and 2013/14. The adjustment of the fat-correction factors as of 2009/10 allows Germany a further increase in the delivery amounts of approximately 1.5 %. Based on current decisions, an expiration of the milk quota is assumed for the year 2015.

With regard to sugar market regulation, the returns of delivery rights in the framework of a restructuring program through March 6, 2009, are taken into account. In addition, in the framework of the vTI-Baseline, no further cuts are expected until 2021; thus, the sugar quotas in Germany in the target year are at 2.9 million tons of sugar. The obligatory area set aside was repealed with the Health Check mandates.

2.2.4 Direct payments of the first pillar of EU agricultural policy

In the vTI-Baseline, it is assumed that funds available for direct payments will be continued through 2013 and that no budget cuts will be necessary. In Germany, the implementation of the farm premium regulations led to standard state-area premiums. The regional averages for the values assumed for the target year include the direct payments[8] still to be decoupled by 2013. The direct payments range from 296 €/ha for Saarland and Rhineland Palatinate up to 366 €/ha in Lower Saxony/Bremen (Table 2.5).

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7 The targets were recalculated for the demand for biodiesel and ethanol based on the expected use of fuel.
8 In Germany, this refers to payments for protein crops, starch potatoes, dry feed, flax and hemp.

Table 2.5: Assumptions for the level of the decoupled direct payments in 2021 (in €/ha)

Region	Regional Target value	Regional Mark up value (estimated)	Regional Value (estimated)
		€/ha	
Baden-Württemberg	308.05	0.7	309
Bavaria	354.55	6.4	361
Brandenburg/Berlin	300.30	5.3	306
Hesse	299.58	0.3	300
Mecklenburg-West Pomerania	329.44	3.5	333
Lower Saxony/Bremen	352.28	14.1	366
North Rhine-Westphalia	359.44	0.3	360
Rhineland-Palatinate	294.54	1.0	296
Saarland	258.96	36.5	296
Saxony	357.26	1.5	359
Saxony-Anhalt	354.97	3.2	358
Schleswig-Holstein/Hamburg	358.83	0.1	359
Thuringia	346.35	1.2	348
National average	339.23	4.8	344

Source: BMELV (2011).

2.2.5 Measures of the second pillar of EU agricultural policy

For the projection of the funding of measures for rural development, the current expenses in the previous programme period from 2000 to 2006 are compared with those of the approved budget for the new period. This comparison should reflect long-term trends in the focus of the programmes. Because 2007 is not suited for use as the first year of the new programme period, the planned development of the programmes in the period from 2007 to 2013 is reflected. Furthermore, in 2007, existing obligations from the previous period played an important role. Because of their relevance for farm support, the following measures were selected for comparison: investment aid, area payments for less-favoured areas, and payments in the context of Natura 2000 and the agri-environment. Budget expenses from the EU, national and state governments for the measures under Regulation (EG) 1257/1999 for the time period from 2000 to 2006 are compared with planning data for the implementation of measures according to Regulation 1698/2005 (European Agricultural Fund for Rural Development (EAFRD) Regulation; see TIETZ, 2007), and specific federal state trends are identified.

Due to cuts in the EU co-financing funds, additional national funding, according to Article 89 of the ELER-Regulations, played an important role in the new programme period. For this reason, purely national support measures are considered for the period 2000 to 2006 as well. Complete data were available for investment aid and payments for less-favoured areas; for agri-environment measures, in contrast, available data on expenses for the period from 2000-2006 were not complete for those measures exclusively financed by federal states. In the current programme period, the average investment aid will be further increased, whereas the budgets for less-favoured areas and agri-environmental measures will be reduced, according to the data. However, the developments in individual federal states differ substantially.

Additional EU funds, which were made available to increase the budget for EAFRD Measures in 2013 in accordance with the Health Check decision to increase modulation, are considered. It is assumed that 80 percent of the fund increases will be used for a proportional increase in investment aid, payments in less-favoured areas and agri-environmental measures. In accordance with these assumptions, no additional increase in the EAFRD budget will occur because there are still sufficient national funds in the existing EAFRD budgets of the federal states for co-financing. In the modified financial planning of 12 of the 13 federal states for the current EAFRD period, an increase in investment aid as well as in the budget for less-favoured areas is planned. The agri-environmental budget was increased in 10 federal states (see TIETZ, 2010). For the baseline projection, it is assumed that budgets will continue through the year 2020 on the basis of changes shown in Table 2.6.

Table 2.6: Changes in the funding of selected measures of the second pillar

EAFRD measure	**Investment aid**	**Less favoured areas**	**Agri-environmental measures**
Region	Planned budget for 2013 in percent of budget spent in 2000-2006 [a)]		
Baden-Württemberg	91	56	85
Bavaria	74	94	79
Brandenburg/Berlin	44	89	82
Hamburg	104	366	174
Hesse	137	84	111
Lower Saxony/Bremen	174	132	209
Mecklenburg-West Pomerania	130	32	126
North Rhine-Westphalia	96	78	116
Rhineland-Palatinate	116	70	104
Saarland	77	0	73
Saxony	190	103	39
Saxony-Anhalt	120	187	129
Schleswig-Holstein/Hamburg	120	230	229
Thuringia	53	100	110
National average	141	88	92

a) Including planned EAFRD art. 89 measures (2007-2013) (i.e. financed without EU), for 2000-2006 nationally financed measures are considered as fas as data are available.
Source: Tietz (2007).

2.2.6 The subsidisation and use of biofuels and biogas

The expansion of biogas production will be promoted through the Renewable Energy Laws (EEG), the revision of which took effect on January 1, 2012. The extent to which the revision affects the investment behaviour of biogas facilities, upon which the regional biomass crops largely depend, can hardly be estimated. For this reason, the current regional investment dynamic was continued for two years to consider the biogas facilities already under construction or in planning and to estimate their biomass requirements. The status thus achieved will be maintained until the target year 2021 due to the 20-year guaranteed protection of interests and the crop areas required for the production of the biomass.

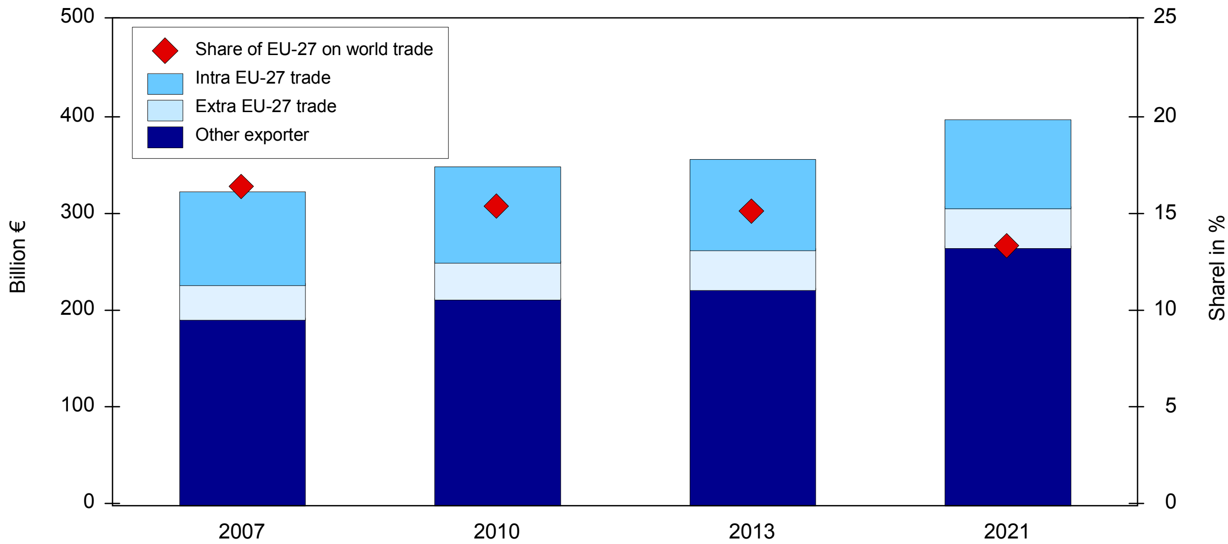
The present vTI-Baseline takes the observance of the fuel-blending goals of the EU and their implementation into account. Here, however, for the total projection period, the implementation of the mandatory blending proportions for fuels is assumed. The conversion of the substitution quotas of fossil fuels with biofuels on the basis of energy content in a climate protection quota from 2015 is, however, not considered. In addition, no consideration is given to the use of second-generation biofuels.

3 Results

3.1 Development of agricultural trade

The implementation of the mixture quotas for biofuels, the (minimal) adjustments to trade policy and the changes in the macroeconomic framework conditions lead to a change in the trade flows in the vTI-Baseline. Figure 3.1 shows how global agricultural trade develops from 2007 to 2021. Here, the EU exports are related to the trade values of other exporters. Additionally, a differentiation is drawn between internal EU trade and EU exports in non-EU-countries. In the base year 2007, the internal trade of the EU was worth almost three times more than trade with non-EU-countries. Over time, the importance of EU trade with non-EU-countries increases. In 2007, the EU exported agricultural products with a value of 37 billion Euros to other countries; this value increases by the year 2021 to 41 billion Euros. The participation of the EU in global agricultural trade decreases from 16 % to 13 %. The question arises as to the causes of this decline in the export portion of the EU. In Figure 3.2, the countries and regions to which the EU exports are presented. In the base year 2007, the USA, European countries, including Russia and Turkey, and Asia are the most important importers of EU agricultural products. Over time, trade with some of these countries and groups of countries increases only slightly, whereas trade with other countries remains at a relatively constant level or even decreases.

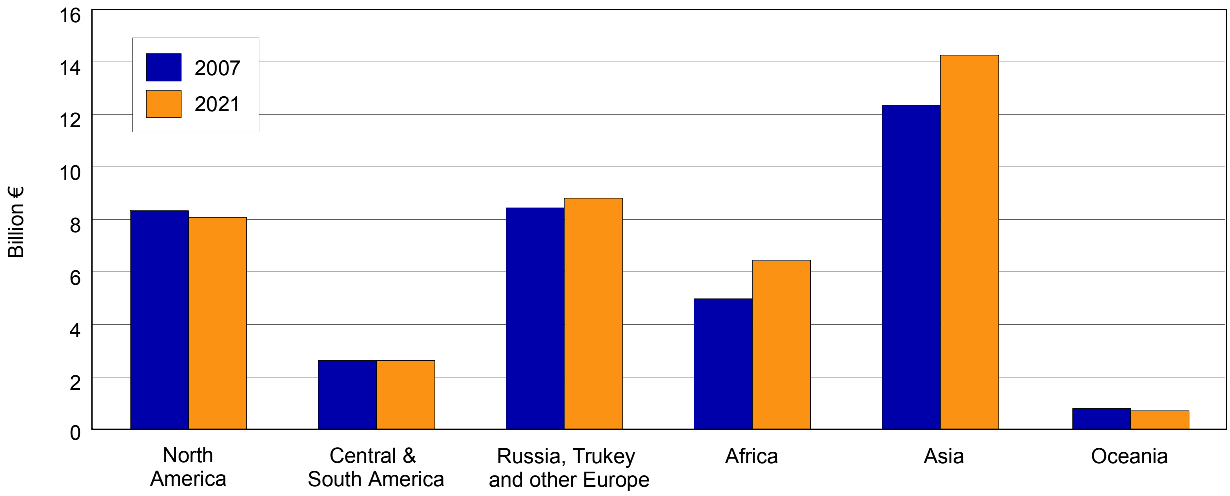
Figure 3.1: Agricultural exports of the EU-27 in billions of Euros and share of the EU-27 in global agricultural trade (exports)



Source: Own calculations with GTAP (2011).

It can be seen in a sector disaggregation of agricultural trade that the increase in exports from the EU to Asia (and here particularly to China) is due to the increasing demand for poultry meat and pork as well as beef. The exports of plant products to China hardly rise. Additionally, the EU can increase its export of milk products to Africa and Asia.

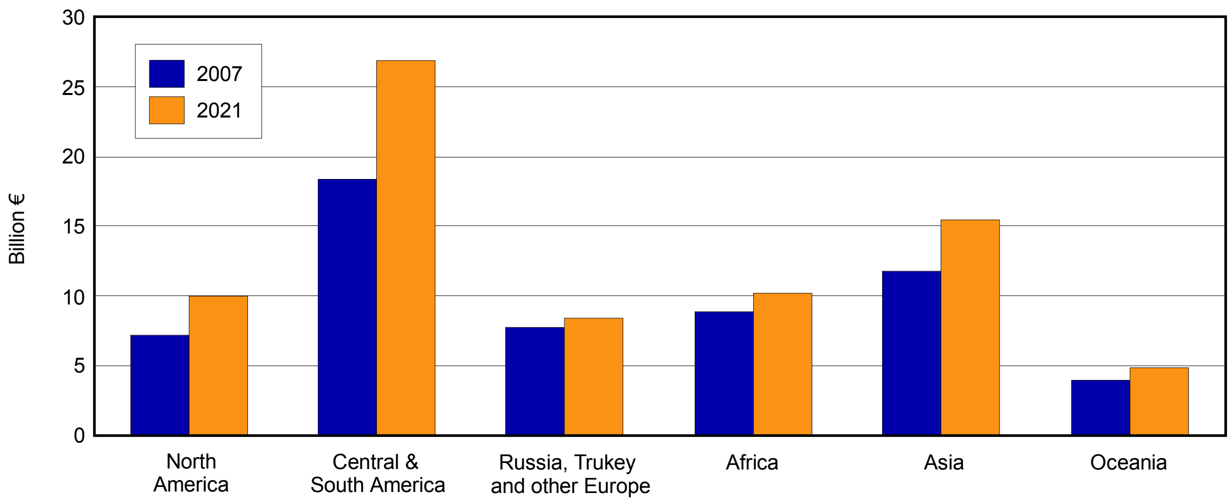
Figure 3.2: A comparison of agricultural exports of the EU-27 in the years 2007 and 2021



Source: Own calculations with GTAP (2011).

How is the import situation in the EU? What are the most important countries or regions from which the EU purchases its agricultural products? In Figure 3.3, the EU-27 imports for the year 2007 are compared to the imports in 2021. It can be seen that the EU imports from virtually all countries increase. This effect is caused, particularly in the vTI-Baseline, by the implementation of the fuel mixture obligations in the framework of the EU biofuel regulations. The declining population development in the EU tends to contribute to the declining import values of the EU, but the vTI-Baseline results clearly describe that the EU cannot fulfil the mixture requirements of the biofuel regulations from domestic production of the necessary raw materials and is dependent on imports. The results show that imports from North and South America (oilseeds and coarse grains), but also from Asia, increase significantly in the considered time period of 2007 to 2021.

Figure 3.3: A comparison of EU-27 agricultural imports between the years 2007 and 2021

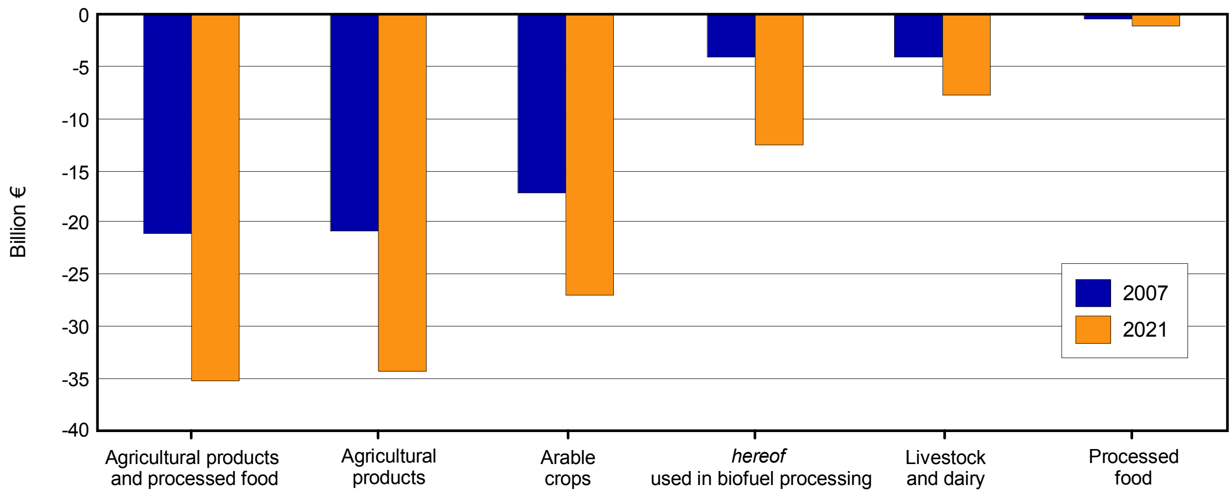


Source: Own calculations with GTAP (2011).

Figure 3.2 and Figure 3.3 show that EU exports to most countries stagnate or increase only slightly, whereas the import values increase significantly. However, how do the imports develop in relation to the exports? To answer this question, Figure 3.4 shows the changes in the trade balance. The trade balance is defined here as the changes in exports minus the changes in imports. A differentiation between the individual product groups provides additional information on the development of the agricultural trade of the EU. For all products, the trade balance considered for the entire time period of the vTI-Baseline is negative. This negative balance indicates that the imports increase strongly in comparison to the exports, or rather that they decrease less. The strongest increase in the trade balance deficits in the agricultural product and food sectors is attributable to the crops used for biofuel production (oil seeds and coarse grains). For animal products and processed foods, there is only a slight change in the trade balance. The negative development of the EU trade balance is mainly due to the assumptions of energy policy measures (biofuel regulations) and to macroeconomic variables. In the vTI-Baseline 2009 – 2019, the decline in the EU population and the increase in per capita income in other parts of the world led to a significant increase in the EU's net exports, this increase was overshadowed by the implementation of biofuel regulations.

Through the more rapidly increasing GDP in countries such as China, Brazil, Russia and India, there is a greater demand for processed agricultural products and meat. In comparison to the adjustment of macroeconomic variables, the implemented trade policies in the vTI-Baseline have only a slight effect on most products. An exception is sugar; the implementation of the EBA-Initiative led to an increase in sugar imports from the poorest countries in the world, the so-called LDCs. Also, in the case of beef, the EBA-Initiative led to an increase of imports from the LDCs. This effect, however, is overcompensated by the growth in demand in countries outside of the EU, causing the trade balance changes to show positive signs.

Figure 3.4: Trade balance changes in the EU-27 for selected product groups



Source: Own calculations with GTAP (2011).

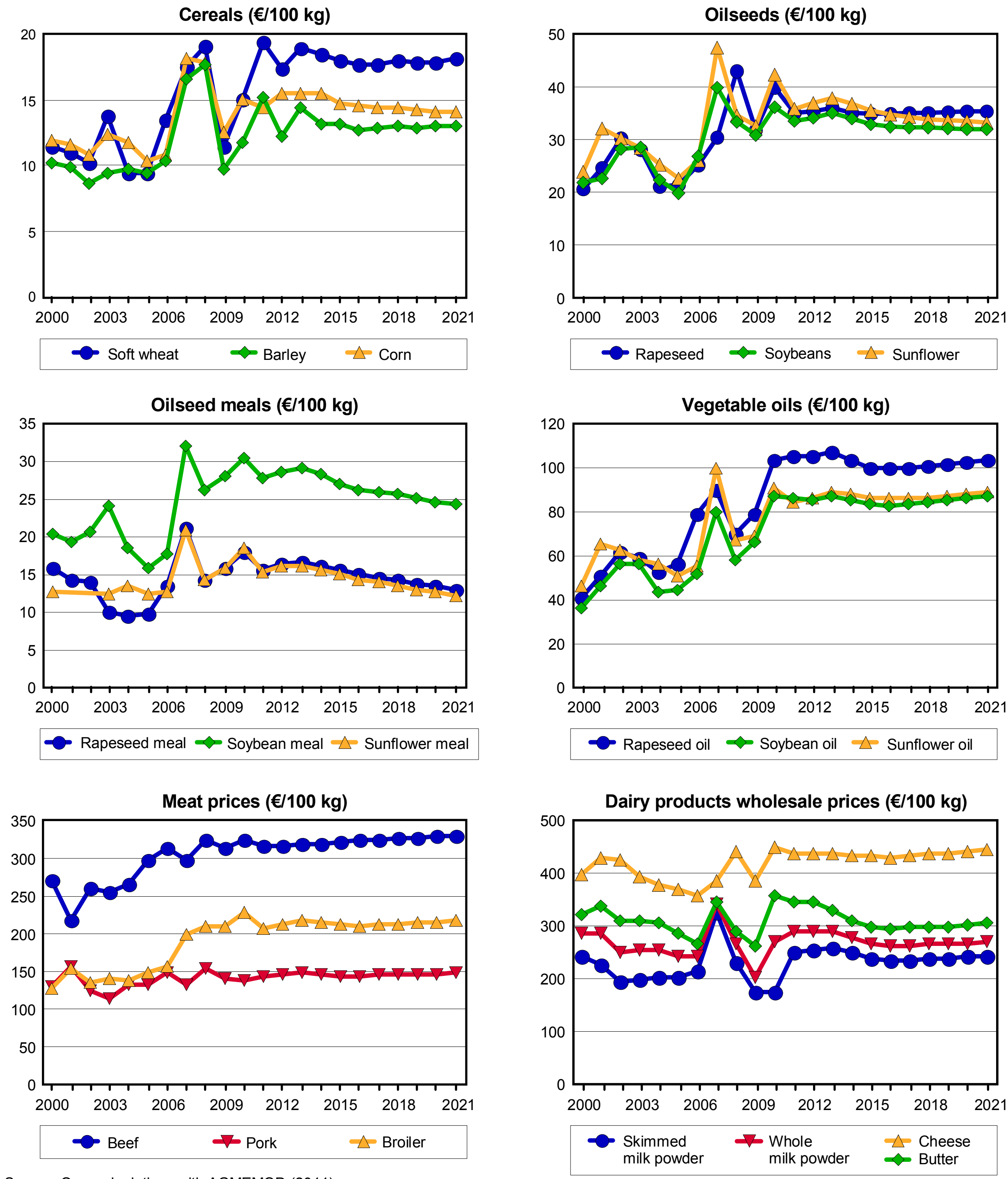
In the interpretation of these results, it is important to note that only approved trade policies are considered in the vTI-Baseline. The current WTO negotiations were, for example, not implemented. Thus, it will be possible in later analyses to quantify the impacts of the WTO trade liberalisation on the basis of the vTI-Baseline. The presented results thus reflect a situation in which the EU still pays export refunds and collects, for example, tariffs of an average of 134 % on sugar or 66 % on beef imports. With a further trade liberalisation in the framework of a successful conclusion of the current WTO round, the EU will more strongly export products for which it is internationally competitive with minimal external protection. Trade liberalisation will be a challenge for sectors that have profited from external protection, such as beef or sugar. For other sectors, in contrast, new export possibilities will emerge because external protection against the EU will be reduced.

