European Commission

Prospects for Agricultural Markets and Income in the EU 2012-2022

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Agriculture and Rural Development

Note to the Reader

World agriculture is at a crossroads, facing an increase in the level and volatility of agricultural prices not seen since the 1970s, a stronger influence from factors outside of agriculture, such as macroeconomic shocks or the co-movement of agricultural with energy and other commodity markets, and major climate-related uncertainties. In such an environment, the development of medium term projections for EU agricultural markets required some significant changes in approach, which are reflected in the present publication.

The outlook presented herein consists of a set of market and sector income prospects elaborated on the basis of specific assumptions regarding macroeconomic conditions, the agricultural and trade policy environment, weather conditions and international market developments. As in previous years, these are not intended to constitute a forecast of what the future will hold; rather they describe what may happen under a specific set of assumptions and circumstances, which at the time of projections were judged plausible. Thus, they should be seen as an analytical tool for medium term market and policy issues, not as a forecasting tool for monitoring short term market developments.

These projections and analyses have been carried out on the basis of economic models available in the European Commission (at the Directorate-General for Agriculture and Rural Development and in the Joint Research Centre – Institute for Perspective Technological Studies (JRC-IPTS)). This report is based on the information available at the end of September 2012, except for macroeconomic assumptions, which are from November 2012. The changes in legislation proposed or adopted since that date have not been taken into account. Moreover the projections do not take account of any potential outcome of on-going bilateral/regional/multilateral trade negotiations. The analysis covers the period between 2012 and 2022. The market outlook is presented in Part I (Chapter 1 to 7). To take account of the challenges outlined above, the outlook also focuses on the identification and quantification of the main areas of uncertainty, whose potential impact is analysed in Part II (Chapter 8 to 12).

The validation procedure included an external review of the baseline and uncertainty scenarios in an Outlook Workshop on 16-17 October 2012 in Brussels, gathering high-level policy makers, modelling and market experts from the EU, the United States and international organisations such as the Organisation for Economic Co-operation and Development, the United Nation's Food and Agriculture Organisation and the World Bank.

The modelling approach, especially the assessment of uncertainties, has been further improved by increasing the number of market and modelling experts involved and by relying on state-of-the-art agro-economic models. These changes aim at enhancing the accuracy, usefulness and relevance of baseline market prospects, thus enabling the projections and analyses presented in this publication to provide useful up-to-date input into the debate following the Common Agriculture Policy towards 2020 legislative proposals.

Acknowledgements

The publication involved joint efforts in the European Commission (at the Directorate-General for Agriculture and Rural Development and in the Joint Research Centre – Institute for Perspective Technological Studies (JRC-IPTS)). The authorship and responsibility for the contents of the publication rest with Directorate-General for Agriculture and Rural Development.

At the Directorate-General for Agriculture and Rural Development the publication and the underlying baseline was prepared by: Pierluigi Londero (Head of Unit), Alberto D'Avino, Livia Galita, Beatriz Velazquez and Stephan Hubertus Gay (baseline co-ordinator). In addition, Vincent Cordonnier, Giampiero Genovese, Maciej Krzysztofowicz, Dangiris Nekrasius and Balázs Bence Tóth as well as the outlook groups at the Directorate-General for Agriculture and Rural Development contributed to the preparation of the baseline.

At the Joint Research Centre – Institute for Perspective Technological Studies (JRC-IPTS) the team contributing to the preparation of the baseline, organising the Outlook Workshop and preparing the uncertainty analysis included: Marco Artavia, Alison Burrell, Pavel Ciaian, Sophie Hélaine, Robert M'barek, Zebedee Nii-Naate and Benjamin Van Doorslaer. Anna Atkinson edited the report and contributed to the organisation of the Outlook Workshop in October 2012.

The feedback during the Outlook Workshop in October 2012 and by many other colleagues during the preparation is duly acknowledged. The cover picture has been taken by Inge Van Oost '.

Executive summary

Agricultural market developments have attracted considerable attention recently, due to increasing consumer food prices and sharp short term price fluctuations of agricultural commodity prices. This medium term outlook provides a projection for major EU agricultural commodity markets and agricultural income until the year 2022, based on a set of coherent assumptions. Under these assumptions agricultural commodity prices are expected to stay firm over the medium term, supported by factors such as the growth in global food demand, the development of the biofuel sector and a prolongation of the long term decline in food crop productivity growth.

EU commodity markets are projected to remain balanced - on average - over the outlook period, without the need for market intervention. Prospects for agricultural income grow at EU level during the outlook period, resulting from continuing decline in labour input rather than from income increases at sector level.

Policy and macroeconomic assumptions

The present medium term outlook for EU agricultural markets and income is based on a status quo assumption for agricultural and trade policy. The present proposals of the Commission to reform the Common Agricultural Policy (CAP) are not taken into account, but the CAP is assumed to follow the Health-Check decisions and global trade policy is assumed to respect the Uruguay Round Agreement on Agriculture. Macroeconomic assumptions include negative EU GDP growth of -0.3% in 2012, followed by a gradual return to a modest growth of about 2% per year as of 2015, and the exchange rate remaining at current levels until 2014, with a subsequent slight appreciation of the Euro to around 1.35 USD/EUR in 2022.

Arable crops

The medium term prospects depict a relatively positive outlook for arable crops in the EU as a result of solid world demand and firm prices. In the EU, market developments for arable crops are driven by the biofuel market, which is the most dynamic demand factor, as EU feed and food demand are expected to show only a marginal increase.

The medium term outlook for EU cereal markets is characterised by tight market conditions, low stock levels and prices remaining above historical levels. These developments are driven by moderate supply growth reaching 309 million t by 2022, mainly the result of low annual yield growth rates (0.9% on average), and an increase in the domestic use of cereals in the EU, most notably due growing demand by the ethanol and biomass industry in the framework of the Renewable Energy Directive (RED). Some reallocation between crops in the context of a stable overall cereal area is expected, with maize and common wheat further increasing their share (up to 17% and 42% respectively) at the expense of other cereals. The growing demand for rice will be satisfied by increasing imports further reducing the EU self-sufficiency to 56%.

Similar drivers impact upon the medium term prospects for the EU oilseed markets, which show a positive outlook for producers with strong demand and high oilseed oil prices. Supply growth is driven by moderate yield growth and to a lesser extent from a slightly expanding oilseed area. The expected increase in domestic use of oilseeds in the EU would also be driven by additional demand for vegetable oil as biodiesel feedstock.

Prospects for EU sugar markets are mixed. The growing demand for ethanol in the framework of the RED supports a growth in sugar beet production geared towards ethanol. On the other hand, for food consumption, isoglucose is expected to increasingly replace beet sugar, following the expiry of quotas in 2015. The expiry of the sugar quota will lead to a reduction of the domestic sugar price in the EU and make imports, including preferential access, less attractive.

Overall, the projected growth in domestic consumption of cereals, oilseeds and sugars is largely dependent on the assumptions for bioenergy use. Regarding biofuel, it is assumed that progress towards meeting the Renewable Energy Directive (RED) target of 10% of renewables in energy share will continue, but the target will be met after 2020. Nevertheless, the production and use of biofuels will increase by about two-thirds, reaching a 8.5% share by 2022.

Meat

The EU market is likely to be affected by the on-going economic downturn and historically high levels of unemployment, which tend to push EU demand towards cheaper meat options. The new animal welfare requirements in the pig sector are also expected to play an important role in the near future. As a consequence, total EU meat production, after having increased during both 2010 and 2011, will contract by 2% over the next two years. After this reduction, total meat production is projected to steadily recover over the ten year horizon and to reach almost 45 million tonnes in 2022, approximately the same level recorded in 2011.

Meat production is mainly driven by increasing poultry and pork meat consumption, as well as by a firm external demand and higher prices. On a per capita basis, EU meat consumption in 2022, at 82.6 kg, would be at approximately the same level as it was in 2009 and 1% lower than in 2011, despite the improved macroeconomic prospects. Pig meat is expected to remain the preferred meat in the EU with 40.8 kg/capita consumption in 2022, compared to 24.1 kg for poultry, 15.7 kg for beef/veal and less than 2.0 kg for sheep and goat meat.

The net trade position of the EU is projected to deteriorate over the outlook period, driven by an increase in meat imports (of beef/veal, sheep and goat and poultry meats) and a parallel decline in exports of poultry. Aggregate meat imports would grow by 5.2% (2022 vs. 2011) and exports would decline by 6.8%, leaving the EU, nevertheless, a net exporter of pig and poultry meats in 2022.

Milk and dairy products

Medium term prospects for milk and dairy products appear favourable due to the continuing expansion of world demand.

Global population and economic growth, and increasing preference for dairy products are expected to be the main drivers, fuelling EU exports and sustaining commodity prices. The best export performance is shown by cheese and SMP, whose exports over the outlook period would expand by two thirds and triple respectively.

Milk production is projected to continue increasing from 2012 onwards, at a moderate growth rate. Aggregate EU production would remain below the potential growth rate provided by the gradual elimination of the quota regime. EU milk production is projected to reach 159.3 million tonnes in 2022, accounting for a cumulative increase of 5% since 2011.

Cheese output is seen to grow by almost 7% on aggregate from 2011 to 2022, reaching 9.6 million tonnes by the end of the outlook. Consumer preference towards fresh dairy products, in particular drinking milk, cream and yogurt, would sustain an expansion in production up to 49.6 million tonnes in 2022 (+8% compared to 2009 and +6.3% compared to 2011) EU skimmed milk powder production is projected to increase by 23% throughout the outlook to reach around 1.3 million tonnes in 2022; Exports would reach 678 000 tonnes by the end of the outlook (30% more than in 2011). Total butter production is expected to remain constant in the short run, and to recover in the years soon after the quota expiry, reaching 2.4 million tonnes in 2022 (+8% with respect to 2011).