3.2 Producer price developments for agricultural products

The vTI-Baseline 2011 – 2021 is marked by strong economic growth following the financial crisis and an increasing world market price level. The increase in the world market prices in US dollars does not lead to an increase in Euro prices because the anticipated development of exchange rates implies a slight revaluation of the Euro vs. the US dollar. The German price level will also be influenced by energy policy requirements. In this concern, the politically induced demand for bioenergy and the input reimbursement according to the Renewable Energy Laws (EEG) should be mentioned. Thus, the demand for appropriate products such as rapeseed oil and wheat is largely independent of changes to the prices of these products. In addition, the development of overall fuel demand has an influence because, with fixed blending rates, the required amounts of raw material are based on the demand for biofuel. Depending on the price relation, the product mixture of raw materials can change. On the one hand, the relation between gasoline and diesel can shift; on the other hand, different oils can be used, either from domestic or imported oil seeds. In addition, oil can be directly imported. The same holds true for ethanol. In Germany, the main raw materials are rapeseed for the production of vegetable oil, imported rapeseed oil and maize for the production of biogas, and wheat for the production of ethanol. These additional sales limit possible feedstock price drops, or rather, induce price increases; however, they do not appear to reduce the relatively volatile grain and oil seed prices of the past years. Also in the future, product prices can vary significantly either up or down depending on supply and demand fluctuations in contrast to the annual average or multiple-year average. A decrease would be limited, to a certain extent, through intervention.

In the vTI-Baseline 2011 – 2021, the high global market prices in the projections also tend to lead to higher domestic market prices. In Germany, the price level has risen significantly for grain since 2008/09 (see Figure 3.5) and is thus above the intervention price level for wheat. Since the production of grain in 2010 did not meet the expected levels, but demand and export were comparatively high, the grain prices in 2010/11 generally increased. This development was driven by a price-related limit of the crop areas in Germany, and the weather conditions were unfavourable to the yields. Maize was the exception to the yield reductions. Due to the price development in Euros on the global market and improved production, the prices for the main grain varieties decreased. After a slight recovery in 2012/13, the prices plateau but at a comparatively high level. In the vTI-Baseline projection, wheat, in particular, profits from the demand for raw materials for ethanol production. The situation differs by feed grain variety. According to the world market price development, feed grain prices tend to be weaker, and particularly barley is affected. The effective extent of price differences will be largely dependent on general economic development and thus on the demand for biofuels coupled with fuel developments.

Figure 3.5: The development of agricultural prices in Germany in the vTI-Baseline



Source: Own calculations with AGMEMOD (2011).

The situation with regard to oilseed development is comparable to that of grains. In addition to the world market prices, the strongly increasing demand for rapeseed oil for biofuels plays a very important role, whereas in recent years, the demand has not shown quite the expected growth. In 2010/11, high rapeseed oil prices had a depressant effect. The cause for the high prices was EU-wide rapeseed production that did not meet expectations. On the one hand, seeded areas had to be limited due to weather conditions, and on the other hand, high levels of precipitation caused the yields to be far below average. The harvest yields in 2011/12, expected to be better, caused the rapeseed oil prices to drop somewhat. The persistent high demand for rapeseed oil continued to lead to high rapeseed oil prices, which plateaued at a high level due to exchange rates. These high prices also affected the rapeseed by-product rape meal, for which a below-average price developed. Possible imports of oilseed, oils and grain from the world market prevented the domestic price from remaining clearly above the world market price level for these products (see Chapter 2.1.2).

The demand for meat in Germany continues to be marked by a reduced consumer preference for beef. The per capita consumption changed only slightly. Overall, the vTI-Baseline 2011 – 2021 shows a slight production decrease for beef, which causes a very slight recovery for beef prices. The remaining livestock sectors are characterised over the long term by relatively strongly technical advances, which have led in past years to expansions of production of both pork and poultry. Because part of the growth in the pork sector was due to imported piglets from the Netherlands and Denmark, it is not clear how piglet supply will develop in the future and whether this work-sharing process will remain. A second important aspect is the import of fattened pigs for slaughter, for example, from the Netherlands. In 2010, the prices for pork dropped. The relatively high feed prices depressed the expansion of production. This rather modest development led to stable and slightly increasing prices with a stable demand. The situation for poultry was comparable to that for pork. Both supply and demand grew significantly. Due to the increasing feed prices and other production costs, the profit margins sank. This limited the growth potential, causing poultry prices to decrease somewhat from the very high price level of 2010 but generally remains stable in the projection period.

Following the financial crisis of 2007/08, the German dairy sector was marked by a relatively high supply, low demand and low prices in 2009. The subsequent economic growth induced high milk production prices in 2010, which remain at a comparably stable level in the projection period to 2014. The devaluation of the US dollar in the following years of the projection period imply rather weak production prices, whereby production expansion in Germany and the EU following the elimination of quotas plays a certain role. High sales projections on the domestic and world markets explain a producer price for milk with 3.7 % fat and 3.4 % protein at approximately 30 €/100 kg milk (without value-added tax) at the end of the projection period.

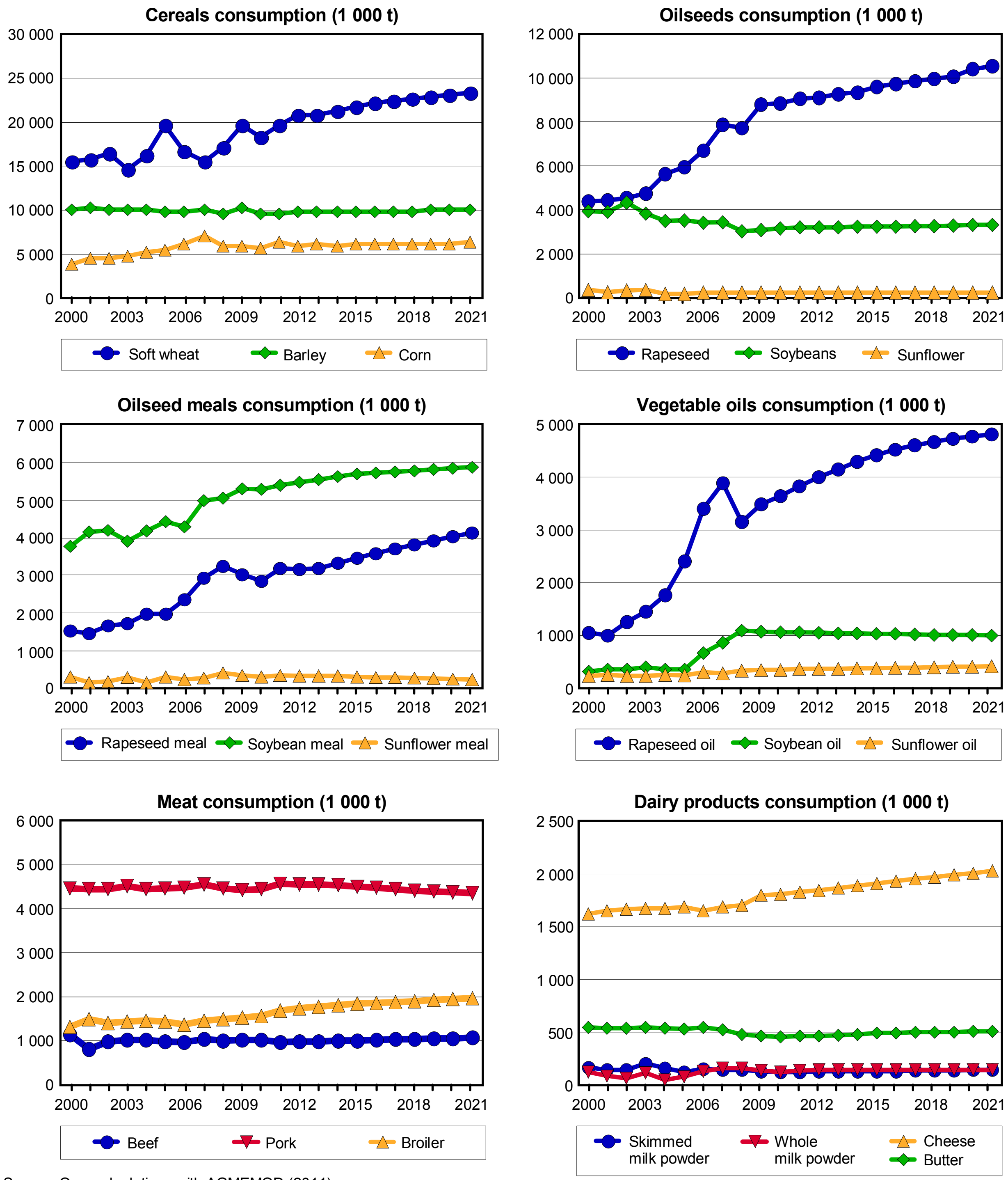
Here, it must be considered that the assumed economic growth and the generally higher agricultural and energy prices also increase the production costs. The short-term producer prices resulting in the model calculations are over 32 €/100 kg milk. The total dairy market is stabilised and kept relatively sustainable by the price for cheese, the German domestic demand, and especially the brisk export demand. Because milk is increasingly used to produce cheese, this has a positive impact on the price of butter and is additionally strengthened by the active demand on the world market. Thus, the German butter price follows the development of the world market price. The situation for milk powder is comparable. Through the stronger Asian demand for whole milk power, however, there is a price difference for whole milk powder vs. skim milk powder. The development in amounts in the production of milk products thus follows the development of demand and past trends in relation to processing. The production of fresh milk products and cheese products is being further developed while the production of the other products stagnates or decreases.

3.3 Demand development

Due to the stagnating population and the average income growth, the domestic use of most product groups in the projection period increases to a limited extent (Figure 3.6). Based on the political requirements for the bioenergy sector, the demand for wheat and rapeseed continues to grow, whereas a below-average development in the demand for feed grains is seen. Due to the price relations, increased amounts of meal are used. However, it must be noted that the use of maize for the production of bioenergy is not described in the market model. In the mid-term, the demand for feedstock for the production of ethanol is expected to be more equally distributed among the grain types, for which, the proper conditions do not currently exist. The increased domestic demand, particularly for wheat, reduces the export potential for wheat drastically, and the imports increase. Since Germany only holds a limited market share of wheat in the EU's domestic market, the impact of this additional demand on the price development is limited, but a drop in prices to the level of the intervention price is excluded due to the raw material needs for bioenergy. This sales channel functions like regular intervention purchases.

In contrast to the demand development for grains, the domestic use of rapeseed had already increased significantly in the past. According to this demand development, rapeseed is being increasingly purchased by oil mills. However, the high prices for oilseed, or rather oil, in the past has led to a demand that is not quite in keeping with expectations. Domestically produced rapeseed is currently used primarily in milling to obtain the oil necessary for use as bioenergy. Alternatively, rapeseed can be imported for further processing. Rapeseed oil is, however, imported directly. For the model calculation, an unchanged usage possibility for rapeseed oil is assumed. Rape meal is a by-product of rapeseed oil production and is either used in national animal production or is exported. The low meal prices lead to an increased demand from the animal sector, whereby grain is substituted. Because rape meal is of much lower quality as a protein source than other products and is not usable in unlimited portions in feed rations, it must be sold for the price it brings. The additional rapeseed oil demand for biodiesel use also has an effect on other oils and oilseed due to the high level of substitutability among the oils.

Figure 3.6: The development of domestic uses in Germany



Source: Own calculations with AGMEMOD (2011).

Animal products are marked by slightly increasing consumption. Particularly, pork and poultry profit from further increasing demand. The growth in the demand for milk products continues in Germany. As in past years, cheese and fresh milk products are particularly important. However, the consumption of butter is increasing more rapidly than in the past. Whether this is a sustainable trend remains to be seen. The sales of milk power are developing slightly positively. However, a range of uncertainties is evident with regard to the sales of skim milk powder and the relation between the use of skim and whole milk powder. In simulations, the price development for these products continues to be dominated by the world market.

3.4 The development of agricultural production

The sectoral developments up to the year 2021 are presented in Table 3.1. Despite the expected approximately 5 % increase in grain prices up to the year 2021 compared with the average of the years 2006 – 2008, a reduction in grain areas occurs. This is a consequence of the highly competitive ability of energy maize crops to be used for biogas production (GÖMANN et al., 2007), causing crop areas increase to approximately 1.4 million ha in the vTI-Baseline. In addition, a decline of agriculturally used land of approximately 400,000 ha is assumed by the year 2021 (see Chapter 2.1.4). The drop in root and legume crops is mainly due to a reduction in the cropping of sugar beets, which can be explained by a reduction in the quotas in the framework of a restructuring program (see Chapter 2.2.3) with a simultaneous drop in beet prices. The expected increase in agricultural prices, as well as the elimination of obligatory set-aside regulations, leads to an intensification of arable land use. Set-aside areas are being farmed again throughout the nation. In addition, large areas of land in less competitive locations that were taken out of production within the framework of the voluntary set aside, particularly in Brandenburg, will be increasingly farmed again by the year 2021.

Table 3.1: Developments in the land use, production and income derived from German agriculture

	Unit	Base year 1999	2006/08	Baseline 2021	Baseline 2021 versus 2006/08
		absolute			in %
Land use					
Cereals	1 000 ha	6,840	6,774	5,877	*-13*
Wheat	1 000 ha	2,706	3,109	3,010	*-3*
Barley	1 000 ha	2,196	1,970	1,423	*-28*
Rye	1 000 ha	851	649	474	*-27*
Oilseeds	1 000 ha	1,137	1,438	1,340	*-7*
Potatoes	1 000 ha	298	270	267	*-1*
Pulses- and root crops	1 000 ha	1,012	759	605	*-20*
Silage maize	1 000 ha	1,203	1,100	900	*-18*
Other fodder	1 000 ha	469	581	663	*14*
Energy maize[a)]	1 000 ha	51	450	1,423	*216*
Set aside	1 000 ha	720	593	215	*-64*
Cattle	1 000 heads	14,831	12,802	11,236	*-12*
Dairy cows	1 000 heads	4,765	4,123	3,824	*-7*
Milk delivery[b)]	1 000 t	26,768	27,954	29,991	*7*
Beef and veal production	1 000 t	1,332	1,183	1,128	*-5*
NVA[c)]	Mio. €	11,431	13,661	14,458	*6*
Labor requirements	1 000 AWU [d)]	647	530	397	*-25*
NVA / AWU	1 000 €/AWU	18	26	36	*41*
Subventionen	Mio. €	5,076	6,446	6,494	*1*

a) Estimated. b) Acutal fat content. c) NVA = Net value added at factor costs. d) AWU = Annual Work Unit.
Source: Own calculations with RAUMIS (2011).

The production of milk will expand to approximately 30 million tons despite the drop in milk prices through the elimination of quotas by the year 2021. This result indicates an increase in milk production of approximately 7 percent over the years 2006-08. From the beginning of the 1990s through 2006-08, the cattle herd size decreased by more than a quarter, from 5.6 to 4.1 million dairy cows, due to the annual milk yield increases. According to model analyses, a further reduction of the dairy cattle herd of approximately 300,000 to 3.8 million cows can be expected by the year 2021 despite a slight increase in the amount of milk produced.

The number of “other cattle” decreases by approximately 15 percent by 2021. Above average is the decline in the number of suckling and multiple-suckling cows as well as in calf raising, which are processes that play only a small part in beef production; thus, beef production is reduced by approximately 5 percent. The diminishing cattle herd has a reductive effect on silage maize crops. The observed expansion of other arable feed crops, which, according the model analyses, continues until 2021, also includes the planting of arable feed crops for biogas production.

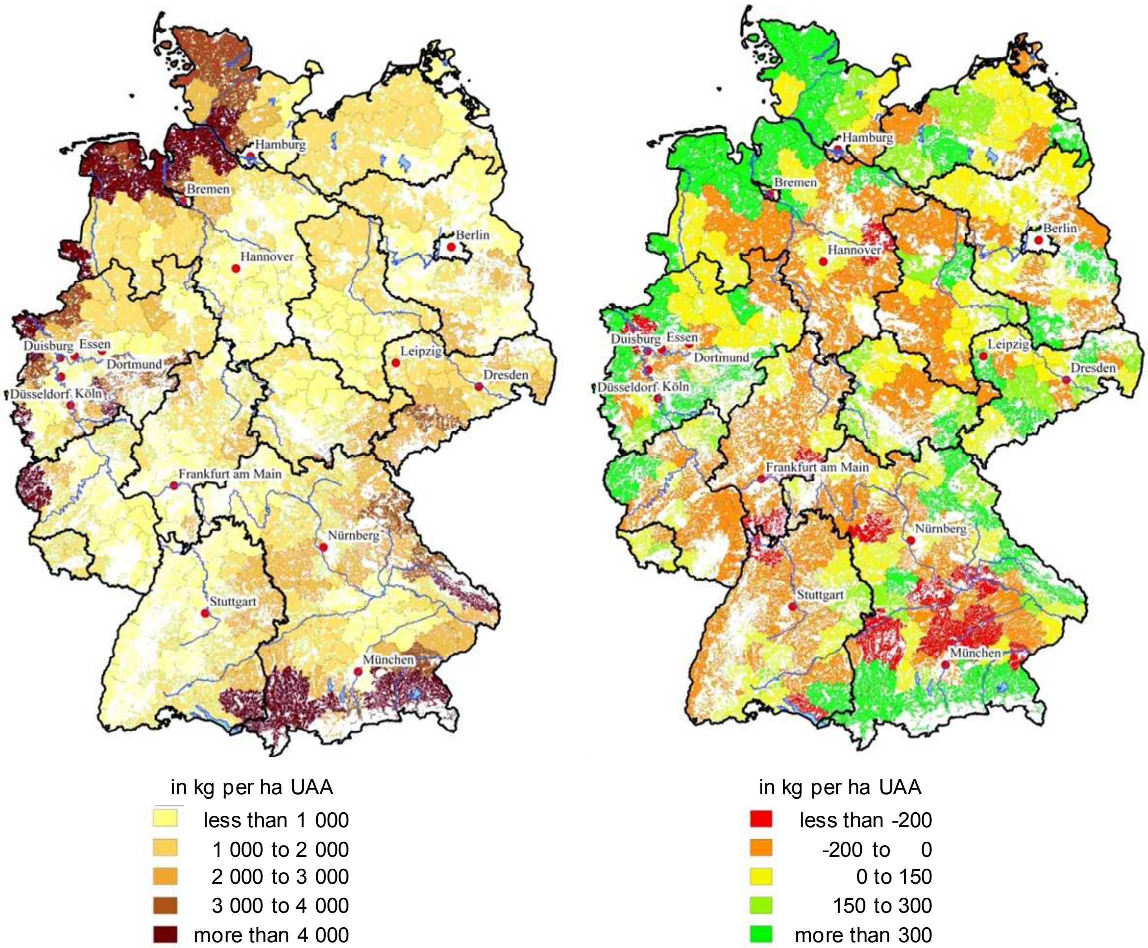
As a consequence of the promotion of renewable resource crops, energy maize areas will expand further until 2021. Particularly competitive in Germany are the arable crop regions of Lower Saxony, Saxony-Anhalt, Thuringia and Saxony, which produce high yields of grains and oilseed in their crop rotations. For the further regional development of biogas facilities, however, the investment behaviour is decisive and is currently difficult to estimate.

In comparison to arable land uses, the use possibilities for grassland are limited. In Germany, grasslands are primarily used as cattle husbandry and grazing areas, which are mainly used for keeping dairy cattle. Because the cattle herd is expected to decrease by 12 percent by 2021 in comparison to 2006/08 due to expected reductions in suckling and multiple-suckling cows, heifer rearing and dairy cow husbandry, increasingly less grassland will be required for grazing areas.

The trend already observed in the ex-post-development of a regional concentration of dairy production (see KREINS and GÖMANN, 2008) will be accelerated through the elimination of the milk quota system. An expansion of dairy production takes place, according to the model results, particularly the coastal regions, on the lower Rhine, in some low mountain and in the Allgäu and pre Alps (see Map 3.1). These grasslands, or rather less-successful arable land areas, have proven to be particularly competitive in milk production and are currently marked by high milk production density.

Map 3.1: Regional significance and changes in milk production in Germany

Milk production density in kg per ha UAA (2021) | Regional changes in milk production in kg/ha UAA (2006/08 to 2021)



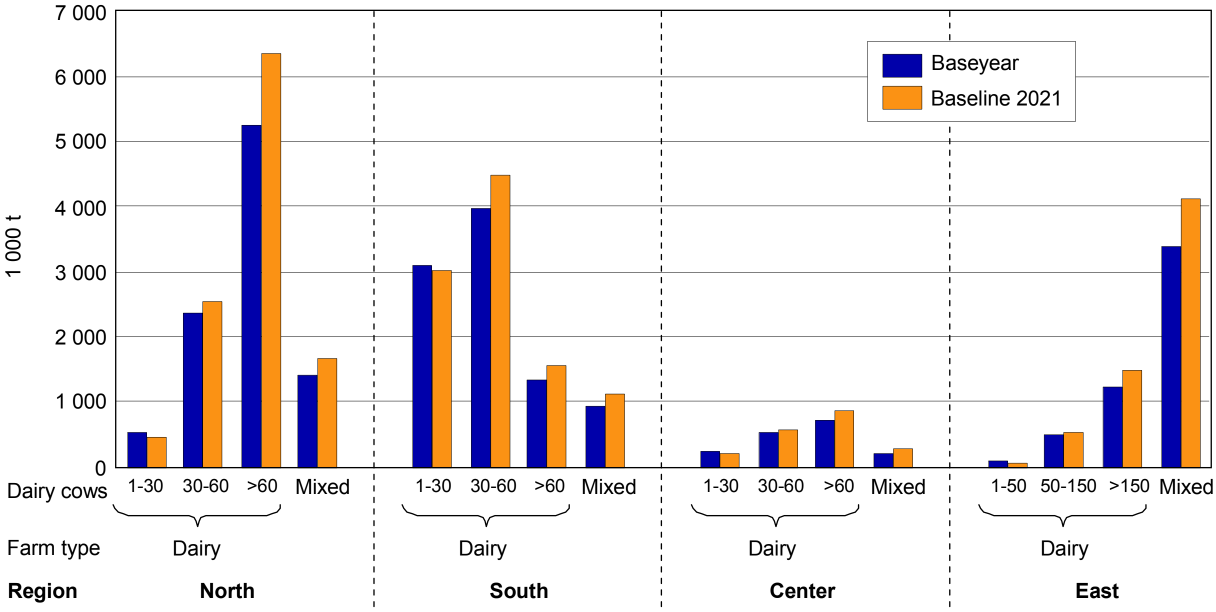
Source: Calculations with RAUMIS (2011).

A withdrawal from milk production was shown particularly for arable crop sites, such as, for example, the Köln-Aachen Bight, the Hildesheim Plain, favourable sites in Bavaria and the intensive livestock farms in western Lower Saxony (see Map 3.2). In addition, grassland locations lose a share of milk production. This loss of production affects, for example, the Black Forest as well as parts of Hessen—those grassland regions that have proven to be less competitive for milk production in the past and in which milk production is limited. These regions are in the vicinity of urban centres with comparably good non-agriculture employment possibilities and in which the significance of tourism “farm holidays” is increasing.

In all regions, the production of milk on small farms drops slightly as a consequence of structural changes (Figure 3.7). The large dairy farms as well as the mixed farms in the northern and eastern federal states show the highest increase (20 to 22 %) in milk production. The model results also show that in all regions, regardless of the regional trend, larger farms are able to increase their production. Despite these adjustments in farm and regional concentration of milk production, no fundamental change of the structure of the German dairy sector is expected in the vTI-Baseline.

Thus, for example, in the southern federal states, the majority of milk will continue to be produced on farms with fewer than 60 dairy cows.

Figure 3.7: The development of milk production in different farm groups



Source: Own calculations based on FARMIS (2011).

3.5 Income development

The reforms of the sugar and dairy markets and the integration of these sectors into the existing direct payment system have further increased the importance of direct payments, which make up a major portion of agricultural income. Subject to budget cuts in the framework of modulation or the financial perspective, total subsidies for agriculture in Germany are projected to increase by 48 million € by 2021 (see Table 3.1). The calculated labour requirements decrease by approximately one quarter by 2021 due to technical progress. In combination with an increase in the sectoral net value added at factor costs (NVA) of approximately 6 percent, the total increase of NVA per annual work unit is approximately 41 % (from 26,000 to 36,000 €).

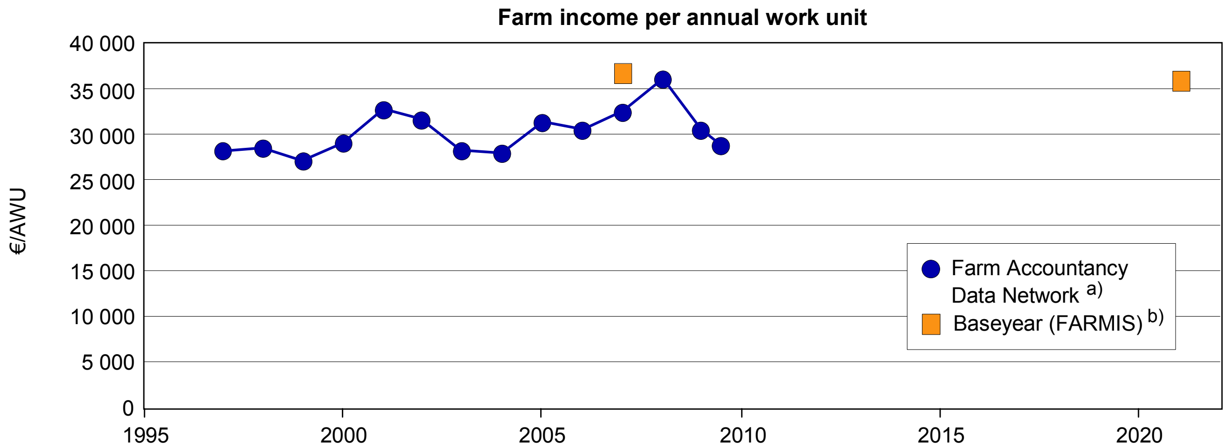
The assessment of income developments at the farm level focuses on the indicator "farm net value added per worker". Below, all income figures are adjusted for inflation and refer to 2007 prices to facilitate interpretation.

An overview of the development of the average farm net value added per annual work unit (FNVA/AWU) in the past, as well as in the vTI-Baseline, is given in Figure 3.8. In comparison to the base period of 2006 to 2008, the FNVA/AWU drops slightly but is still significantly above the average income over the past ten years. The decrease of product prices in real terms is partly offset by multiple factors:

– a continuing structural change with high exit rates, especially of small farms with below-average income;

- the resulting opportunity for growth for remaining farms;
- the reduced labour requirements as a consequence of technical change; and
- increases in crop and dairy yields.

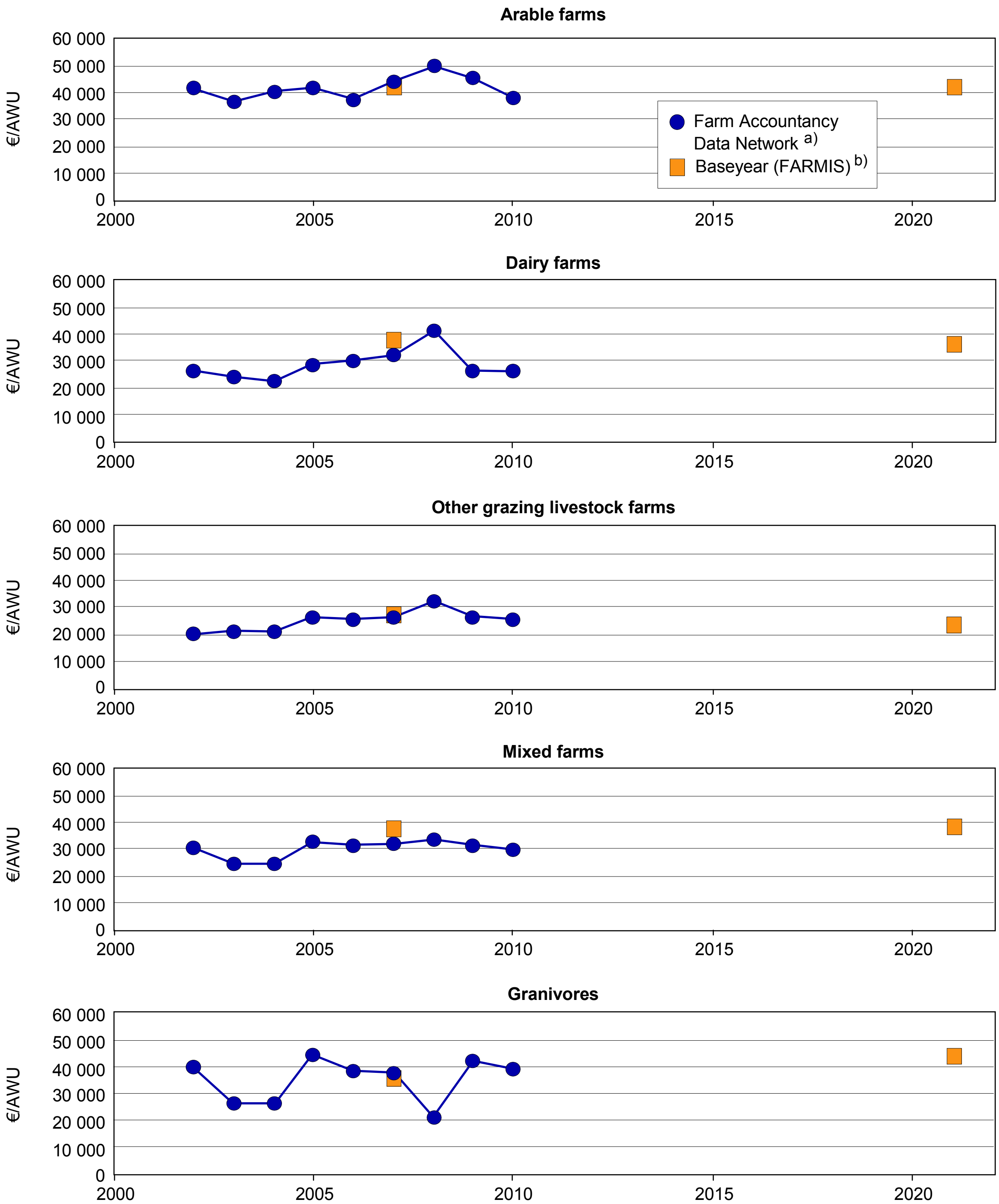
Figure 3.8: The development of farm net value added per annual work unit over time (in real terms, 2007 prices)



a) Full time farms.
b) All FADN farms; average 2005/06 to 2007/08.
Source: Agrarbericht (BMELV, diff. years) and own calculations with FARMIS (2011).

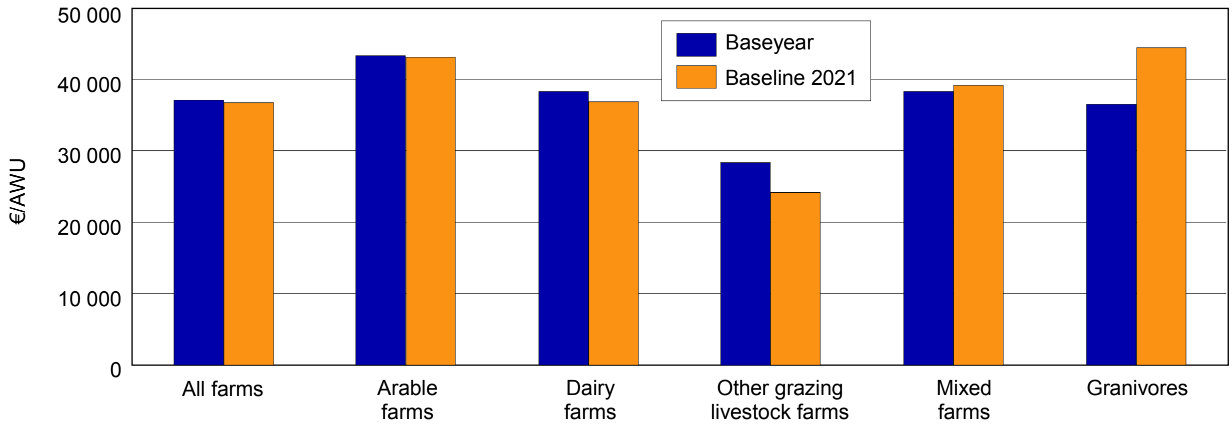
Income development differs by farm type (Figure 3.9 and 3.10), which can be mainly attributed to the different price developments for agricultural products (see Chapter 3.2). In addition, the full transformation of the single farm payment to regional flat rate premiums and the increase in the modulation result in changes in payments; the size and direction of these changes depend strongly on individual farm characteristics (e.g., historical stocking rates and share of grassland and the total volume of payments).

Figure 3.9: The development of farm net value added per annual work unit over time by farm type (in real terms, 2007 prices)



a) Full time farms.
b) All FADN farms; average 2005/06 to 2007/08.
Source: Agrarbericht (BMELV, diff. years) and own calculations with FARMIS (2011).

Figure 3.10: The development of farm net value added per annual work unit in the vTI-Baseline, by farm type (in real terms, 2007 prices)



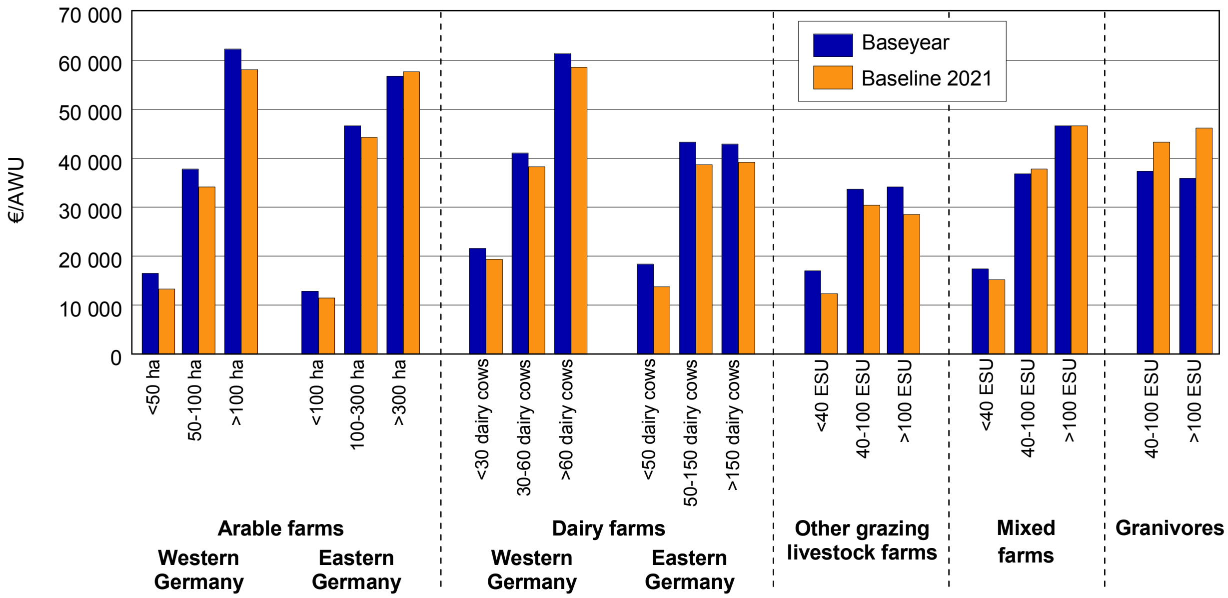
Source: Own calculations with FARMIS (2011).

Arable farms can maintain their comparatively high income level of the base year due to the nominally increasing prices for cereals and oilseed and due to new income opportunities from the production of energy maize. Dairy farms, despite the significant growth of average herd sizes and the elimination of quota costs, face a reduction in income of 4 % compared to during the base period as a consequence of increasing production costs and nearly constant producer prices for milk (32.5 cents/kg at real fat content). However, the income level of dairy farms is still above the average income realised during the last nine years. In other grazing livestock farms, the increase of input prices leads to significantly lower incomes (-15 %) despite the continuing structural change and slightly increasing producer prices for beef. Thus, the income of these farms is below the average level of the past nine years. Pig and poultry farms profit significantly from increasing pork and poultry prices in the vTI-Baseline scenario. By 2021, their income increases by 22 % compared to the base period.

For the interpretation, it is important to note that the increase in 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 3.11 provides a differentiated picture of income developments by farm size. The results highlight that the FNVA/AWU decreases in medium-sized and large farms of all farm types with the exception of large arable farms in the new federal states and pig and poultry farms. However, these results should be considered against the background of often quite favourable financial results during the 2006-2008 base period.

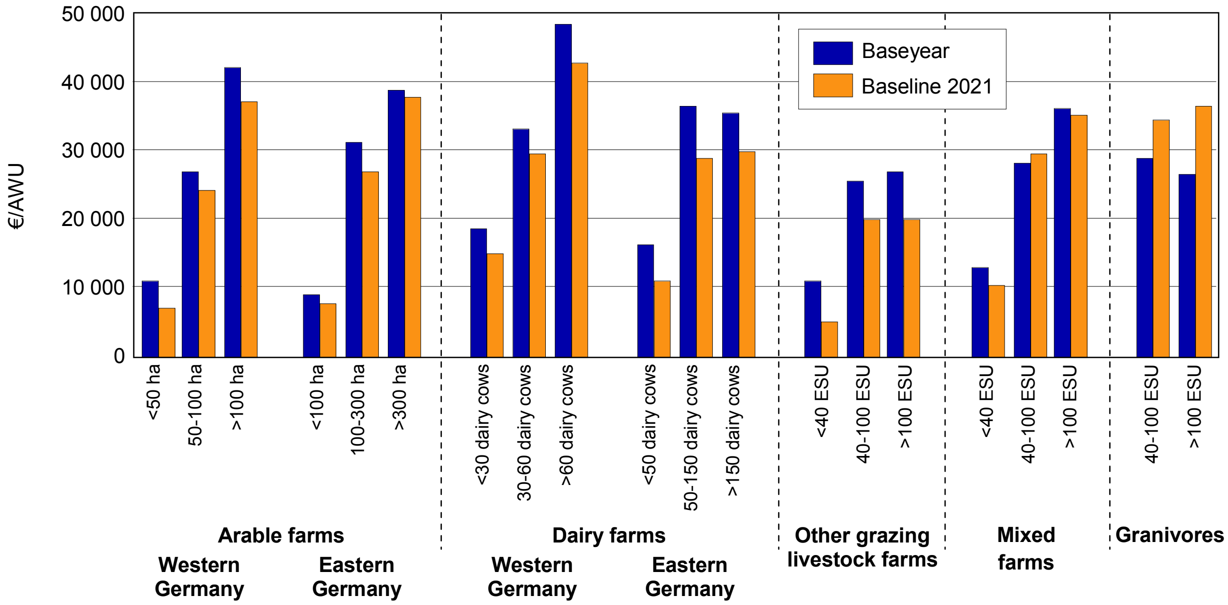
Family farm income is another important measure of success in farming. In contrast to farm net value added, the calculation of family farm income takes into account expenditures for the production factors land (rent), labour (wages) and capital (interest). To allow for a meaningful comparison of the economic development of different legal types of farms, this indicator was extended to “family farm income plus wages” following the approach used in the agricultural reports of the German federal government. In this context, the development of rental prices plays a particularly important role in the vTI-Baseline scenario because these prices are influenced, among other things, by the design of subsidies. In the vTI-Baseline scenario, the transformation of coupled premiums to regional flat rate premiums leads to an increase in rental prices for grasslands in the mid-term. This increase particularly affects large dairy farms and large other grazing livestock farms (Figure 3.12), for which rental costs increase due to the high share of grasslands in combination with a frequently high share of rented land. In these farms, family farm income plus wages per annual work unit drops significantly.