Agricultural income

While the medium term changes in the price and volume components of the arable crops and major livestock sectors have been established in line with the market projections, in the remaining agricultural sectors – such as fruit, vegetables, wine and olive oil – it was assumed that income would follow a development related to its historical trend. Compared to a five year average of the period 2008-2012, the EU-27 agricultural income per annual working unit in real terms would be 17.5% higher in 2022 compared to the base period. This positive trend is the result of an expected sharp deterioration of the factor income in real terms at sector level (-15.6%), which is more than compensated by a reduction in the workforce employed in agriculture (-28.4%).

Against the background of an overall positive trend in real agricultural income per worker, marked differences appear between the EU-15 and EU-N12 aggregates. In the EU-15, agricultural income in 2022 is expected to be roughly unchanged (+0.1%) compared the base period. On the other hand, in the EU-N12, agricultural income continues to display a positive trend, almost 55% higher than the reference period by 2022, thus slightly converging towards the EU average.

Caveats

The outlook for EU agricultural markets and income presented in this publication is based on a specific set of assumptions regarding the future economic, market and policy environment. In addition, the baseline assumes normal weather conditions, steady yield trends and no disruptions caused by factors like animal disease outbreaks or food safety issues.

The projections are not intended as a forecast of future outcomes, but instead as a description of what may happen given a specific set of assumptions and circumstances, which at the time of making the projections were judged plausible. As such, they serve as a reference for policy simulations. It follows that the baseline projections depict rather smooth market developments, while in reality markets tend to move along a more volatile path as observed in the past and particularly over recent years.

An uncertainty analysis accompanies the presented baseline to quantify some of the uncertainties and to provide background on variation of the results. The uncertainty scenarios analysed focus on the impacts of i) the variability of input costs at regional level on farmers' income, ii) climate change on the agricultural sector, and iii) different EU biofuel policy scenarios on feedstock markets.

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Abbreviations

EU	European Union
EU-N12	EU Member States which joined in 2004 and 2007
EU-15	EU including the current 15 Member States before 2004
EU-25	EU including the current 25 Member States before 2007
EU-27	EU including the current 27 Member States
NUTS2	Nomenclature of Units for Territorial Statistics (level 2)
US	United States of America
JRC-IPTS	Joint Research Centre – Institute for Perspective Technological Studies
FAO	Food and Agriculture Organization of the United Nations
OECD	Organisation for Economic Co-operation and Development
CAP	Common Agricultural Policy
SPS	Single Payment Scheme
SAPS	Single Area Payment Scheme
CNDP	Complementary National Direct Payments
RED	Renewable Energy Directive
EUR	Euro
USD	US dollar
CPI	Consumer Price Index
GDP	Gross Domestic Product
SMP	Skimmed Milk Powder
WMP	Whole Milk Powder
1st-gen.	first-generation
2nd-gen.	second-generation
hl	hectolitres
kg	kilogrammes
t	tonnes
t.o.e.	tonnes oil equivalent
w.s.e.	white sugar equivalent
CV	coefficients of variation

1. Introduction – the baseline setting

This medium term outlook provides a projection for major EU agricultural commodity markets and agricultural income until the year 2022, based on a set of coherent macroeconomic and policy assumptions. This baseline assumes normal weather conditions, steady demand and yield trends and no disruptions caused by factors like animal disease outbreaks or food safety issues. This stable path in assumed exogenous variables is reflected in the baseline projections, which depict rather smooth market developments; in reality, markets tend to move along a more volatile path as observed in the past and particularly over recent years.

Part I of this publication summarises the main results of updated baseline projections for the cereal, oilseed, meat and dairy product markets and agricultural income in the European Union for the period 2012-2022. Part II of the publication focuses on a set of uncertainties surrounding the baseline setting with a focus on the macroeconomic environment, the volatility of yield developments, climate change and biofuel policy scenarios.

The projections are established under a set of assumptions on agricultural and trade policies and the macroeconomic environment. The world market environment is based on the OECD-FAO agricultural outlook of July 2012, taking into account more recent global macroeconomic prospects. These working hypotheses have been defined on the basis of the information available, which at the time of the analysis was deemed to be most plausible. The projections are based on statistics and market information available at the end of September 2012, while the macroeconomic assumptions are based on projections published in November 2012.

1.1. Policy assumptions

The present projections assume a status quo EU policy environment over the outlook period, i.e. a continuation of the Common Agricultural Policy (CAP) following the Health Check decisions adopted by the Agricultural Council in November 2008. The following elements have particular importance regarding market and income developments:

1) **Phasing out of milk quotas:** Milk quotas are increased by 1% every quota year between 2009/10 and 2013/14. For Italy, the 5% increase was introduced in one go in 2009/10. Milk quotas are abolished by April 2015.

2) **Expiry of the sugar quota system:** Sugar and isoglucose quotas are assumed to expire after the marketing year 2014/2015 as set out in the existing legislation.

3) **Intervention mechanisms:** Intervention is set at zero for barley and sorghum. For wheat, butter and skimmed milk powder intervention purchases are possible at guaranteed buying-in prices up to 3 million tonnes, 30 000 tonnes and 109 000 tonnes respectively for each year. Beyond these limits, intervention is possible by tender.

4) **Decoupling:** The payments that some Member States kept coupled after the 2003 CAP Reform are decoupled and moved into the Single Payment Scheme (SPS) by 2010 for arable crops, durum wheat, olive oil and hops and by 2012 for processing aids and the remaining products, with the exception of suckler cow, goat and sheep premiums, where Member States are assumed to keep current levels of coupled support.

5) The Member States currently applying the **single area payment scheme (SAPS)** are assumed to adopt the regionalised system from 2014 onwards.

6) **Set-aside:** The requirement for arable farmers to leave 10% of their land fallow was abolished in 2008.

7) **Modulation (shifting money from direct aid to Rural Development):** direct payments exceeding EUR 5 000 annually shall be reduced each year, by 7% in 2009 up to 10% in 2012. An additional cut of 4% will be made on payments above EUR 300 000.

Policy changes related to the European Commission proposals for a CAP towards 2020 as presented on 12 October 2011 have not been taken into consideration for the baseline projections as the legislative procedure is still on-going. Concerning the sugar quota regime, the CAP towards 2020 proposal confirms the existing provisions on expiry of the regime after the marketing year 2014/15. The policy assumption on the expiry of sugar quotas therefore is in conformity with existing legislation and with the European Commission proposal.

Regarding the trade policy environment all commitments taken within the Uruguay Round Agreement on Agriculture in particular regarding market access and subsidised exports are assumed to be fully respected. No account is taken of any potential outcome of the multilateral trade negotiations within the framework of the Doha Development Round, or of on-going bilateral and/or regional trade negotiations.

1.2. Macroeconomic environment

World GDP, which increased by just 0.9% in 2009, rebounded with growth of 3.4% and 4.2% in 2010 and 2011, respectively. The subsequent slowdown of 2.6% and 2.4% in world GDP growth (2012 and 2013, respectively) is expected to be followed by somewhat higher growth rates of about 2.7% to 3.0% until 2022.

As a consequence of the financial and economic crisis, EU GDP contracted sharply by 4.3% in 2009. Although it recovered by 2.1% in 2010, it slowed down to 1.5% in 2011. The current year 2012 is expected to be marked by negative GDP growth, with EU GDP declining 0.3%. Prospects for 2013 are for a low GDP growth of 0.4%. It is expected that a steady growth path will only be reached from 2015 onwards with a GDP growth rate of 1.9% to 2.2% in the EU. Thus for the EU, the turbulent times continue for at least another year, and the growth path is considerably below expectations before the start of the economic crisis.

The macroeconomic assumptions used in the baseline have mixed implications for EU agricultural markets. Continuous world population growth drives increasing demand and supports higher prices for agricultural commodities, while the expectation of lower short term economic growth limits income growth thereby reducing the potential for demand growth over the near term. In terms of EU export potential, the positive situation during recent years, supported by favourable currency exchange rate developments, is projected to prevail during the baseline period, favouring EU exports. The oil price is expected to remain, albeit with fluctuation, around the current levels. Due to the high level of uncertainty surrounding the macroeconomic outlook, most of the analysis in Part II of the publication focuses on the implications of alternative macroeconomic scenarios on the prospects of EU agriculture until 2022.