Figure 3.11: The development of farm net value added per annual work unit in the vTI-Baseline by farm type and size class (in real terms, 2007 prices)



ESU: European Size Unit. Indicator of economic farm size.
Source: Own calculations with FARMIS (2011).

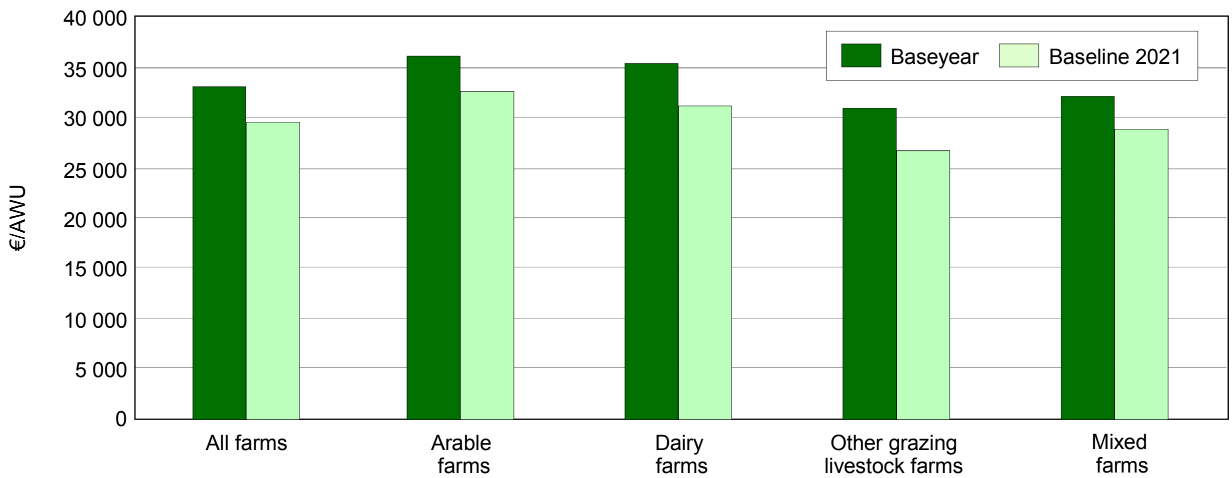
Figure 3.12: The development of family farm income plus wages per annual work unit in the vTI-Baseline by farm type and size class (in real terms, 2007 prices)



ESU: European Size Unit. Indicator of economic farm size.
Source: Own calculations with FARMIS (2011).

The FNVA/AWU of organically managed farms declines in the baseline (2021) compared to the 2006-2008 base period (Figure 3.13). This decline is particularly caused by the increasing production costs under the vTI-Baseline scenario. Furthermore, for the organic dairy farms, milk yield increases only moderately. Due to the relatively high percentage of dairy farms in organic farming, this moderate increase has an above-average impact on the profitability of the organic farms and outweighs the positive income effects resulting from higher producer prices for meat and cereals as well as from farm growth. The higher production costs and the moderate increase in yields also have a negative impact on the real income development of other farm types. In the short to medium term, organic farms profit from the implementation of the Luxemburg Reform and the CAP Health Check. In the long term, however, the increasing competitiveness of conventional farming resulting from higher world market prices, a politically induced demand for renewable resources, and an increase in competition for land as a consequence of the expansion of energy maize crops in Germany may lead to a reduction in the attractiveness of organic farming.

Figure 3.13: The development of farm net value added per annual work unit in organic farms (in real terms, 2007 prices)



Source: Own calculations with FARMIS (2011).

3.6 The development of selected environmental indicators

3.6.1 Environmental policy framework conditions

Following the energy sector, agriculture is the second largest source of greenhouse gas emissions. In contrast to the energy sector, which mainly emits Carbon dioxide (CO2) as a pollutant, the greenhouse gases methane and nitrous oxide are produced in agriculture. The greenhouse effect of methane is 21 times that of an equal amount of CO2. Methane is primarily formed by ruminant digestive processes and the storage of manure. The greenhouse effect of nitrous oxide is 310 times that of CO2. The most important source of nitrous oxide is microbial deterioration processes of nitrogen compounds in the soil, which take place both under natural conditions and also through agricultural nitrogen inputs. In addition, there are nitrous oxide emissions from manure storage. The greenhouse effects of both gases are expressed in CO2 equivalents. In the Kyoto Protocol and Decision 2002/358/EG, the Federal Republic of Germany committed itself to share the burden of reducing the discharge of climate-relevant gases with other countries of the European Community and to curb these emissions by the year 2012 by 21 % compared to the base year 1990. Agriculture in Germany has no direct reduction obligations. At the same time, each reduction in greenhouse gas emissions from the agricultural sector relieves the burden on other sectors of the German economy.

Ammonia is one of the most important air pollutants affecting the ecosystem and humans. Ammonia emissions cause the acidification and eutrophication of soils, waters and sensitive living areas such as forests, bogs and fens. Furthermore, these emissions cause the development of fine particulate matter and are thus a human health hazard. Nitrous oxide emissions result from nitrogen deposition, which, in turn, is caused by ammonia emissions, which are considered to be indirect emissions from agriculture. Regulation 2001/81/EG of the European Parliament and the Council of October 23, 2001, on national emission limits for certain air pollutants ("NEC-Regulation") sets binding targets for the reduction of air pollutants by the year 2012. Among other requirements, ammonia emissions in Germany should be reduced to less than 550,000 tons per year from the target year 2010 onwards. Because the majority of ammonia emissions can be traced back to agricultural causes, this goal is a particular challenge for German agriculture.

The emission of greenhouse gases and ammonia is closely linked to the nitrogen cycle in agricultural production and is influenced by the intensity of land use and animal production as well as by the technology implemented.

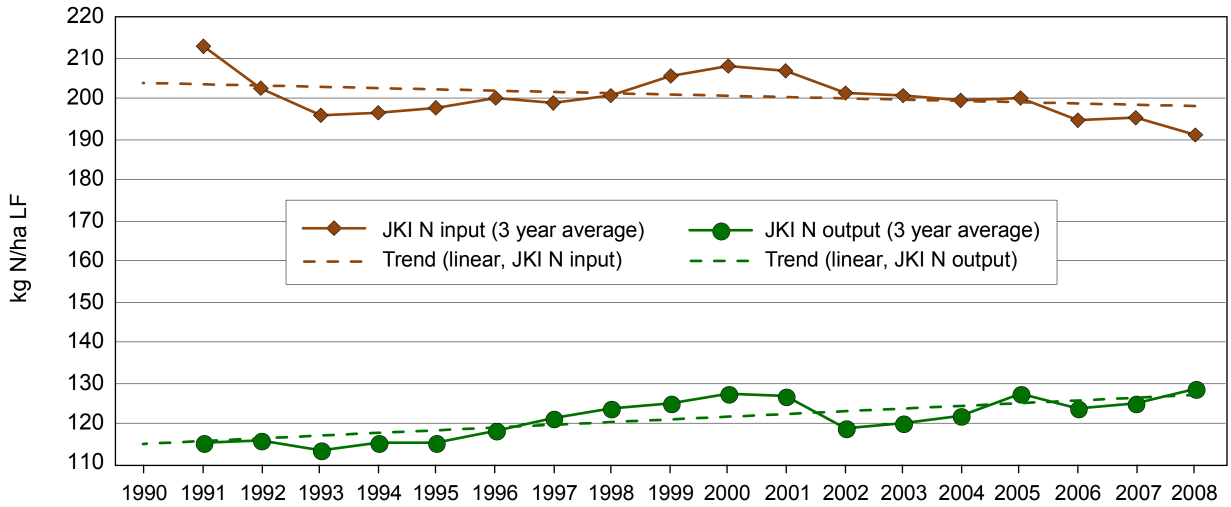
An environmental indicator of water quality is the nitrogen balance surplus, representing the amount of nitrogen (N) that exits the agricultural production cycle and presents a possible endangerment and stress potential for water bodies. Nitrogen balancing is used to calculate N-inputs and N-outputs of agriculturally used areas. Here, the site-specific characteristics are considered in terms of regional demand factors for nitrogen. Nitrogen inputs include mineral and organic fertilisers. Furthermore, N-balancing takes into account the input of atmospheric nitrogen as well as symbiotic and asymbiotic N fixation. Nitrogen withdrawal takes place both through the harvested crops and through unavoidable losses in the storage and distribution of farm manure in the form of ammonia.

In the vTI-Baseline 2011 – 2021, N balances as pollutant emissions are calculated at various regional aggregation levels based on the projection of the production activities and assumptions about technologies used. In the following section, the results for nitrogen balance surpluses are first discussed on the regional level, and, subsequently, trace gas emissions for Germany and the EU are presented.

3.6.2 The development of the nitrogen balance surpluses

In Figure 3.14, the development of the N inputs and N outputs of the land area balance is presented on the basis of a three-year moving average. In the case of N inputs, in this analysis, mineral fertiliser, organic fertiliser (sewage sludge, compost and animal meal) and farm-produced fertiliser are considered after subtracting ammonia losses, atmospheric N deposition, nitrogen binding via legumes and N in seeds and plant matter. In the past, the N input experienced great variability, but overall, there is a reduction trend. The N output, however, has increased. This finding results in a decrease in the N balances of the land area balance from approximately 80 kg N/ha UAA in the year 2000 to approximately 70 kg/ha in the year 2007.

Figure 3.14: The development of N Inputs and N Outputs per hectare of agriculturally used area

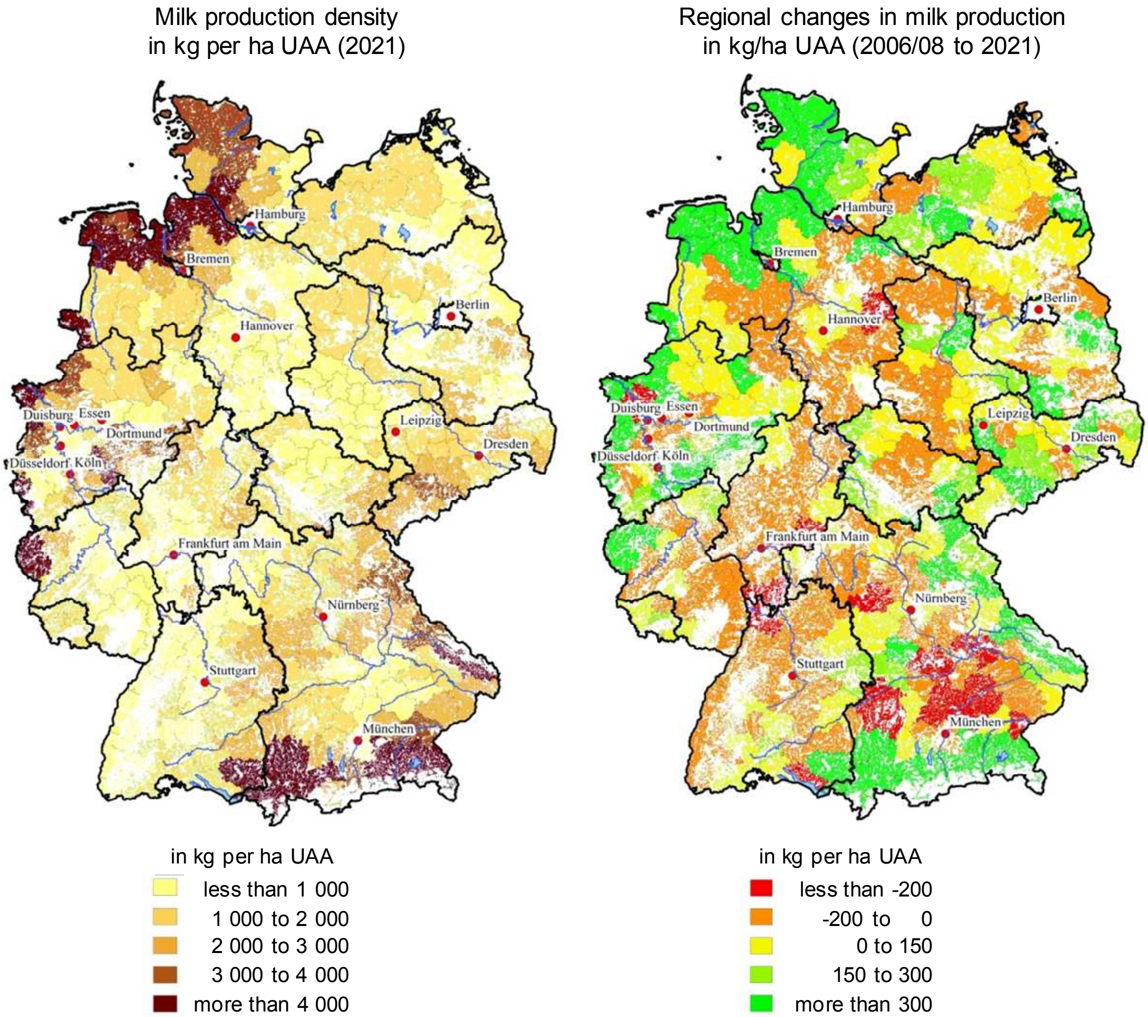


Source: Institute of Crop and Soil Science, Julius Kühn Institute (JKI) and Institute for Landscape Ecology and Resources Management, University Gießen, surface balance from 1990 to 2009 in kg N/ha utilized agricultural area. Statistischer Monatsbericht des Bundesministeriums für Ernährung, Landwirtschaft und Verbraucherschutz 05/2011.

The future development of fertiliser efficiency plays an important role in the projection of the N-balance surpluses up to the year 2021. In light of the growing yields as well as increasing agricultural prices, increasing production intensity with higher fertiliser input can be assumed. In addition, according to model results, the drop in the animal herd size will slow as a consequence of the favourable price development. Therefore, the downward trend of the N-balance surpluses decreases. In addition, there is an increasing distribution of digestate from the production of biogas. The nitrogen contained in the digestate, in contrast to mineral fertiliser, shows a lower level of N availability for plant growth, which will contribute to an increase in the N balances. If a constant fertiliser efficiency for nitrogen from mineral fertiliser and farm-produced organic fertiliser is assumed, the sectoral N balance of the area balance up to the year 2021 increases by approximately 10 % compared to the year 2007. With slightly improving fertiliser efficiency, the balance will remain approximately the same as that in 2007.

Map 3.2 provides an overview of the regional N-balance surpluses in the year 2021. These surpluses are closely correlated with the regional animal population densities due to the farm-produced fertiliser. Thus, N-balance surpluses of more than 100 kg N per ha UAA occur in regions with intensive livestock production. Due to the expected increase in milk production found in the model results for the coastal regions, the Lower Rhine, the Allgäu, and in the pre Alps (see Map 3.2), which are already partially marked by high animal population densities, the nitrogen problem will not be alleviated in these areas. In regions with intensive crop farming and low animal population densities, such as the area around Cologne-Aachen and the Hanover-Hildesheim area, the N-balance surplus is comparably low at less than 60 kg/ha.

Map 3.2: Regional N-balance and regional stocking rates

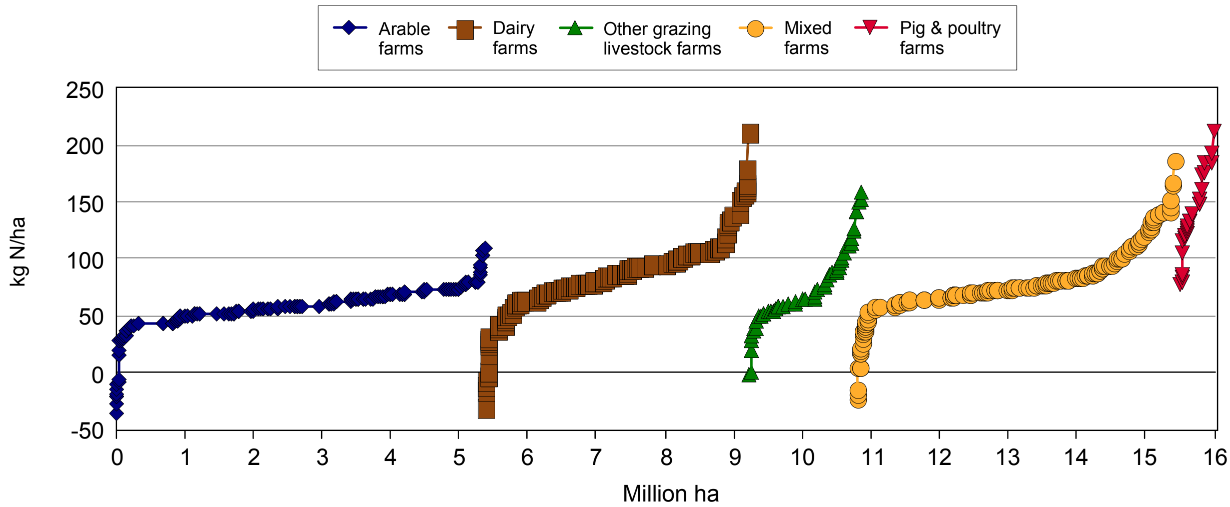


Source: Calculations with RAUMIS (2011).

In Figure 3.15, the distributions of the net N-balance surpluses are presented per hectare and differentiated by farm type. In almost all farm types, both very low as well as very high N-balance surpluses can be observed. The lowest N-balance surpluses are shown for arable farms. These farms comprise the largest portion of the agricultural area in Germany at approximately 5.4 million hectares. In more than 60 % of this area, the N-balance surplus is less than 60 kg N/ha. The N balances of the groups of dairy, other grazing cattle and mixed farms are similarly distributed. On average, their balance surpluses are approximately 75 kg N/ha. The variation in this group is particularly large; thus, particularly in dairy and mixed farms, some groups are included with very high balance surpluses. The highest N surpluses can be observed in intensive livestock farms. The farms in this group make up only three percent of the agriculturally used area and show a very high animal density. The trade with farm-produced fertiliser is not considered in the model. In farms with surpluses of over 110 to 150 kg N/ha, where, in general, the maximum allowable balance levels and quantity levels of organic fertilisers are exceeded, it can be assumed that the farm-produced fertiliser above the thresholds is delivered to other farms.

In the model calculations, some farms (especially arable farms) show negative N-surplus balances. This result is almost exclusive to organic farms, for which the calculation of the balances is particularly influenced by the assumptions made for the calculation of gaseous nitrogen losses and nitrogen fixation by legumes.

Figure 3.15: The distribution of the net N balance per hectare in the vTI-Baseline by farm type

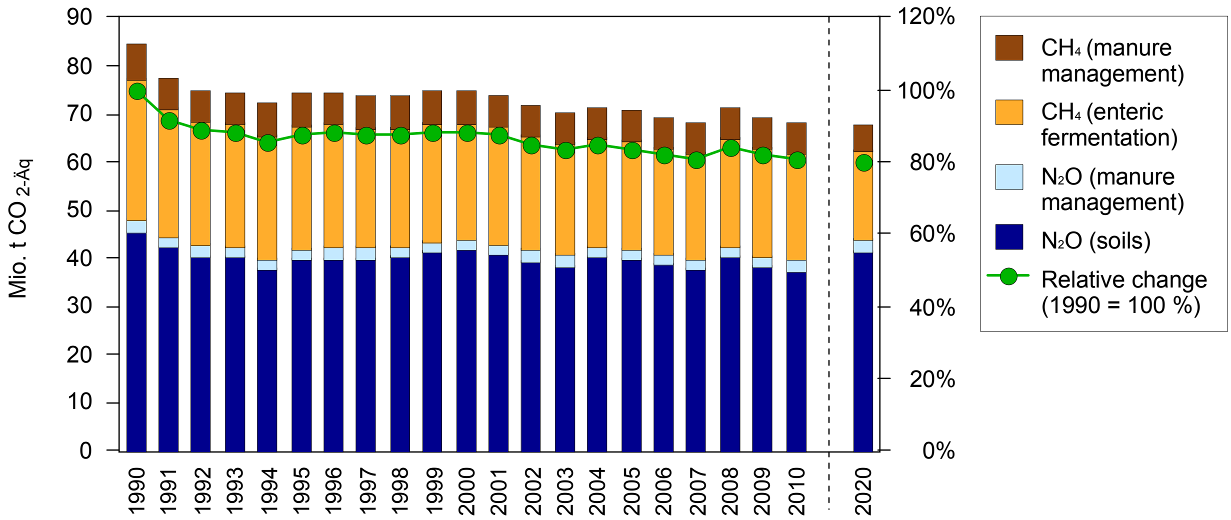


Source: Own calculations with FARMIS (2011).