Table 1.1 Baseline assumptions on EU key macroeconomic variables

		2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Population growth		**0.3%**	**0.3%**	**0.3%**	**0.2%**	**0.2%**	**0.2%**	**0.2%**	**0.2%**	**0.2%**	**0.2%**	**0.2%**	**0.2%**	**0.2%**	**0.1%**
	EU-15	0.4%	0.4%	0.5%	0.4%	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%	0.2%	0.2%	0.2%	0.2%
	EU-N12	0.0%	-0.1%	-0.1%	-0.2%	-0.1%	-0.1%	-0.1%	-0.1%	-0.1%	0.0%	-0.1%	-0.1%	-0.1%	-0.1%
Real GDP growth		**-4.3%**	**2.1%**	**1.5%**	**-0.3%**	**0.4%**	**1.6%**	**2.1%**	**2.2%**	**2.1%**	**2.0%**	**1.9%**	**1.9%**	**1.9%**	**1.9%**
	EU-15	-4.3%	2.1%	1.4%	-0.3%	0.3%	1.5%	1.9%	2.0%	1.9%	1.8%	1.8%	1.8%	1.8%	1.8%
	EU-N12	-3.6%	2.3%	3.1%	1.0%	1.4%	2.3%	4.4%	4.4%	4.3%	4.2%	4.0%	4.0%	3.9%	3.7%
	World	0.9%	3.4%	4.2%	2.6%	2.4%	2.7%	2.9%	2.9%	3.0%	2.9%	2.9%	2.9%	2.8%	2.8%
Inflation (Consumer Price Index)		**0.8%**	**1.9%**	**3.0%**	**2.5%**	**1.9%**	**1.7%**	**2.2%**	**2.1%**	**2.0%**	**1.9%**	**2.0%**	**2.0%**	**2.0%**	**2.0%**
	EU-15	0.7%	1.9%	2.9%	2.5%	1.9%	1.7%	2.1%	2.0%	2.0%	1.9%	1.9%	2.0%	2.0%	1.9%
	EU-N12	2.9%	2.8%	3.8%	3.8%	3.0%	2.5%	2.7%	2.5%	2.4%	2.3%	2.3%	2.3%	2.4%	2.4%
Exchange rate (USD/EUR)		**1.39**	**1.33**	**1.39**	**1.29**	**1.30**	**1.30**	**1.34**	**1.35**	**1.35**	**1.35**	**1.35**	**1.35**	**1.35**	**1.35**
Crude oil price (USD per barrel Brent)		**62**	**79**	**111**	**108**	**93**	**90**	**85**	**90**	**94**	**98**	**102**	**105**	**108**	**110**

In 2011, the EU population surpassed 500 million. But the rate of growth has been continuously declining, and this trend is foreseen to persist over the outlook period. Eurostat projections (EUROPOP 2010) show a steady decrease in annual population growth from 0.2% to 0.1% from one year to the next over the medium term, with a slightly higher growth rate in the EU-15 and a marginal decline in the EU-N12.

The annual EU inflation rate averaged 0.8% in 2009, but increased to 1.9% in 2010 and reached 3.0% in 2011. In 2012, it is expected to be slightly lower at 2.5%, while for the outlook period assumptions range from 1.7% to 2.2%.

After continuous strengthening of the Euro against the US dollar from 2001 to 2008, the Euro depreciated in 2009 and 2010, averaging 1.39 USD/EUR and 1.33 USD/EUR respectively. In 2011 the Euro appreciated to 1.39 USD/EUR, but during the current year 2012 it is expected to fall to 1.29 USD/EUR. For the outlook period, the Euro is expected to remain at the level of the last four years and reach an exchange rate of 1.35 USD/EUR in 2022.

Having reached a peak in 2008, the price of crude oil dropped to an annual average of 62 USD/barrel in 2009; it has since increased again to 111 USD/barrel in 2011. The medium term projections indicate a rather stable nominal oil price of between 85 and 110 USD/barrel, the latter at the end of the outlook period.

1.3. Croatia

Croatia is a candidate country of the EU scheduled to enter the EU in July 2013. Since Croatia is not covered in the medium term outlook presented here, some background information on its agriculture is provided to put its agriculture in the broader EU context.

Overall Croatia has a population of 4.5 million less than 1% of the EU population and a utilized agricultural area of 1.3 million ha about 0.7% of the EU total. From the products covered in this outlook, Croatia is self-sufficient in arable products: oilseeds, cereals and sugar. It is also a considerable exporter of these products. In the case of oilseeds, Croatia exports oilseeds but imports large quantities of vegetable oils and protein meals. Croatia is an important supplier of sugar to the EU market due to preferential access but on the other hand imports considerable quantities from especially Brazil to satisfy domestic demand. Croatia is close to self-sufficiency for most livestock products and has only considerable imports of cheese and pig meat.

Table 1.2 shows the production of agricultural products in Croatia. Only in the case of maize and soybeans Croatia accounts for considerable more than 1% of EU production (maize about 3% and soybeans about 12%).

Table 1.2 Agricultural production in Croatia, 2007-2011 ('000 tonnes)

	2007	2008	2009	2010	2011	average share in EU-28
Pig meat	156.0	147.9	78.3	88.5	88.2	0.5%
Sheep meat	8.2	7.5	1.0	0.8	0.8	0.4%
Poultry meat	93.1	92.4	62.0	60.2	60.8	0.6%
Beef and veal	54.8	58.1	48.8	55.4	53.8	0.7%
Milk (Cow milk only)	673.5	598.7	675.3	623.9	626.4	0.4%
Cheese	29.9	25.9	28.2	29.1	30.1	0.3%
Butter	4.0	4.0	5.0	5.0	5.0	0.2%
Wheat	812.3	858.3	936.1	616.3	781.8	0.6%
Barley	225.3	279.1	243.6	166.0	194.0	0.4%
Maize	1424.6	2504.9	2182.5	2060.0	1729.0	3.2%
Other cereals	72.0	83.2	79.6	82.7	116.7	0.3%
Sugar beet	1582.6	1269.5	1217.0	1249.2	1168.0	1.2%
Sugar	306.7	320.4	190.0	218.6	204.4	1.3%
Soybeans	90.6	107.6	115.2	153.6	147.3	12.3%
Rapeseed	39.3	62.9	80.4	33.0	48.5	0.3%
Sunflower seed	54.3	119.9	82.1	61.8	85.0	1.2%
Vegetable oil	44.8	70.8	41.9	42.3	33.8	0.3%
Protein meal	98.4	150.7	92.5	128.1	92.0	0.4%