3.6.3 The development of gaseous emissions

In Figure 3.16, the ter a clear drop in emissions due to a reduction in animal herd sizes in the eastern German federadevelopment of the direct greenhouse gas emissions of the agricultural sector is presented. Afl states, the greenhouse gas emissions only decreased slowly and were, in 2010, at approximately 80 % of 1990 levels. Through the ongoing animal herd size decreases, above all in cattle, the nitrous oxide emissions from farm-produced fertiliser management, as well as from methane emissions, have dropped continuously since the mid-1990s. Other nitrous oxide emissions from N fertilisation and from N losses have experienced strong variations. In the baseline projection, there is a further drop, above all in the methane gas emissions from cattle husbandry. The nitrous oxide emissions from the N fertilisation thus increase slightly so that the considered greenhouse gas emissions of the agricultural sector in the year 2020 remain at a level of 80 percent of those of 1990. The impact of biogas production on the prevention of greenhouse gas emissions from the farm-produced fertiliser management, and possible increases in methane emissions through leakages, are not considered in the presented data.

Figure 3.16: The development of methane and nitrous gas emissions of the German agricultural sector from 1990 to 2010 and projections for the year 2020.

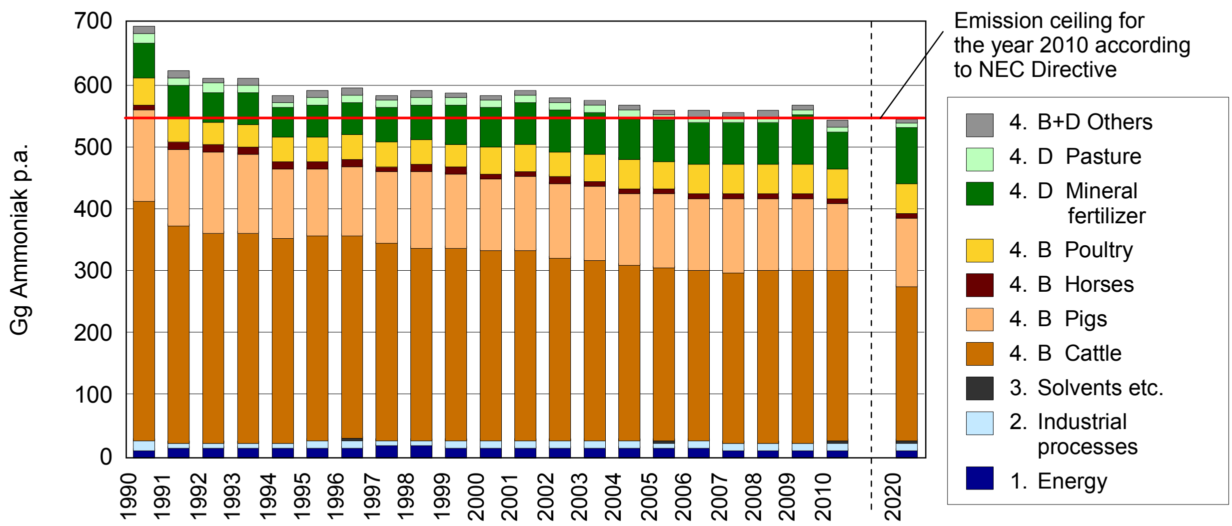


Source: GAS-EM (2011).

In Figure 3.17, the development of the ammonia emissions in Germany for the time period 1990 to 2010 are presented and supplemented through the baseline projections for the target year. Since the emissions ceiling of 550,000 t (equal to 550 kilotons or gigagrams (Gg)) holds for all sectors, other sources are added according to data of the German Environmental Office. These other sources, however, account for only approximately 5 percent of the total ammonia emissions.

The animal population decline in the eastern federal states at the beginning of the 1990s, the continuing decrease in cattle populations, and the technological advances in farm fertiliser management have contributed to a drop in ammonia emissions. Emissions from N mineral fertiliser result mostly from the significant increase in the percentage of urea. This form of nitrogen causes much higher ammonia emissions compared, for example, to calcium ammonium nitrate. Changes in the proportion of urea of the total mineral N fertiliser is subject to strong, price-related shifts. In 2010, urea sales were particularly low. As a result, the ammonia emissions in 2010 were slightly below the upper limit of 550,000 t. For the year 2020, it is assumed that urea inputs will increase. The ammonia emissions would then reach the level of the emissions' upper limit, although, as a trend, the emissions in animal husbandry drop slightly. This prediction makes clear that further measures to reduce the ammonia emissions will be necessary to securely and permanently drop below the emission ceiling. Emissions of ammonia from the storage and distribution of biogas residues of plant origin are not yet considered in the data. If gaseous losses from digestate from biogas production are calculated at a level of 15 % of the total N, in accordance with administrative requirements for the implementation of the fertilisation regulation (Düngeverordnung), the ammonia emissions from this new source could exceed 40,000 tons per year. This source is not yet being accounted for the emission ceiling.

Figure 3.17: The development of the ammonia emissions of the German agricultural sector from 1990 to 2010 and projections for the year 2020

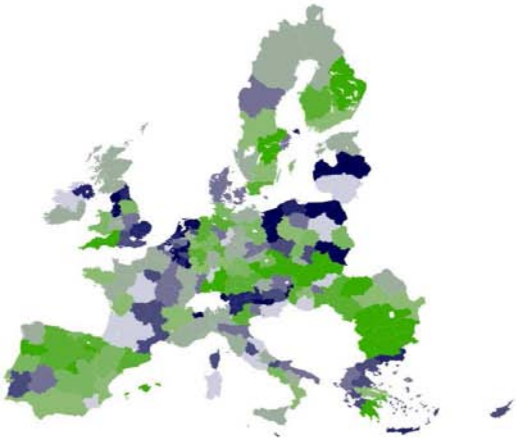


Source: GAS-EM (2011); non-agricultural sources according to UBA (2010).

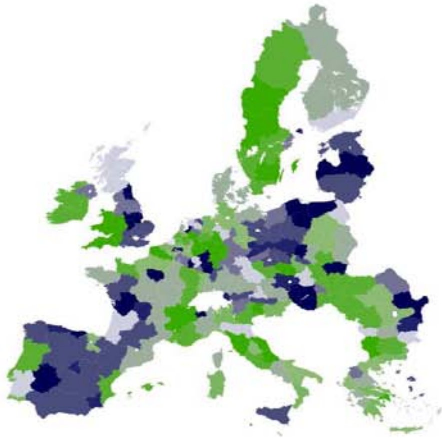
In the following section, the results of the CAPRI model on emissions developments in the EU are presented. In the countries of the EU-27, with the exception of the Netherlands, Belgium, Hungary, the Baltic States and Poland, between 2004 and 2021, a reduction in greenhouse gas emissions is to be expected in CO2 equivalents. The current baseline assumes a reduction of 2 % for the EU-27. The regional distribution in the EU can be seen as a percentage change between the base year 2004 and the baseline. For both the greenhouse gases methane and nitrous oxide, the following development results: the greenhouse gas methane from ruminant digestion and from manure drops in the EU-27 by 2.5 %. With the exception of the Netherlands, Poland, Austria and Belgium, the emissions of methane drop. France and Germany, as the largest methane producers, can reduce their emissions by 2 % and 8 %, respectively. The largest proportional changes are expected for Slovakia, Bulgaria and Romania. The drop in nitrous gas emissions at the EU-27 level is 2 %. This value is the result of two factors. First, the emissions from farm manure are reduced. The cattle populations in the EU-27 reduce overall by seven percent. This reduction is induced by the decoupling of the direct payments and reduced incentives to keep cattle, sheep and goats resulting from this decoupling. The changed land uses also support this development to some extent. The land area used for energy crop production is expanded. However, the set-aside obligation is abolished (2.3 million ha), and the land used for feed production is reduced (2.2 million hectares). Through the high prices and increased demand for bioenergy crops, the planting of rapeseed, wheat and feed maize increase, as do their yields. The increases in fertilisers and in plant residues promote the emissions of nitrous oxide. The net effect in France and Germany is a nitrous oxide reduction of 2 and 4 %, respectively. The largest proportional changes can be observed in Ireland (-15 %) and Sweden (-12 %).

For the current baseline, ammonia emissions in the EU-27 are reduced by 7 %. The reduction varies among the Member States. Two-thirds of the total emissions are caused by France, Germany, Italy, Spain, Poland and Great Britain. All countries have reduced their emissions between 2 and 11 %, with the exception of Spain, where the emissions grew by 2 %. In most of the new EU Member States (the EU-10, Bulgaria and Romania), a relatively strong reduction can be observed, which can be traced back to the reduction in cattle herd sizes following entrance into the EU; however, their share of the total ammonia emissions in the EU is relatively low (20 %).

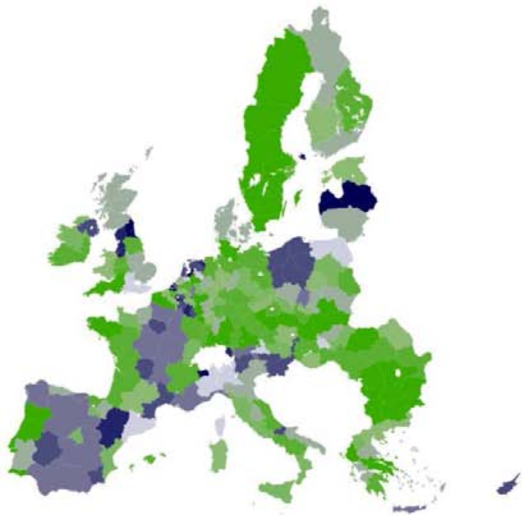
Map 3.3: Environmental indicators for greenhouse gases and ammonia for the EU-27



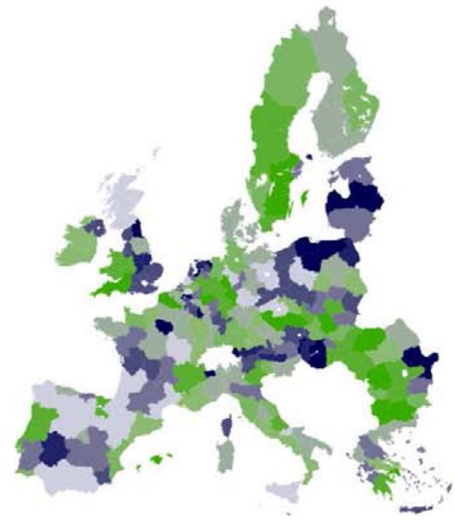
Methane (CH_4)



Nitrous Oxide (N_2O)



Ammonia (NH_3)



Carbon dioxide (CO_2) Equivalents

Source: CAPRI (2011).

4 Discussion

4.1 A comparison of the vTI-Baseline with price projections of other organisations

In this section, a brief validation of the vTI-Baseline with projections of other agencies will be undertaken. The comparison made here is related to the projections of the world market prices from the OECD-FAO (OECD-FAO, 2011) and FAPRI-ISU (2011) supplemented by the AGMEMOD-projected prices for Germany.[9] All projections were made before the peak of the international debt crisis and in a time of high price volatility. The discussion is generally limited to the areas in which deviations from the projections can be seen.

According to the OECD-FAO projections, for cereals (Figure 4.1), a price drop to 160 €/t for wheat and to 135 €/t for coarse grains is seen. The FAPRI projections are only slightly different from the above-mentioned coarse grain prices. For wheat, however, FAPRI estimates much higher prices of 182 €/t, which can be explained by increasing imports by China, India and North Africa. The price calculated for Germany according to AGMEMOD follows the FAPRI projections. The large price differences between wheat and feed grains could provide an economic incentive for the expansion of wheat cropping areas.

The projections of the world market prices for oilseeds vary only slightly among the various sources. However, there is a strong demand for rapeseed due to the mandatory mixing of biodiesel, which results in approximately 40 €/t higher prices for rapeseed in Germany. According to the OECD-FAO, the prices for vegetable oils are approximately 100 €/t below the FAPRI projections for rape and soy oil. According to the AGMEMOD results, a partial price increase of some 170 €/t can be expected for rapeseed oil due to the use of biodiesel in Germany. For oil meals, a strong drop in prices is expected in all projections. In comparison to the period of 2000 to 2010, according to the FAPRI results, there is a strong price spread between soy and rape meal (248 €/t to 134 €/t in 2020); because soy meal is used primarily in pig and poultry production, and rapeseed, in contrast, is used more for the feeding of cattle, it can be assumed that the feeding costs for cattle husbandry will be reduced.

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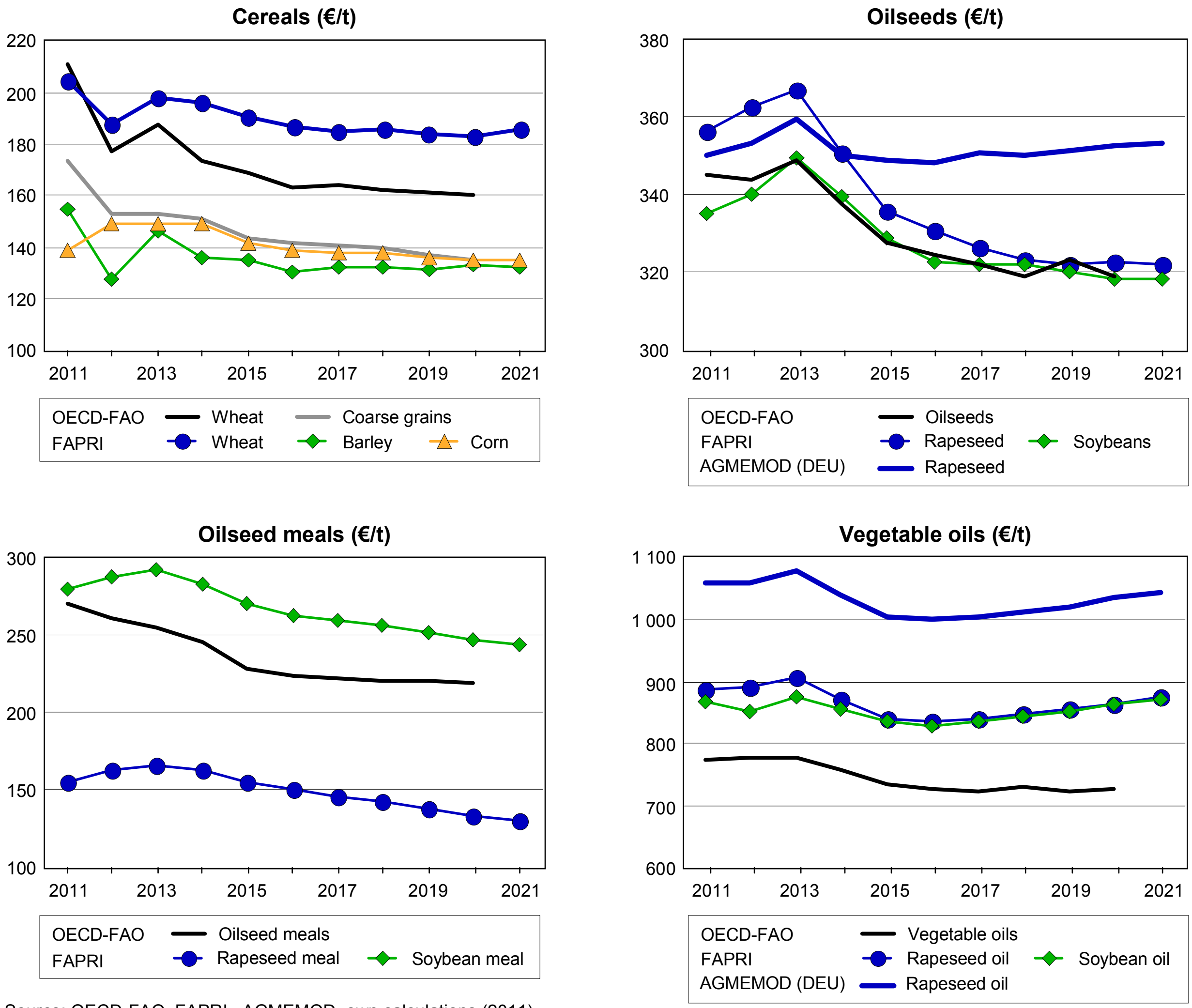
9 Insofar as the prices in the projections are given in live weights, these were recalculated for the slaughter weight. The prices of the OECD-FAO projections were recalculated with the exchange rates used in the FAPRI projections (US$ to €). A comparison of OECD-FAO and FAPRI projections on a US$ basis is given in a report from the EU Commission (EU-Commission, 2011).

Figure 4.1: A comparison of different price projections for crop products

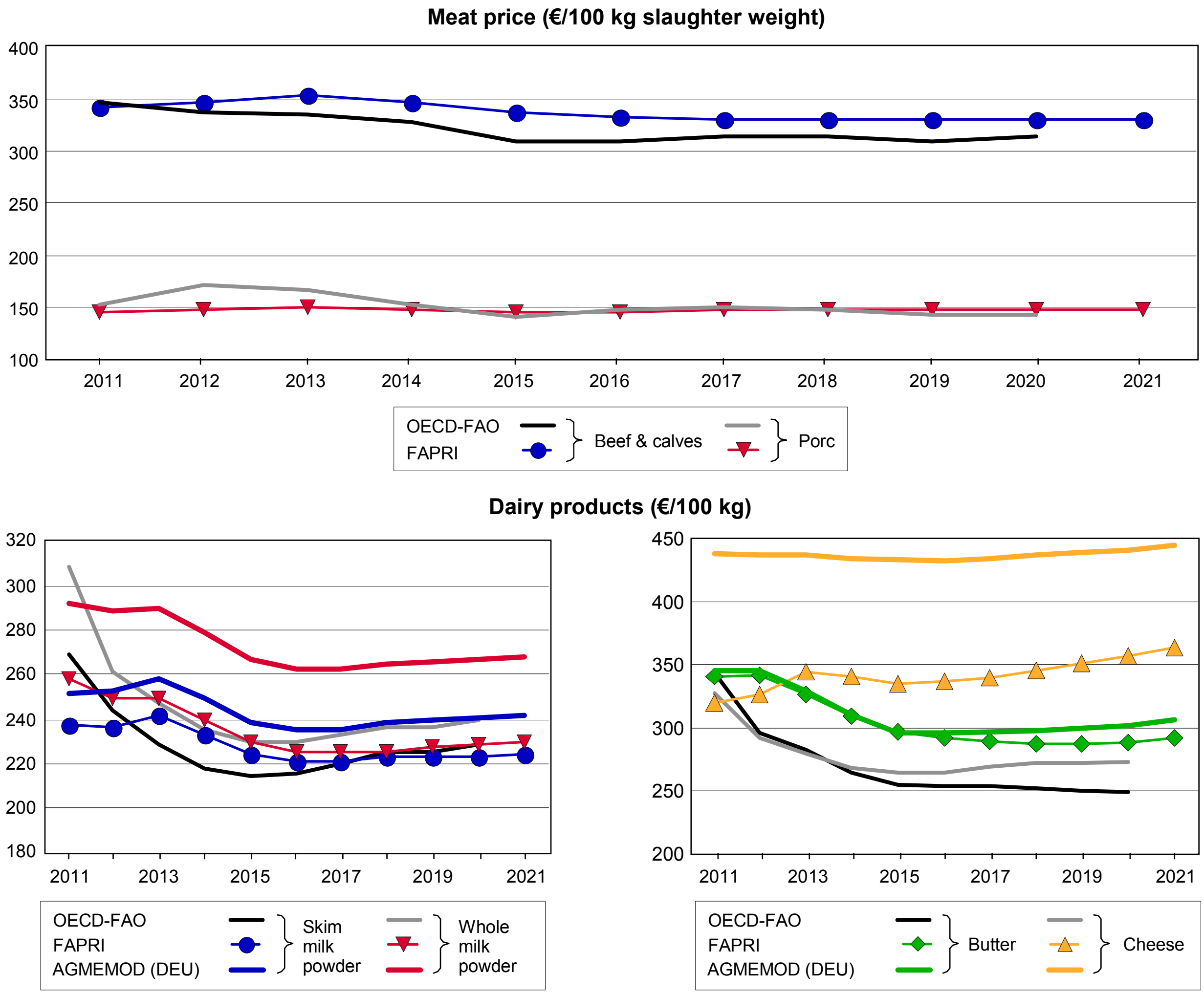


Source: OECD-FAO, FAPRI, AGMEMOD, own calculations (2011).

In the area of meat (Figure 3.19), the projections of the OECD-FAO and FAPRI are similar. In contrast to the cyclical course of pork prices, the projections indicate an almost-constant level. Together with lower feed costs, particularly for coarse grains, a slight improvement in the profitability of pig production may result. In the case of beef, in contrast, a slight price drop can be expected in comparison to the higher base level. The AGMEMOD results are only insignificantly higher than those of FAPRI and are, for this reason, not included in Figure 3.18.

For milk products, slight price drops were seen, departing from a high base level in 2011. In the case of skim and whole milk powders, the projections are almost identical, whereas according to the FAPRI results, particularly for cheese, slightly increasing and higher price levels can be seen. According to the AGMEMOD projection, in Germany, significantly higher prices for whole milk powder are expected than in the world market. The price projections for cheese, for which the price of ‘Emmental’ cheese serves as the basis in Germany, show a price level of approximately 80 €/100 kg above the world market price projections for related cheese types. The price development, however, is comparable with the FAPRI Projection.

Figure 4.2: A comparison of different price projections for meat and dairy products.



Source: OECD-FAO, FAPRI, AGMEMOD, own calculations (2011).

4.2 A comparison with the vTI-Baseline 2009 – 2019

There are several reasons why the current vTI-Baseline projection for 2011 – -2021 deviates from the former vTI-Baseline projection for 2009 – 2019. The deviations result from updated projections of exogenous variables (e.g., economic growth), recently updated (agricultural) policy assumptions or their implementation and the improvement and updates of the models. In the following section, an overview of the most important differences between the current and previous vTI-Baselines is given.

The largest deviations come from the GTAP results of the current vTI-Baseline 2011 – 2021, which vary dramatically from those of the vTI-Baseline projection 2009 – 2019. The model shows significantly increasing EU-27 exports, an increasing share by the EU of the world agricultural exports, and a significant improvement in the balance of trade for agricultural commodities in the vTI-Baseline 2009 – 2019. The results in the current vTI-Baseline point in the opposite direction. Although the EU-27 remains an important exporter of agricultural products, its increase in imports far outweighs its increase in exports and results in a negative development in the balance of trade for agricultural commodities.

The following factors are primarily responsible for this development:

1. The GTAP model applied projections for population growth from the UN that assume a less negative population growth, particular for Germany and the EU, than considered in the vTI-Baseline 2009 – 2019.
2. Similarly, the current baseline assumes a more positive development of national income than the vTI-Baseline 2009 – 2019. Both assumptions, a slower decrease in population and more positive income development, lead to a higher domestic consumption within the EU and to lower export surpluses.
3. The major driver behind the differences is that the current model version considers the maintenance of the minimum blending limits within the EU-Biofuels directive. This GTAP version, however, does not consider a) that in 2015, the energy-content-based calculation of the substitution of fossil fuels by biogenic fuels will switch to one based on climate protection quotas, or b) the use of second-generation biofuels.

The inclusion of the minimum blending limits results in an especially strong increase in export deficits for agricultural raw materials used for biofuels such as oilseed and coarse grains because additional demand could only be covered to a limited extent by domestic products.

Prices of the current vTI-Baseline exceed those of the former vTI-Baseline because the projection is based on more favourable economic conditions for income and higher world market prices for agricultural commodities. Particularly for the animal sectors, prices tend to be higher than the projections in 2009-2019 due to increased input costs as well as increased demand.

Projections in the current vTI-Baseline for land use and production differ from the vTI-Baseline 2009 – 2019, primarily because of the improved assumptions of the development of the utilised agricultural area (UAA) (a greater reduction of the UAA than reported in the vTI-Baseline 2009 – 2019) and the assumed increase in areas for energy maize by about 200,000 ha. These assumptions lead to a stronger drop in cereal production, particularly in the case of barley and rye. The greater expansion of dairy production, compared to the vTI-Baseline 2009 – 2019, can be explained by higher milk prices.

In comparison to the base year, the farm income development is slightly lower than in the vTI-Baseline 2009 – 2019, which is due to a longer projection time period and higher input prices. However, dairy farms can attain higher income as a consequence of more favourable milk price expectations. Greater differences from the vTI-Baseline 2009 – 2019 can be found in the projection of income development in organic farms, particularly as a consequence of recently updated assumptions for the development of prices and yields from expert opinions. Whereas the organic farms profit in the short and long term due to the implementation of the Mid-term Review and the Health Check of the CAP, in the current vTI-Baseline, higher production costs and only moderate increases in yield in these farms lead to declining income.

4.3 Reflections on the assumptions and model limits

The vTI-Baseline projections are based on a number of external assumptions on developments that are not endogenously considered in the models. Some of these assumptions are subject to great uncertainty.

- At the time the projections were made, the impacts of the world financial crisis of 2008 seemed to be foreseeable. The impression was that the peak had been reached or perhaps exceeded, and the negative impacts on the future development of the world markets would be reduced in terms of extent and duration than generally feared. In the meantime, however, the perspectives of many industrial countries have worsened in the course of increasing national debt. The extent to which the economy and, hence, the demand for agricultural goods will be affected by this new development is not foreseeable.
- Uncertainty also exists with regard to crude oil price development. The crude oil price volatility in recent years was both well below and well above the assumed developments in the baseline. This uncertainty affects both the direct assumptions for the price development of farm inputs and the assumptions (via the substitution relations as raw materials for energy) of the world market price level of agricultural products in general.

All economic models used in the vTI-Baseline rest upon economic theory representing detailed causal effects within agricultural production and upon a multitude of policy instruments. The applied models were built over many years, are constantly being improved and have proven themselves in the framework of various policy analyses. However, due to specific model characteristics and limited data availability, it is unavoidable that some policy instruments or new technical developments are either not or only partially considered in the models. The most important aspects in this regard are described below:

- In the comparative-statistical models, extreme situations such as short-term, strong price peaks on the global agricultural markets are either not considered or considered only to a very limited extent through exogenous assumptions.
- The demand for energy maize is not endogenous in the models. In addition, the competitiveness of energy maize and the demand for biomass for the production of biogas determines the regional cropping of energy plants. The demand, in turn, is determined by the regional investment behaviour of biogas facilities. Because it is currently unclear how amendments to the EEG 2012 will impact investment behaviour, observed regional developments are projected in the future to take into account the current and planned construction of biogas facilities. The energy maize areas assumed in the baseline do not include any projected cropping under the changed framework conditions of the EEG 2012.
- Environmental indicators are significantly influenced by the technology used. Innovative production processes, leading to a regulation of emissions and balance surpluses, are not considered here.

5 Summary

This report presents selected results of the vTI-Baseline 2011 – 2021 as well as the assumptions upon which the results are based. Five models were linked to create the vTI-Baseline: the general equilibrium model GTAP, the partial equilibrium model AGMEMOD, the model system CAPRI, the regionalised programming model RAUMIS and the farm group model FARMIS. The target year for the projections is 2021.

The vTI-Baseline projection is not a forecast about the future but rather describes the expected developments in light of certain assumptions related to the development of exogenous factors and policies. The presentation of results is mainly concentrated on developments in the German agricultural sector. The projections are based on data and information available as of spring 2011. At that point in time, the prognoses for the development of the world economy and the prices of oil and agricultural products were marked by a moderate optimism. The vTI-Baseline assumes a continuation of the current agricultural policy and the implementation of already-approved policy changes. For the vTI-Baseline 2011 – 2021, this primarily means the implementation of the Health Check Decisions, including the phasing out of milk quota regulations in 2015.

The European Union is also, during the analysis period, a main player in international agricultural markets. The EU share of world agricultural trade, however, drops from 16 to 13 % from 2007 to 2021. This decline is mainly due to increased imports of raw materials for the production of biofuels. The results make clear that the EU-27 is not able to comply with the mandatory blending of biofuels by relying on domestic production but rather is particularly reliant on imports from North and South America (oilseeds and coarse grains).

In the crop sector, the prices in Germany are largely stable and exceed the support price level where it still exists. In addition to the global market prices, the development is influenced through the politically determined mandatory blending of biofuels. The amounts necessary for this blending are, in particular, made available through the production, import and milling of rapeseed as well as the import of rapeseed oil. Bioethanol, in particular, is derived from wheat and biogas from silage maize. These developments limit the supply expansion of rape. Higher stable grain prices make animal production more expensive. This is true both in international trade and domestic markets. In past years, some price increases were compensated for, in part, by productivity advances. In dairy production, world market prices also affect domestic market prices in the mid-term.

According to model analysis, through the year 2021, the promotion of biomass crops for energy purposes has the greatest influence on the development of agricultural land use in Germany. In the vTI-Baseline, energy maize is produced on approximately 1.4 million hectares, for which set-aside land is used, and cereal grain and oilseed production are reduced. Milk production will, at largely stable prices, be expanded to 30 million tons by the year 2021, following the elimination of quotas. This increase in milk production will be approximately 7 % in comparison to the years 2006-2008. The concentrations of milk production on grassland locations favourable for milk production in the past (i.e., the coastal regions in north-western Germany, the lower Rhine, parts of the Eifel, and the pre-Alps) continue to the disadvantage of arable crop regions and the unfavourable grassland regions.

In comparison to the base year period (2006 to 2008), the average farm net value added per work unit drops slightly but is significantly above the mean level of the past ten years. The income de-

velopment shows differences among the farm types. Whereas the farm net value added of dairy farms (-4 %) and other grazing livestock farms (-15 %) is declining, the pig and poultry farms benefit (+21 %) from increasing meat prices. Arable crop farms can maintain their above-average income level from the base year period due to slightly increased prices for grains and oilseeds and new income possibilities offered by growing energy maize. Large dairy farms and large other grazing livestock farms are particularly affected by an increase in the rental prices for grassland because they frequently have a high share of grasslands in combination with a high share of rented land. For these farms, the profit per work unit clearly drops. When classifying these developments, it must be considered that the base year period of 2006 to 2008 was generally marked by above-average farm profits, with the exception of pig and poultry farms.

With regard to the environmental impact of agriculture, no clear changes are expected in the baseline projection. The greenhouse gas emissions of the baseline remain at a level of approximately 80 % of 1990 emissions. The ammonia emissions in Germany are barely below the legally determined upper emission limits of 550,000 t in the year 2010, but with increasing sales of urea fertiliser, which causes increasing ammonia emissions, emissions could increase again. Due to increasing yields and the extension of energy crop production, a higher nitrogen fertilisation intensity is expected. With a stable nitrogen fertiliser efficiency, the nitrogen balance will increase by approximately 10 percent. In regions and farms with intensive animal husbandry, the nitrogen problem will not be eliminated. Biogas fermentation plant residuals will play an increasing role and contribute to higher balances due to lower nitrogen utilisation rates. In addition, these residuals present a new source of ammonia emissions.

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Annex

Annex 1

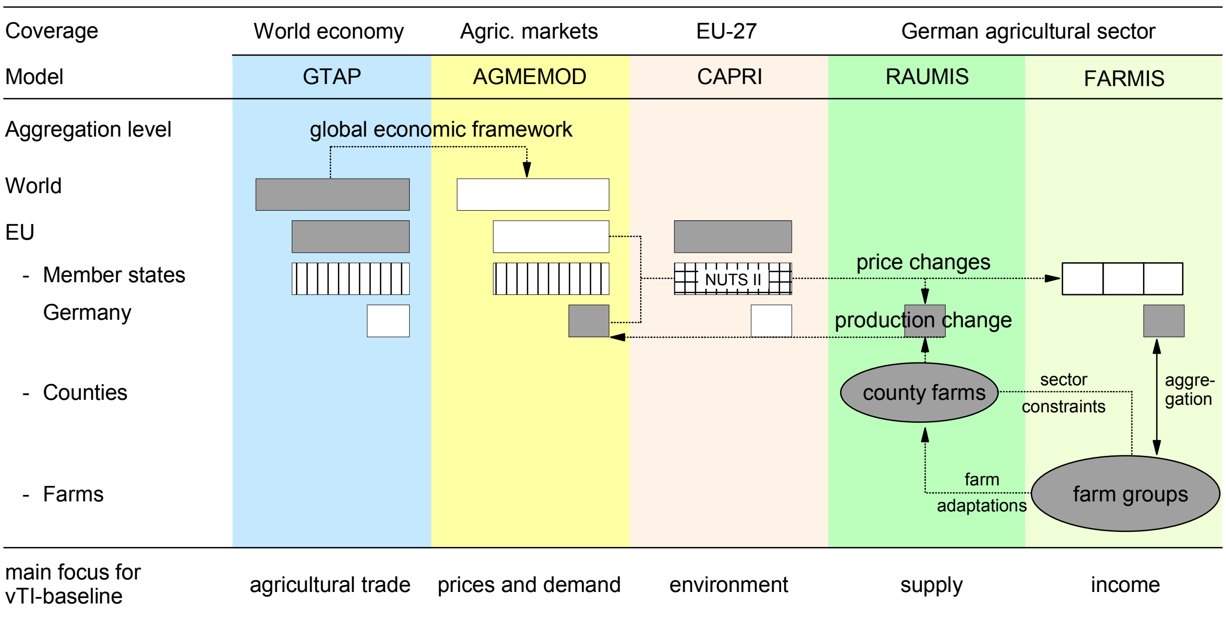
Database and models

The vTI Model Network supports policy decision making, particularly for the German Federal Ministry of Agriculture, Food and Consumer Protection (BMELV), with prospective quantitative scenario analysis and policy impact assessments. With the help of the model network, developments and policy impacts can be analysed at the global and EU agricultural market levels as well as at the sectoral, regional and farm levels. The focus is on the impacts of EU trade, agricultural and environmental policies as well as selected regional and structural policies.

In the analysis, a coordinated, parallel and/or iterative implementation of the model takes place. This implementation allows for the alignment of important assumptions, the exchange of model results as a basis for other models of the network, and the reciprocal check of the model results. This approach aims at providing a consistent overall result.

The vTI Model Network consists of mathematical-economic simulation models that each describe different decision-making levels (Figure A1.1). With the model GTAP, development and policies are simulated for the global economy as well as for single countries and regions. The AGMEMOD model describes the most important agricultural markets of the EU Member States as well as interactions between the agricultural and food sectors. The CAPRI model is used to quantify this analysis at the regional level (NUTS II) in the EU. On the basis of the German agricultural sector, RAUMIS presents regional adaptation reactions by agriculture. Farm modelling with FARMIS builds on a “bottom up” approach at the farm and farm group levels with a scaling up of the results to the sector level. The models are used according to their individual emphases and strengths for answering different questions. A particular advantage of their use in the network is the consistent coordination of the different description areas, through which the complex interactions among the different decision-making levels can be captured.

Figure A1.1: The use of models of the vTI Model Network for the vTI-Baseline 2011 – 2021



Regional focus of the respective model for the vTI-baseline 2011-2021.

The databases and characteristics of models are briefly described below.

The **GTAP** Model is a comparative-statistical, multiregional, general equilibrium model covering global economic activity as well as single countries and regions. This model describes the interaction among agriculture, the input sector and the food industry as well as commercial economics and the service sector. The intra- and inter-regional interlocking of markets and actors are considered as well as the resulting re-coupling effects.

The basis of the GTAP model is a simultaneous system of non-linear equations, which can be divided into two types: the identity conditions that provide equilibrium in the model and an identity between expenses and income, or, rather, costs and returns. The GTAP model also contains behavioural equations with the help of the economic activity of different actors (for example, consumers and producers). Product demand, product supply and factor demand functions are so specified that consumers and producers maximise the use or profit. From this interplay of supply and demand, the endogenous model predetermines prices and quantities, which provide a clearing of product and factor markets. In the export area, the GTAP Model uses the assumptions defined by Armington (1969). Through these assumptions, products are differentiated by origin. On this basis, the trade structure can be described in the form of a matrix of bilateral trade flows and can also be described with consideration of the transport requirements (see HERTEL und TSIGAS, 1997).

An expanded version of the standard GTAP Model, as developed by the LEI in The Hague, serves as the basis of this baseline. To identify this model expansion, this model is known as LEITAP in the literature. LEITAP is the basis for various publications and studies by NOWICKI et al., (2009), TABEAU et al. (2011) and BANSE et al. (2008). In contrast to the standard GTAP Model, LEITAP is expanded in the areas of agricultural factor markets and the production of biofuels and associated policies. For a description of the model expansion in LEITAP, see BANSE et al. (2008) and van MEIJL et al. (2006).

The basis is the GTAP version 7.0 with the base year 2004. Overall, 57 sectors and 13 regions are included in this version. Extensive documentation is available on the GTAP Homepage.[9]

AGMEMOD (http://www.agmemod.eu) is a partial, multi-national, multiple-product model with, as a rule, econometrically estimated parameters and a recursive-dynamic approach. In the model's principal 20 agricultural sectors and 17 processing sectors of the EU Member States, membership candidates and other neighbouring countries are described. However, the product coverage in the country models can vary according to the regional significance of a product. AGMEMOD is used to create mid- and long-term market projections for the EU Member States and to develop these for the simulation of market measures of the CAP. Production, consumption, trade, inventories, prices and often processing are described for the considered sectors. In the German models module, detailed grains and oilseed, potatoes, cattle and calves, sheep, pigs, poultry and milk as well as their processed products are included (SALAMON and VON LEDEBUR, 2005). Coupled with each other and the appropriate world markets, the models create a combined EU Model for the individual EU Member States. In the present model, version 4.0, the world markets are given exogenously (VAN LEEUWEN et al., 2010). The basis for these data includes, as a rule, the years 1973 to 2004 and where available up to 2007. Thus, these data also serve as the basis for the econometric estimates of the model parameters. The base year for the model calculations is the year 2004 or more recent

9 https://www.gtap.agecon.purdue.edu/databases/v7/v/_doco.asp

years, based on which the simulations for each year of the projection period are created. In general, the simulation results are available for all EU Member States. Here, only results for Germany are described overall.

The data basis for the model bases in particular relies on the supply balances for primary products and the first processing levels that are in the EUROSTAT database NewCronos. The EUROSTAT databank gives priority to providing a harmonised and consistent European data source. In the case of missing or divergent information, the database uses national statistics, which can, in part, be supplemented with additional sources. Macroeconomic exogenous variables are based on information from national statistical offices, whereas exogenous policy variables are generally based on information from the EU Commission as well as Agra Informa (2011).

For the modelling of the vTI-Baseline 2011 – 2021, it is assumed that biodiesel and ethanol are used exclusively to reach the policy goals for bioenergy because no alternative, more marketable biogenic fuel is available to date. In addition, land area needs for the production of raw materials (energy maize) are assumed for the biogas facilities, which, due to non-available market data, were, until now, not possible to project.

RAUMIS is a regionalised agricultural and environmental information system. Developments in global agricultural markets, particularly in prices, are seen here as the exogenous framework data for RAUMIS, which simulates the adaptation behaviour of agriculture in Germany at the regional level. The model describes the total agricultural production of the German agricultural sector with its intra-sectoral linkages consistent with the Economic Accounts for Agriculture (LGR), indicating that the production of more than 50 agricultural products is described as they are formulated in the LGR. The model includes the total inputs necessary for the production of this agricultural product. The income concepts are also in accordance with the definitions of the LGR: 326 regional farms serve as the spatial descriptive level and are, to a great extent, in accordance with the counties in Germany. Beyond this strongly regional differentiation, the very heterogeneous natural site conditions in Germany, as well as the differing farm structures, are considered. At the same time, a small spatial level is utilised to study agricultural environment relations. A differentiated matrix and activity analysis is created for each of these model counties.

With regard to the time, the ex-post period of the so-called base year is differentiated. Data for the years 1979, 1983, 1987, 1991, 1995, 1999, 2003 and 2007 are available. The model system RAUMIS follows a comparative statistical approach in its prognoses. Two central areas are to be differentiated. First, the specification of the production alternatives and their restrictions that are valid for the target year are determined with regard to decision criteria for profit maximisation above the optimal production structure in the framework of a mathematical programming model (HOWITT, 1995). For each individual model county, as well as for their aggregation, information is provided on the product extents of the more than 40 main agricultural processes; the production quantities of more than 50 agricultural products, inputs and the primary factor input; the salaries of the used capacities; the income calculation according to the LGR; and a range of environmental indicators.