Source: Eurostat and own estimates

2. Arable crops

The medium term prospects depict a relatively positive outlook for arable crops in the EU as a result of solid world demand and firm prices. In the EU, these are driven by the biofuel market, which is the most dynamic demand factor, as EU feed and food demand are expected to show only a marginal increase. On the supply side, growth is limited to increasing yields as arable area is expected to decline slightly in line with the long term trend.

This chapter covers a large range of arable crops: common wheat, durum wheat, barley, maize, rye oats, other cereals, rapeseed, sunflower seed, soybeans, rice and sugar beet. In addition, the processed products sugar, vegetable oils, protein meals, biodiesel and ethanol are discussed. To structure the chapter first land use developments are assessed, followed by cereals, the oilseed complex, sugar, rice and finally biofuels.

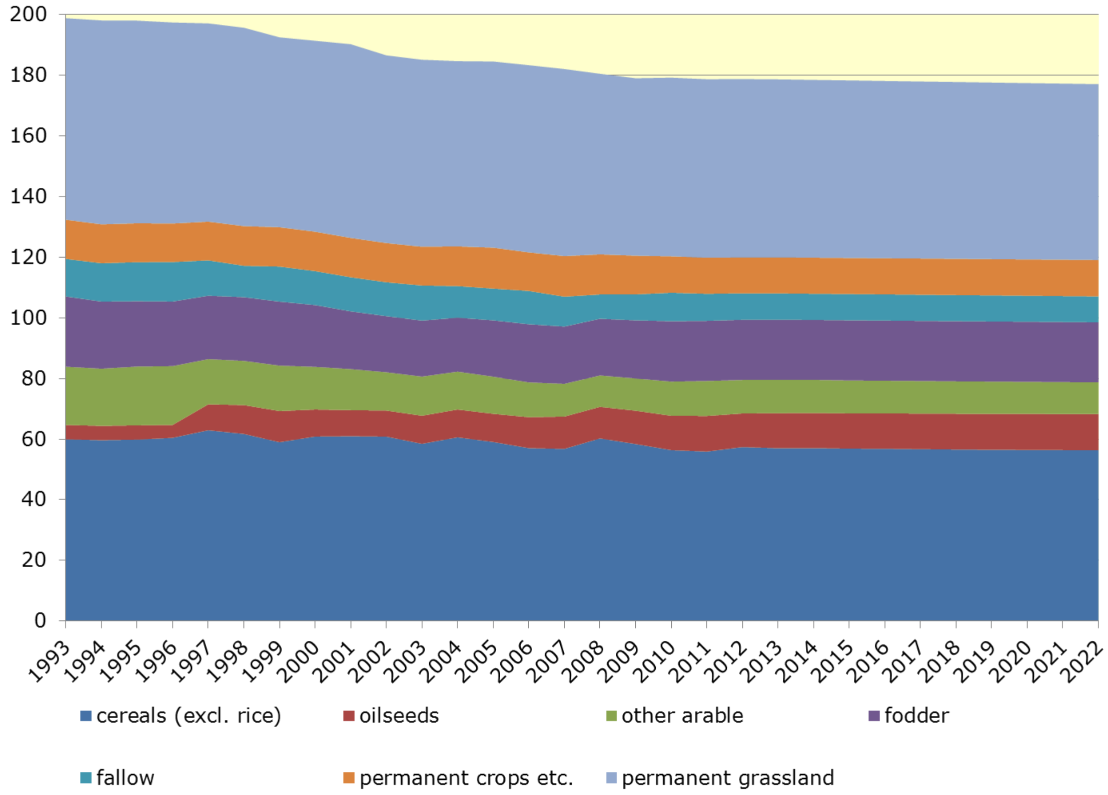
2.1. Land use developments

The link between the agricultural products covered in this chapter is the use of arable land for their production. The development of available land for arable use in the EU reveals a slight decline over time. Generally, availability of agricultural land in the EU declines due to the increasing use of land for building purposes and also the protection of forest land and other habitats. About a third of agricultural land is comprised of permanent pasture and a small share is used for permanent crops, kitchen gardens and greenhouses, leaving around 60% for arable crops (Graph 2.1).

Of the large categories included in Graph 2.1 oilseeds is the only one which increased considerably during the last 20 years, driven to an extent by the increased use of rapeseed oil for the production of biodiesel. On the other hand, fallow including set-aside declined noticeably due to the end of compulsory set-aside and other arable decreased due to a concentration of arable production on the most profitable crops. Land use for most fodder crops (e.g. lucerne, temporary grassland) declines, but green maize increases, resulting in a relative overall stability of this category over the longer term. The expansion of green maize in recent years is partly due to its use as a feedstock in the production of biogas, mainly in Germany, where an increase in the green maize area of 1 million hectares can be observed over the last ten years.