FARMIS is a comparative-static nonlinear programming model that describes agricultural activities at the farm group level in detail (OSTERBURG et al., 2001; OFFERMANN et al. 2005). Farm group values are weighted with the help of group-specific aggregation factors to ensure consistency with sector data. The heart of the model is a standard optimisation matrix, which, in its current form, contains 27 arable crop activities and 15 animal production processes. As in RAUMIS, profit is maximised within the approach of Positive Mathematic Programming, with revenue elasticities of single production activities considered for the determination of PMP coefficients. FARMIS is used in the framework of the modelling network to estimate the farm impacts of various policy scenarios. For this study, the analyses conducted with FARMIS are based on accounting data of the German Farm Accountancy Data Network for the accounting years 2005/06, 2006/07, and 2007/08. Stratification by region, type of farming, management system and size class resulted in 628 farm groups (of which 71 farm groups cover organic farming). To account for structural change, exogenously estimated exit probabilities for various farm size classes are used for the projection of aggregation factors. The agricultural areas freed by the exit of a farm are transferred to other farms in the same region (in total, there are 63 regions) via modelled rental markets (BERTELSMEIER, 2005).

The **CAPRI** model supports the political decision-making process with quantitative analyses on the common agricultural policy of the EU (BRITZ and WITZKE, 2008). The goal is to estimate the influence of agricultural political decisions on production, income, the market, trade and the environment – both globally and regionally. This estimation is done by linking regional or specific farm-type supply models with a global market model. The supply models serve as a detailed description of the European agricultural sector. In the model, one can choose between two aggregation levels. The higher level comprises approximately 270 regional models on the NUTS II level and the lower level approximately 1900 farm group models (GOCHT and BRITZ, 2011). In the supply models, the extent of the production practices, as well as the yield, affected by different intensity levels, are endogenous. The agricultural land area (UAA) available for production is modelled endogenously on the basis of land rents in the model. Additionally, grass and arable land can be substituted endogenously. A series of environmental indicators is calculated for all regions. The market model describes the agricultural trade and assumes profit maximisation for producers and use maximisation of consumers. Both model components are closely linked in terms of content and technology through the transfer of prices from the market model into the supply model and through the return of product effects on the market model, and both components find an equilibrium price after multiple iterations.

The international network is responsible for the further development and use of the model. The vTI is a network partner for the supply modelling and the farm group development. A further description, in English, of the model is available on the CAPRI homepage.[10]

10 http://www.capri.model.org/dokuwiki/doku.ph?id=start

Annex 2

The development of selected statistics for agricultural trade

Table A2.1: The share of the EU-27 in global agricultural trade

		2007	2010	2013	2021
Other exporter	Billion €	191.7	213.4	224.1	266.5
Extra EU-27 trade	Billion €	37.5	38.7	38.9	40.8
Intra EU-27 trade	Billion €	94.7	97.4	92.3	89.9
Share of EU-27 on World trade	%	16	15	15	13

Source: Own calculations with GTAP (2011).

Table A2.2: Agricultural trade in the EU-27 in a comparison of the years 2004 to 2021

	Exports		Imports	
	2007 Billion €	2021 Billion €	2007 Billion €	2021 Billion €
North America	8.4	8.1	7.2	10.0
Central and South America	2.6	2.6	18.4	26.9
Russia, Turkey and oter Europe	8.5	8.8	7.8	8.4
Africa	5.0	6.4	8.9	10.2
Asia	12.4	14.3	11.8	15.5
Oceania	0.7	0.7	4.0	4.8

Source: Own calculations with GTAP (2011).

Table A2.3: Trade balance changes in the EU-27 for selected agricultural products

	2007 Billion €	2021 Billion €
Agricultural products	-20.6	-34.2
Arable crops	-16.8	-26.8
hereof used in biofuel processing	-3.9	-12.2
Livestock and dairy	-3.8	-7.4
Processed food	-0.1	-0.8
Agricultural products and processed food	-20.7	-35.0

Source: Own calculations with GTAP (2011).

Annex 3

Agricultural price developments in Germany

Table A3.1: Producer Prices in Germany in the vTI-Baseline (€/100 kg)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Soft wheat	11.44	11.02	10.20	13.86	9.49	9.45	13.53	17.59	19.13	11.45	15.01	19.51	17.49	18.94	18.50	18.02	17.80	17.81	18.00	17.96	17.88	18.25
Barley	10.18	9.86	8.67	9.50	9.75	9.38	10.40	16.66	17.75	9.72	11.84	15.28	12.33	14.41	13.25	13.19	12.70	12.96	12.97	12.86	13.07	13.03
Maize	11.92	11.62	10.81	12.46	11.80	10.34	10.86	18.28	17.84	12.64	15.12	14.50	15.52	15.53	15.56	14.82	14.54	14.42	14.44	14.24	14.12	14.15
Rye	10.87	10.59	9.52	8.99	10.65	8.10	8.96	12.33	19.55	11.27	12.38	12.20	9.50	12.65	11.28	11.77	11.29	12.07	12.07	12.15	12.34	12.65
Triticale	10.38	10.04	8.78	9.73	9.73	9.02	8.76	9.07	12.69	11.59	14.41	14.75	13.68	14.79	14.28	14.07	13.73	13.93	13.96	13.87	13.96	14.00
Oats	10.49	10.98	10.17	9.09	9.47	7.93	8.38	11.95	17.70	12.04	13.70	13.40	9.49	14.01	11.99	12.72	12.03	13.15	13.12	13.23	13.49	13.89
Rapeseed	20.61	24.56	30.14	28.02	21.06	21.30	25.00	30.30	42.96	31.71	39.77	35.02	35.34	35.94	35.01	34.90	34.86	35.09	35.06	35.14	35.28	35.35
Sunflower seed	23.78	32.05	30.25	28.38	25.16	22.66	26.02	47.47	34.54	32.51	42.29	35.78	36.92	37.78	36.68	35.41	34.76	34.27	33.83	33.59	33.43	33.09
Soybeans	21.79	22.67	28.24	28.55	22.27	19.86	26.83	39.86	33.33	30.85	36.04	33.52	34.06	34.95	33.98	32.88	32.30	32.20	32.20	32.01	31.84	31.84
Rapeseed meal	16.03	14.40	14.07	9.91	9.36	9.62	13.50	21.30	14.31	15.89	17.99	15.58	16.35	16.69	16.26	15.60	15.13	14.66	14.29	13.82	13.43	13.06
Sunflower meal	12.79	-	-	12.30	13.50	12.30	12.80	21.10	14.23	15.97	18.51	15.45	16.08	16.27	15.74	14.97	14.42	13.93	13.49	13.03	12.60	12.17
Soybean meal	20.38	19.43	20.83	24.13	18.57	15.87	17.87	32.10	26.25	28.12	30.47	28.00	28.78	29.26	28.36	27.13	26.39	25.97	25.69	25.21	24.80	24.53
Rapeseed oil	40.33	50.47	62.18	59.23	53.06	56.27	79.00	90.67	69.96	79.64	103.85	105.80	106.07	107.79	103.97	100.51	100.01	100.46	101.07	102.11	103.37	104.31
Sunflower oil	46.40	65.54	62.61	58.61	56.52	51.24	55.20	100.00	67.75	68.75	91.21	84.88	86.89	89.74	88.35	86.56	86.24	86.52	86.95	87.77	88.80	89.59
Soybean oil	36.44	46.00	56.47	55.96	43.81	44.61	51.35	80.00	58.10	66.45	87.27	86.92	85.38	87.48	85.50	83.61	83.04	83.57	84.40	85.27	86.23	87.20
Beef and veal	270.26	218.00	260.00	256.00	267.00	298.00	313.00	297.00	325.00	314.00	324.00	316.81	317.29	318.36	319.74	322.23	323.95	324.81	326.14	327.96	329.59	331.11
Pork	130.38	155.00	123.00	114.00	131.00	133.00	147.00	132.00	154.00	139.00	138.00	143.02	144.87	147.47	144.80	143.16	143.29	144.67	146.17	146.51	146.84	148.26
Chicken	128.00	154.00	135.00	140.00	138.00	147.00	156.00	200.00	209.00	210.00	228.00	208.37	211.12	218.52	215.76	211.63	210.67	211.55	213.59	214.70	216.00	218.44
Milk	28.43	28.68	25.05	25.48	25.42	24.56	28.90	34.71	35.00	25.30	31.30	32.23	32.02	32.03	30.97	30.08	29.82	29.88	30.17	30.34	30.53	30.85
Skimmed milk powder	242.86	227.61	193.10	198.30	200.30	203.00	214.00	327.00	228.20	174.70	174.70	251.60	252.46	257.72	248.98	238.87	235.60	235.57	238.91	239.87	240.25	241.92
Whole milk powder	284.28	286.80	250.50	254.80	254.20	242.60	240.80	341.70	266.10	203.40	268.50	291.99	289.09	289.99	278.44	267.05	263.06	262.90	264.72	265.94	266.62	268.38
Emmenthal [a)]	399.45	428.00	427.00	392.00	378.00	370.00	357.00	384.00	440.00	387.70	450.49	438.44	437.38	437.35	434.65	432.88	431.97	434.33	436.87	438.60	441.14	444.57
Butter	323.90	337.00	309.00	311.00	304.17	284.62	267.00	344.00	291.00	260.00	357.00	345.15	345.99	329.18	309.78	296.09	295.90	297.16	297.96	299.32	301.74	306.12

a) Based on prices in Kempten.
Source: Own calculations with AGMEMOD (2011).

Annex 4

Regional developments of selected statistics

Table A4.1: The extent of selected production processes (2021)

	Dairy cows	Cattle	Pigs	Cereals	Oilseeds
Region	in 1 000 animals			in 1 000 ha	
Schleswig-Holstein	344	1,076	1,108	289	117
Lower Saxony[a)]	724	2,364	6,703	892	144
North Rhine-Westphalia	366	1,286	4,994	570	57
Hesse	123	446	623	263	56
Rhineland-Palatinate	107	368	215	212	41
Baden-Württemberg	305	885	1,503	483	73
Bavaria	1,106	3,036	2,388	996	166
Saarland	13	54	12	20	4
Brandenburg[b)]	156	440	523	466	127
Mecklenburg-West Pomerania	174	402	514	505	234
Saxony	183	383	392	345	100
Saxony-Anhalt	114	250	691	517	134
Thuringia	109	243	466	319	85
Germany	3,824	11,236	20,133	5,877	1,340

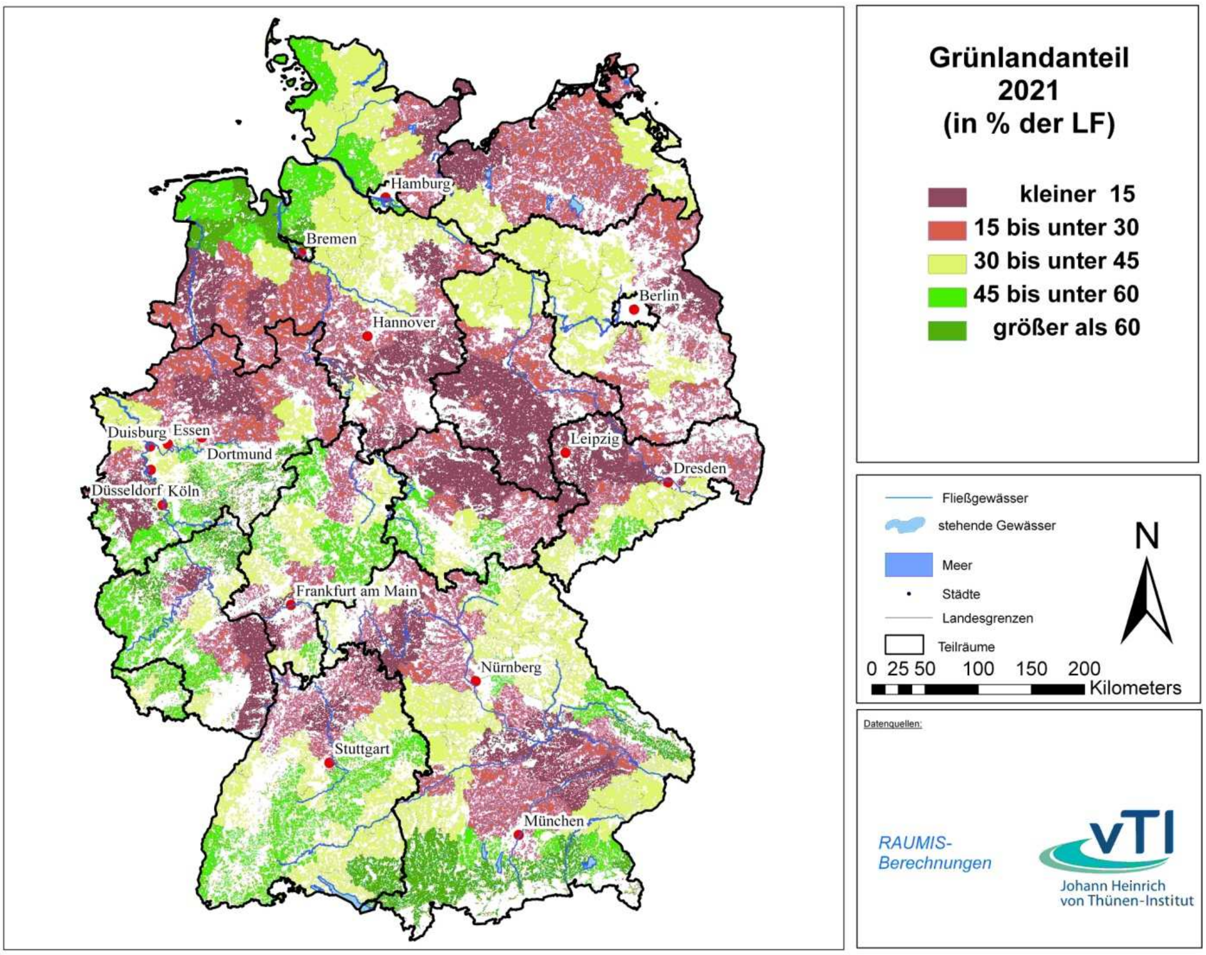
a) Incl. Hamburg and Bremen. b) Incl. Berlin.
Source: Own calculations with RAUMIS (2011).

Table A4.2: The production quantities of selected production processes (2021)

	Milk	Beef and veal	Pork	Cereals	Oilseeds
Region	in 1 000 t				
Schleswig-Holstein	2,662	108	232	2,665	526
Lower Saxony[a)]	6,045	251	1,410	7,263	574
North Rhine-Westphalia	2,936	148	1,045	4,949	241
Hesse	904	44	130	2,134	236
Rhineland-Palatinate	769	33	45	1,507	173
Baden-Württemberg	2,128	89	295	3,894	322
Bavaria	7,606	312	472	7,564	714
Saarland	92	5	3	132	15
Brandenburg[b)]	1,473	35	104	2,662	470
Mecklenburg-West Pomerania	1,627	33	105	3,858	992
Saxony	1,702	29	78	2,380	387
Saxony-Anhalt	1,066	20	137	4,114	550
Thuringia	981	21	92	2,472	343
Germany	29,991	1,128	4,146	45,595	5,543

a) Incl. Hamburg and Bremen. b) Incl. Berlin.
Source: Own calculations with RAUMIS (2011).

Map A4.1: Regional grassland shares of agricultural land areas (2021)



Source: Own calculations with RAUMIS.

Annex 5

The development of selected farm indicators

Table A5.1: The development of farm economic indicators by farm type

		Total		**Arable farms**		**Dairy farms**		**Other grazing live-stock farms**		**Mixed farms**		**Pig & poultry farms**	
Indicator	Unit	2006-08	2021	2006-08	2021	2006-08	2021	2006-08	2021	2006-08	2021	2006-08	2021
No of sample farms		9,404	7,598	2,159	1,715	2,922	2,146	530	465	2,588	2,125	443	384
Represented farms		214,976	173,685	48,187	38,286	70,392	51,693	21,409	18,764	47,986	39,406	10,964	9,497
Utilised agric. area (UAA)	ha	75.4	93.4	111.9	140.8	54.0	74.8	78.2	87.1	97.2	118.9	47.3	49.8
of which: rented	% of UAA	*69*	*73*	*71*	*74*	*62*	*71*	*72*	*74*	*73*	*76*	*61*	*62*
arable land	ha	54.1	66.9	104.5	132.4	23.1	31.9	26.2	29.3	79.0	95.8	41.2	44.3
grassland	ha	21.4	26.5	7.4	8.4	30.9	42.9	52.0	57.8	18.2	23.1	6.1	5.5
Labour units	AWU	1.8	1.9	1.6	1.8	1.6	1.7	1.6	1.6	2.2	2.3	1.8	1.8
Stocking rate	LU/100 ha UAA	101.5	102.6	19.8	20.1	126.6	121.5	86.4	86.8	145.2	147.6	451.8	532.1
Cattle	LU/100 ha UAA	47.9	47.8	5.7	5.8	122.4	117.8	68.0	69.5	35.2	36.8	5.2	5.5
of which: dairy cows	LU/100 ha UAA	24.7	24.4	1.8	1.8	75.6	72.2	13.5	14.0	17.1	17.9	0.6	0.6
Pigs	LU/100 ha UAA	49.7	50.7	12.6	12.5	3.5	3.2	9.1	8.8	104.4	104.5	427.7	504.5
Revenues	€	146,958	228,025	132,148	233,898	125,985	198,749	84,066	112,380	212,128	325,529	249,653	358,428
of which: crop production	€	52,485	94,639	109,723	201,406	9,918	23,395	10,339	20,156	63,657	115,543	36,094	59,668
livestock prod.	€	94,473	133,386	22,425	32,491	116,067	175,354	73,728	92,224	148,472	209,986	213,559	298,760
Subsidies	€	30,582	37,257	39,811	50,896	25,816	33,249	36,336	39,070	38,404	45,666	15,721	19,278
of which: Single Farm Payment	€	23,702	29,290	34,120	43,904	18,289	23,929	24,670	27,212	30,793	36,869	12,745	16,206
Farm net value added	€	67,521	87,358	70,079	97,772	62,815	78,593	46,677	47,127	84,401	111,903	66,643	99,046
Farm net value added	€/AWU	37,170	45,319	43,396	53,080	38,338	45,438	28,431	29,863	38,346	48,193	36,612	54,856
Family farm income plus wages	€/AWU	28,795	33,529	29,780	34,412	31,294	34,487	21,244	18,751	29,654	36,409	27,867	43,568

Source: Own calculations based on FARMIS (2011).

Table A5.2: The development of farm economic indicators, arable crop farms by region and size of land area used

		Total		< 50 ha		50 - 100 ha		> 100 ha	
Indicator	Unit	2006-08	2021	2006-08	2021	2006-08	2021	2006-08	2021
Northern Germany									
No of sample farms		686	534	209	108	227	218	250	250
Utilised agric. area (UAA)	ha	92	118	29	44	73	76	195	202
of which: rented	% of UAA	*60*	*64*	*45*	*64*	*51*	*53*	*66*	*67*
Labour units	AWU	1.40	1.60	0.91	1.16	1.31	1.29	2.15	2.16
Stocking rate	LU/100 ha UAA	28	29	27	29	51	53	22	22
Revenues	€	139,752	242,993	37,441	76,425	123,804	168,410	294,973	419,014
Subsidies	€	31,222	44,903	9,834	16,741	24,485	28,727	66,302	77,315
of which: Single Farm Payment	€	27,121	38,776	8,573	14,739	21,564	25,129	57,323	66,320
Farm net value added	€	70,636	102,367	16,156	24,434	57,223	65,635	157,095	186,088
Farm net value added	€/AWU	50,504	63,913	17,831	21,129	43,576	50,874	72,978	86,330
Family farm income plus wages	€/AWU	34,324	38,498	10,234	7,156	31,346	34,821	49,889	52,305
Central Germany									
No of sample farms		351	264	131	69	114	114	106	106
Utilised agric. area (UAA)	ha	66	86	30	46	68	72	146	152
of which: rented	% of UAA	*76*	*80*	*62*	*76*	*78*	*79*	*82*	*83*
Labour units	AWU	1.27	1.50	0.83	1.09	1.51	1.48	2.05	2.01
Stocking rate	LU/100 ha UAA	24	25	19	19	20	21	29	29
Revenues	€	82,225	144,336	30,008	61,366	84,621	116,337	200,969	277,299
Subsidies	€	22,229	27,117	10,414	14,671	22,865	22,185	48,990	47,875
of which: Single Farm Payment	€	19,459	23,628	8,918	12,765	20,314	19,723	43,016	41,303
Farm net value added	€	41,584	53,294	14,110	18,633	44,905	44,977	101,766	105,080
Farm net value added	€/AWU	32,635	35,614	17,081	17,019	29,751	30,358	49,534	52,389
Family farm income plus wages	€/AWU	24,725	30,289	12,584	13,745	22,669	25,711	37,758	45,133
Southern Germany									
No of sample farms		563	418	351	211	133	133	79	79
Utilised agric. area (UAA)	ha	58	79	27	37	68	73	172	185
of which: rented	% of UAA	*66*	*74*	*41*	*58*	*68*	*70*	*81*	*83*
Labour units	AWU	1.16	1.36	0.86	1.08	1.26	1.26	2.21	2.15
Stocking rate	LU/100 ha UAA	24	24	27	28	36	36	17	17
Revenues	€	70,443	129,327	31,768	59,000	89,079	131,121	201,261	294,196
Subsidies	€	24,189	31,728	10,937	14,971	29,610	30,039	70,134	73,478
of which: Single Farm Payment	€	18,438	24,860	8,455	12,083	21,867	23,014	53,818	57,344
Farm net value added	€	33,936	44,058	13,166	14,272	43,471	46,471	104,742	111,959
Farm net value added	€/AWU	29,369	32,386	15,383	13,262	34,447	36,950	47,326	51,953
Family farm income plus wages	€/AWU	19,696	21,863	11,550	8,545	23,556	26,604	29,556	34,428
Eastern Germany		Total		< 100 ha		100 - 300 ha		> 300 ha	
No of sample farms		559	559	56	56	230	230	273	273
Utilised agric. area (UAA)	ha	333	336	46	45	182	175	685	698
of which: rented	% of UAA	*79*	*79*	*52*	*50*	*73*	*72*	*82*	*82*
Labour units	AWU	3.59	3.42	1.13	1.08	1.76	1.59	7.05	6.79
Stocking rate	LU/100 ha UAA	11	12	11	13	9	10	12	12
Revenues	€	309,785	467,843	29,811	43,727	142,607	202,480	669,209	1,021,735
Subsidies	€	115,133	113,329	16,567	17,453	62,134	61,762	236,636	231,304
of which: Single Farm Payment	€	103,155	102,193	13,069	14,236	53,591	53,684	215,171	211,456
Farm net value added	€	183,188	217,114	14,674	15,227	82,115	86,723	399,909	484,280
Farm net value added	€/AWU	51,032	63,418	12,943	14,067	46,610	54,373	56,699	71,283
Family farm income plus wages	€/AWU	35,011	41,127	9,136	9,547	31,134	33,198	39,048	46,592

Source: Own calculations based on FARMIS (2011).

Table A5.3: The development of farm economic indicators, dairy farms by region and size of land area used

Indicator	Unit	Total		< 30 cows		30 - 60 cows		> 60 cows	
		2006-08	2021	2006-08	2021	2006-08	2021	2006-08	2021
Northern Germany									
No of sample farms		817	602	97	36	323	234	397	382
Utilised agric. area (UAA)	ha	70	104	29	60	60	80	102	131
of which: rented	% of UAA	*62*	*72*	*52*	*76*	*61*	*71*	*65*	*72*
Labour units	AWU	1.75	1.89	1.17	1.89	1.51	1.57	2.32	2.13
Stocking rate	LU/100 ha UAA	150	134	131	126	141	135	159	135
of which: dairy cows	LU/100 ha UAA	84	76	67	65	74	72	92	79
Revenues	€	186,114	305,338	57,728	134,868	145,844	216,581	300,492	409,157
Subsidies	€	30,469	40,543	11,864	25,139	25,410	30,636	46,290	51,302
of which: Single Farm Payment	€	26,000	34,369	9,552	20,185	21,989	26,656	39,538	43,248
Farm net value added	€	91,655	122,245	26,197	52,569	70,803	85,515	150,283	165,009
Farm net value added	€/AWU	52,395	64,516	22,368	27,759	46,915	54,466	64,735	77,383
Family farm income plus wages	€/AWU	40,969	44,967	17,553	17,952	36,235	37,705	50,883	54,357
Central Germany									
No of sample farms		420	292	84	39	185	143	151	142
Utilised agric. area (UAA)	ha	72	101	41	72	76	95	117	133
of which: rented	% of UAA	*73*	*80*	*66*	*81*	*70*	*76*	*79*	*82*
Labour units	AWU	1.65	1.81	1.22	1.71	1.63	1.63	2.36	2.13
Stocking rate	LU/100 ha UAA	97	96	87	86	93	91	106	104
of which: dairy cows	LU/100 ha UAA	61	60	49	46	58	56	73	70
Revenues	€	131,825	213,005	56,369	111,265	127,094	180,202	261,606	338,261
Subsidies	€	27,984	37,686	15,048	27,528	28,447	35,070	48,207	49,329
of which: Single Farm Payment	€	20,123	27,695	10,223	19,965	20,061	25,906	36,260	36,291
Farm net value added	€	62,286	78,961	27,296	41,619	61,061	69,890	120,921	121,052
Farm net value added	€/AWU	37,836	43,624	22,422	24,296	37,381	42,940	51,213	56,906
Family farm income plus wages	€/AWU	31,445	35,430	19,008	19,174	31,537	35,537	41,733	45,918
Southern Germany									
No of sample farms		1,437	1,057	682	438	641	562	114	109
Utilised agric. area (UAA)	ha	39	51	26	36	53	61	95	107
of which: rented	% of UAA	*54*	*64*	*40*	*57*	*61*	*66*	*75*	*78*
Labour units	AWU	1.43	1.46	1.25	1.39	1.63	1.49	2.18	1.92
Stocking rate	LU/100 ha UAA	124	124	118	120	128	128	128	121
of which: dairy cows	LU/100 ha UAA	77	75	72	70	79	78	82	79
Revenues	€	87,838	132,135	52,304	81,080	127,826	167,551	251,743	326,334
Subsidies	€	20,581	26,125	13,404	18,799	29,158	31,687	50,707	51,361
of which: Single Farm Payment	€	12,499	16,471	7,727	12,006	17,942	19,636	34,077	33,085
Farm net value added	€	44,105	51,587	27,042	32,048	63,680	66,072	120,583	120,820
Farm net value added	€/AWU	30,901	35,215	21,582	23,132	39,018	44,293	55,318	62,840
Family farm income plus wages	€/AWU	25,915	28,578	18,686	18,765	32,224	36,061	44,802	50,554
Eastern Germany		**Total**		**< 50 cows**		**50 - 150 cows**		**> 150 cows**	
No of sample farms		248	153	45	21	126	108	77	77
Utilised agric. area (UAA)	ha	230	301	40	45	154	194	609	625
of which: rented	% of UAA	*81*	*84*	*58*	*61*	*69*	*76*	*89*	*90*
Labour units	AWU	5.94	6.38	1.65	1.50	3.24	3.30	16.34	14.26
Stocking rate	LU/100 ha UAA	88	90	86	89	77	71	94	99
of which: dairy cows	LU/100 ha UAA	58	57	62	58	54	49	59	61
Revenues	€	457,938	719,852	71,058	89,296	275,482	408,716	1,279,546	1,596,975
Subsidies	€	106,191	123,330	18,075	20,825	67,992	77,605	286,888	257,960
of which: Single Farm Payment	€	81,191	91,887	13,709	14,765	52,049	59,785	219,359	189,408
Farm net value added	€	242,457	299,336	30,164	24,892	140,139	157,473	697,513	691,661
Farm net value added	€/AWU	40,824	46,953	18,330	16,649	43,200	47,745	42,683	48,501
Family farm income plus wages	€/AWU	34,244	35,556	16,321	13,757	36,485	35,532	35,593	36,896

Source: Own calculations based on FARMIS (2011).

Table A5.4: The development of farm economic indicators, other grazing livestock farms by region and economic size class

		Total		< 40 ESU		40 -100 ESU		> 100 ESU	
Indicator	Unit	2006-08	2021	2006-08	2021	2006-08	2021	2006-08	2021
Northern Germany									
No of sample farms		191	154	14	12	173	137	.	.
Utilised agric. area (UAA)	ha	57	66	51	52	59	70	.	.
of which: rented	% of UAA	*57*	*61*	*69*	*69*	*53*	*59*	.	.
Labour units	AWU	1.42	1.40	1.07	0.99	1.50	1.51	.	.
Stocking rate	LU/100 ha UAA	132	133	65	68	147	147	.	.
of which: cattle	LU/100 ha UAA	101	104	61	64	110	112	.	.
Revenues	€	92,713	126,169	27,392	34,615	109,043	151,477	.	.
Subsidies	€	27,045	28,033	27,944	32,139	26,703	26,825	.	.
of which: Single Farm Payment	€	21,806	21,875	13,221	17,455	23,996	23,148	.	.
Farm net value added	€	45,420	48,292	21,117	16,957	51,622	57,272	.	.
Farm net value added	€/AWU	32,087	34,608	19,675	17,190	34,350	37,853	.	.
Family farm income plus wages	€/AWU	23,394	20,844	9,953	2,104	25,919	24,410	.	.
Central Germany									
No of sample farms		95	95	89	89	.	.	.	.
Utilised agric. area (UAA)	ha	77	80	76	79	.	.	.	.
of which: rented	% of UAA	*66*	*67*	*65*	*66*	.	.	.	.
Labour units	AWU	1.42	1.29	1.40	1.27	.	.	.	.
Stocking rate	LU/100 ha UAA	55	56	53	54	.	.	.	.
of which: cattle	LU/100 ha UAA	43	46	41	43	.	.	.	.
Revenues	€	35,253	42,626	33,198	39,791	.	.	.	.
Subsidies	€	28,230	32,591	28,114	32,932	.	.	.	.
of which: Single Farm Payment	€	17,240	21,921	16,542	21,643	.	.	.	.
Farm net value added	€	24,207	21,964	22,694	20,362	.	.	.	.
Farm net value added	€/AWU	17,071	17,088	16,184	16,019	.	.	.	.
Family farm income plus wages	€/AWU	12,489	10,164	11,578	8,912	.	.	.	.
Southern Germany									
No of sample farms		158	140	71	57	87	85	.	.
Utilised agric. area (UAA)	ha	57	67	52	66	61	67	.	.
of which: rented	% of UAA	*69*	*74*	*73*	*79*	*66*	*69*	.	.
Labour units	AWU	1.27	1.25	1.20	1.27	1.34	1.22	.	.
Stocking rate	LU/100 ha UAA	69	66	56	53	79	78	.	.
of which: cattle	LU/100 ha UAA	53	52	41	39	64	63	.	.
Revenues	€	57,129	81,063	33,211	48,490	81,702	108,457	.	.
Subsidies	€	27,331	31,325	23,144	30,665	31,632	31,880	.	.
of which: Single Farm Payment	€	16,710	20,997	12,534	19,653	21,000	22,127	.	.
Farm net value added	€	30,371	31,292	17,584	14,722	43,508	45,229	.	.
Farm net value added	€/AWU	23,923	25,131	14,603	11,572	32,548	36,998	.	.
Family farm income plus wages	€/AWU	17,378	16,194	8,816	4,341	25,303	26,568	.	.
Eastern Germany									
No of sample farms		86	86	22	22	33	33	31	31
Utilised agric. area (UAA)	ha	284	267	96	83	209	195	539	516
of which: rented	% of UAA	*92*	*91*	*89*	*87*	*96*	*95*	*91*	*90*
Labour units	AWU	4.82	4.11	1.62	1.30	2.55	2.14	10.43	9.00
Stocking rate	LU/100 ha UAA	70	76	69	74	66	71	72	78
of which: cattle	LU/100 ha UAA	59	64	35	40	58	63	63	68
Revenues	€	239,088	289,170	32,409	34,902	101,945	114,903	588,851	726,514
Subsidies	€	135,905	124,289	54,020	47,052	90,427	93,713	263,231	228,734
of which: Single Farm Payment	€	86,858	81,798	26,273	25,484	50,964	57,026	183,916	161,098
Farm net value added	€	162,024	144,794	50,900	42,137	86,733	80,781	352,056	313,306
Farm net value added	€/AWU	33,599	35,249	31,455	32,389	34,036	37,826	33,746	34,823
Family farm income plus wages	€/AWU	26,672	23,060	25,969	19,534	25,922	19,405	26,998	24,596

Source: Own calculations based on FARMIS (2011).

Table A5.5: The development of farm economic indicators, mixed (compound) farms by region and economic size class

		Total		< 40 ESU		40 -100 ESU		> 100 ESU	
Indicator	Unit	2006-08	2021	2006-08	2021	2006-08	2021	2006-08	2021
Northern Germany									
No of sample farms		960	748	126	65	468	380	366	365
Utilised agric. area (UAA)	ha	63	77	26	38	54	61	108	112
of which: rented	% of UAA	*63*	*66*	52	68	*58*	*61*	*68*	*69*
Labour units	AWU	1.61	1.68	1	1	1.47	1.45	2.25	2.03
Stocking rate	LU/100 ha UAA	301	316	211	228	290	307	328	335
of which: dairy cows	LU/100 ha UAA	16	17	6	7	14	16	19	20
Revenues	€	223,797	345,205	71,889	127,390	178,943	251,239	421,874	541,546
Subsidies	€	22,890	29,563	8,571	14,325	20,519	24,580	39,413	41,801
of which: Single Farm Payment	€	19,947	25,619	7,580	12,750	17,076	20,320	35,170	36,980
Farm net value added	€	69,452	103,795	24,071	36,079	57,616	78,264	126,818	161,368
Farm net value added	€/AWU	43,041	61,607	21,554	24,959	39,101	54,086	56,265	79,604
Family farm income plus wages	€/AWU	31,452	44,325	15,651	15,070	28,977	39,731	40,858	57,744
Central Germany									
No of sample farms		334	273	97	63	153	153	84	84
Utilised agric. area (UAA)	ha	70	88	37	51	92	97	143	153
of which: rented	% of UAA	*73*	*76*	*62*	*72*	*76*	*77*	78	79
Labour units	AWU	1.61	1.76	1.07	1.30	1.84	1.72	3	3
Stocking rate	LU/100 ha UAA	111	112	83	85	107	108	141	138
of which: dairy cows	LU/100 ha UAA	8	8	6	6	9	9	9	9
Revenues	€	118,448	186,168	38,414	64,084	141,562	189,630	352,706	461,694
Subsidies	€	24,091	29,875	12,265	18,806	31,847	32,911	48,847	48,671
of which: Single Farm Payment	€	19,178	23,956	9,094	14,020	25,135	26,434	41,775	41,392
Farm net value added	€	50,645	64,442	16,745	21,848	63,604	68,725	142,671	153,584
Farm net value added	€/AWU	31,490	36,604	15,642	16,786	34,567	39,997	47,420	52,567
Family farm income plus wages	€/AWU	24,751	31,065	11,270	12,562	27,171	33,782	38,576	46,569
Southern Germany									
No of sample farms		833	692	305	204	403	403	125	125
Utilised agric. area (UAA)	ha	53	67	28	36	65	70	126	149
of which: rented	% of UAA	*65*	*71*	*47*	*59*	*69*	*71*	76	80
Labour units	AWU	1.45	1.51	1.08	1.19	1.59	1.46	3	3
Stocking rate	LU/100 ha UAA	148	145	111	114	142	143	193	169
of which: dairy cows	LU/100 ha UAA	15	15	10	11	17	17	16	14
Revenues	€	117,748	182,217	47,297	75,019	138,110	184,699	361,540	489,317
Subsidies	€	24,069	28,385	12,663	16,537	29,085	29,638	57,917	59,133
of which: Single Farm Payment	€	17,198	21,129	8,286	11,555	20,860	22,012	44,490	46,392
Farm net value added	€	48,410	62,397	16,934	19,178	59,242	66,890	151,661	174,800
Farm net value added	€/AWU	33,353	41,362	15,663	16,094	37,336	45,853	57,431	67,145
Family farm income plus wages	€/AWU	26,431	33,001	12,201	11,453	29,269	37,215	46,520	54,283
Eastern Germany									
No of sample farms		461	461	25	25	47	47	389	389
Utilised agric. area (UAA)	ha	578	582	42	42	123	119	827	834
of which: rented	% of UAA	*84*	*84*	55	55	72	71	*85*	*85*
Labour units	AWU	10.63	9.61	1	1	2	2	15.08	13.65
Stocking rate	LU/100 ha UAA	60	63	49	53	40	43	61	64
of which: dairy cows	LU/100 ha UAA	21	22	9	9	11	12	21	22
Revenues	€	844,475	1,112,570	32,678	43,078	98,654	126,628	1,236,157	1,629,446
Subsidies	€	227,469	216,554	16,401	18,415	51,757	51,294	324,668	307,879
of which: Single Farm Payment	€	186,060	176,214	10,668	12,770	36,022	36,173	267,856	252,495
Farm net value added	€	426,496	445,267	19,080	19,166	61,505	54,885	620,697	650,578
Farm net value added	€/AWU	40,139	46,320	18,106	20,216	25,007	24,800	41,150	47,659
Family farm income plus wages	€/AWU	31,937	34,468	14,721	13,862	20,058	18,732	32,729	35,473

Source: Own calculations based on FARMIS (2011).

Table A5.6: The development of farm economic indicators, pig and poultry farms by region and economic size class

		Total		40 -100 ESU		> 100 ESU	
Indicator	Unit	2006-08	2021	2006-08	2021	2006-08	2021
Northern Germany							
No of sample farms		259	230	151	124	108	108
Utilised agric. area (UAA)	ha	47	48	41	48	57	48
of which: rented	% of UAA	*61*	*62*	*55*	*60*	*70*	*64*
Labour units	AWU	1.75	1.68	2	2	1.92	1.60
Stocking rate	LU/100 ha UAA	504	585	530	581	473	591
of which: pigs	LU/100 ha UAA	483	562	519	570	439	551
Revenues	€	252,955	348,850	240,792	358,790	273,758	334,857
Subsidies	€	14,330	18,397	12,842	18,075	16,875	18,850
of which: Single Farm Payment	€	12,306	16,171	10,976	16,049	14,581	16,344
Farm net value added	€	71,492	101,830	66,387	99,726	80,224	104,792
Farm net value added	€/AWU	40,941	60,628	40,327	57,479	41,844	65,430
Family farm income plus wages	€/AWU	31,046	46,971	30,873	44,327	31,299	51,001
Central Germany							
No of sample farms		28	23	21	16	.	.
Utilised agric. area (UAA)	ha	53	60	50	60	.	.
of which: rented	% of UAA	*62*	*65*	*63*	*68*	.	.
Labour units	AWU	1.99	2.04	2	2	.	.
Stocking rate	LU/100 ha UAA	251	285	280	321	.	.
of which: pigs	LU/100 ha UAA	213	244	224	260	.	.
Revenues	€	250,082	371,953	246,592	389,476	.	.
Subsidies	€	20,528	23,367	17,294	20,528	.	.
of which: Single Farm Payment	€	14,561	16,676	13,711	16,642	.	.
Farm net value added	€	80,999	110,465	88,755	129,484	.	.
Farm net value added	€/AWU	40,750	54,059	45,564	60,572	.	.
Family farm income plus wages	€/AWU	32,577	46,194	37,409	52,415	.	.
Southern Germany							
No of sample farms		148	120	85	58	63	63
Utilised agric. area (UAA)	ha	43	49	38	46	50	51
of which: rented	% of UAA	*57*	*62*	*50*	*58*	64	65
Labour units	AWU	1.78	1.91	2	2	2	2
Stocking rate	LU/100 ha UAA	331	405	335	450	327	366
of which: pigs	LU/100 ha UAA	298	366	324	436	271	306
Revenues	€	211,094	340,589	176,343	327,364	259,277	353,000
Subsidies	€	17,183	19,950	15,275	19,558	19,828	20,318
of which: Single Farm Payment	€	12,398	15,158	10,967	15,047	14,382	15,263
Farm net value added	€	45,521	79,365	46,520	88,331	44,136	70,952
Farm net value added	€/AWU	25,573	41,639	27,748	42,201	22,944	41,001
Family farm income plus wages	€/AWU	19,074	34,814	22,559	36,385	14,862	33,032
Eastern Germany							
No of sample farms		8	8	.	.	8	8
Utilised agric. area (UAA)	ha	179	137	.	.	179	137
of which: rented	% of UAA	*75*	*68*	.	.	*75*	*68*
Labour units	AWU	6.80	5.95	.	.	6.80	5.95
Stocking rate	LU/100 ha UAA	505	678	.	.	505	678
of which: pigs	LU/100 ha UAA	493	661	.	.	493	661
Revenues	€	1,009,099	1,195,601	.	.	1,009,099	1,195,601
Subsidies	€	50,378	44,019	.	.	50,378	44,019
of which: Single Farm Payment	€	42,971	38,161	.	.	42,971	38,161
Farm net value added	€	268,381	326,238	.	.	268,381	326,238
Farm net value added	€/AWU	39,447	54,855	.	.	39,447	54,855
Family farm income plus wages	€/AWU	33,222	47,675	.	.	33,222	47,675

Source: Own calculations based on FARMIS (2011).

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