In the case of cereal land use, a slight decline over the last 20 years can be observed. The pace of this decline was generally lower than the pace of the yield increase, leading to an increase in overall cereal production. A similar development is expected to continue for the coming decade.

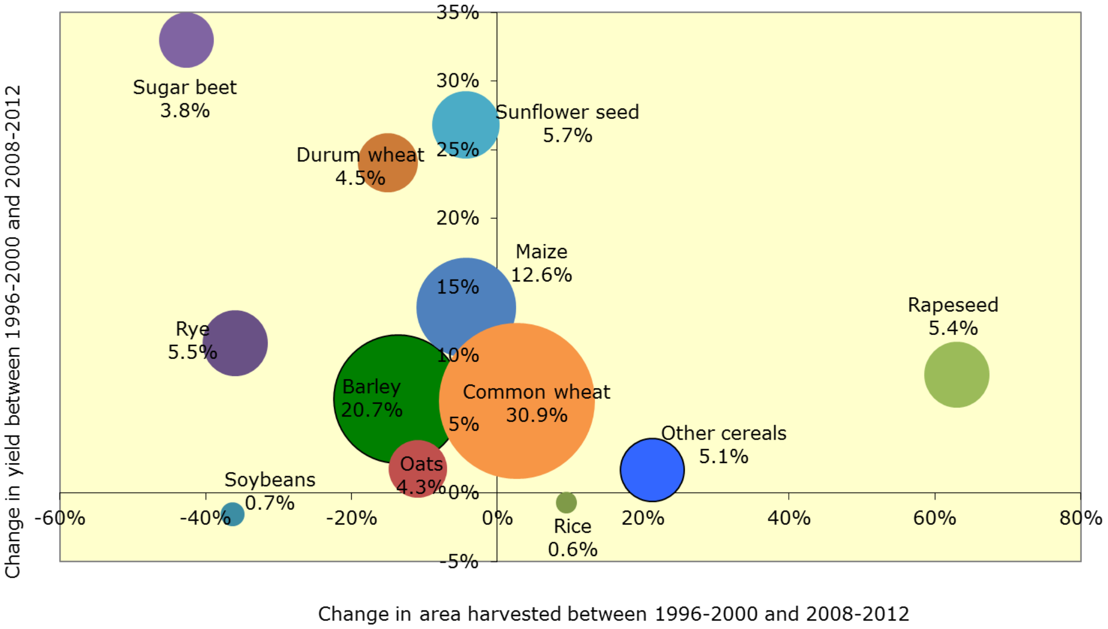
Graph 2.1 Agricultural land use developments in the EU (million ha)



Graph 2.2 in the following page compares historic land use and yield developments for the individual crops covered in this medium term outlook by comparing changes in area and yield between 1996-2000 and 2008-12 (multi-year average is used to reduce the impact of annual fluctuations, especially in the case of yields).

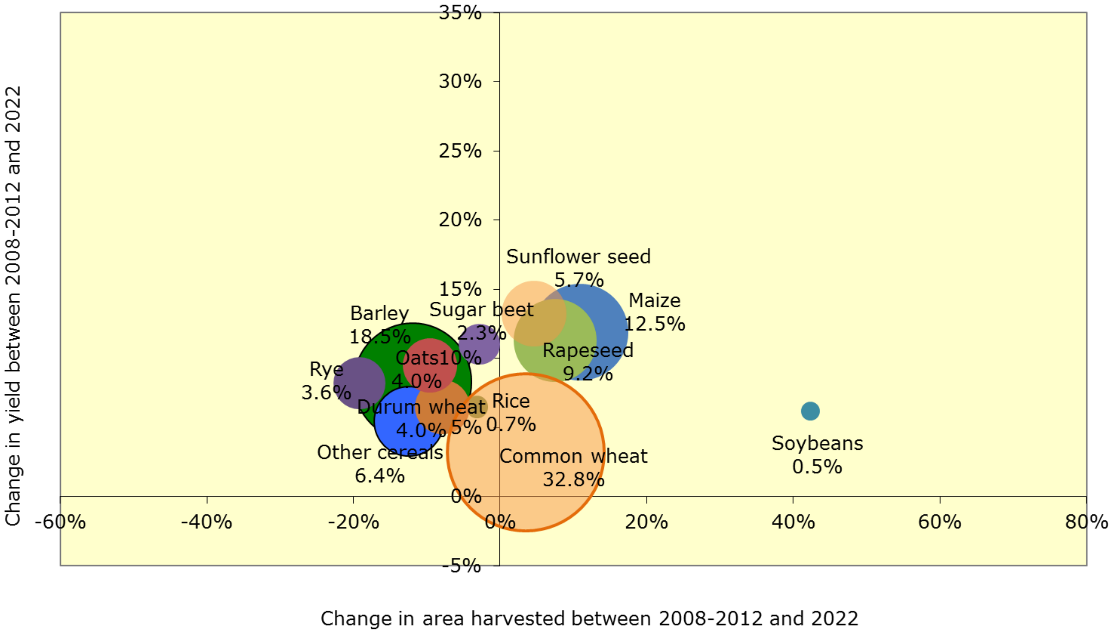
The strongest increases in land use are for rapeseed and other cereals. In the case of rapeseed, this is driven by the development of European biodiesel production based on rapeseed oil. For other cereals, the most notable shift is from rye to triticale. This also partly explains the strong decline in land use for rye. The strong decline in sugar beet area has two reasons; first, the reform of the EU sugar market with a decline in sugar quotas and, secondly, the exceptional yield developments which require less land to produce the same quantities. Strong increases in average yields can be also observed for sunflower seed and durum wheat; in contrast, soybeans and rice witnessed a slight decline in average yields.

Graph 2.2 Cumulative changes in area and yields by crops between 1996-2000 and 2008-2012 in the EU



* size of bubble refers to share in area harvest on average in the years 1996-2000 (values are given in percent)

Graph 2.3 Cumulative changes in area and yields by crops between 2008-2012 and 2022 in the EU



* size of bubble refers to share in area harvest on average in the years 2008-2012 (values are given in percent)

In the coming decade, developments in area and yields for all crops covered are seen much closer together than in the past (Graph 2.3). It is assumed that fundamental shifts in favour of specific crops will not occur. Nevertheless, land planted to common wheat, maize and oilseeds is expected to increase while for other crops, a decline is expected. Different cereals follow the general observation of the recent past, but for oilseeds the strong demand growth for vegetable oils and also biodiesel point towards an increase. Regarding future yield developments, an almost stagnation in yield growth concerns common wheat which, based on recent observations, does not show any substantial increase in yields in the main producing countries e.g. France, Germany and the United Kingdom. The yield growth expectations for sunflower seed, maize, rapeseed and sugar beet are more positive and have also seen the most dynamic yield growth in the recent past.

2.2. Cereals

Recent market developments

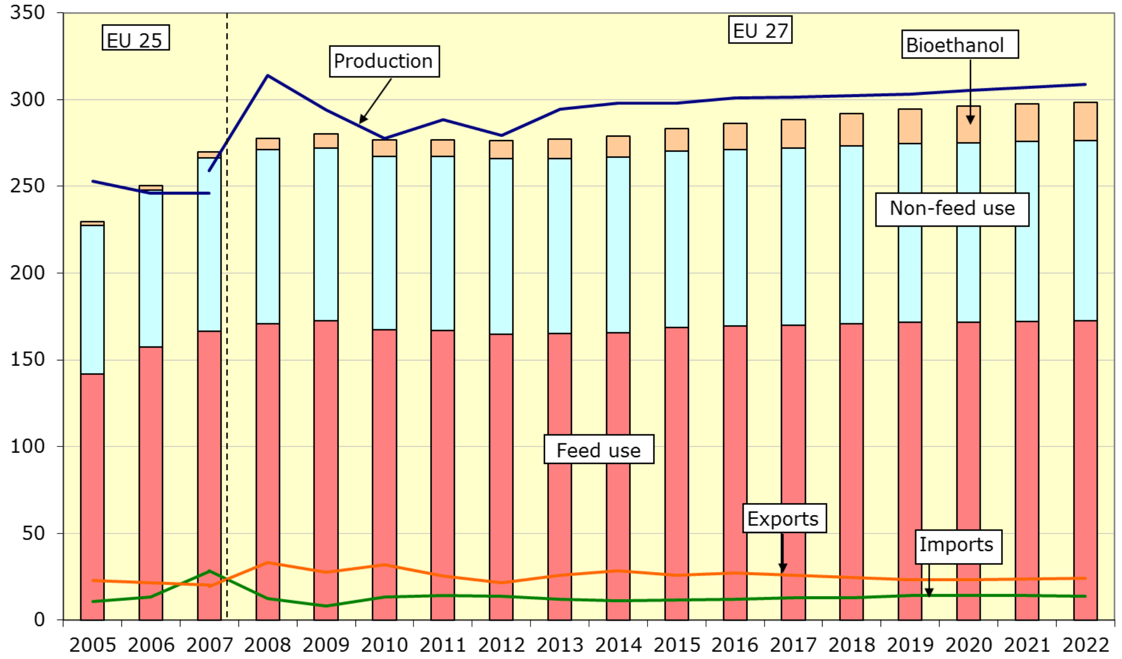
In 2011, the EU cereal harvest reached a usable production of 285.7 million tonnes, due to favourable yields, mainly in maize (+8.9%). During the marketing year 2011/2012, imports increased by 1.0 million tonnes from the previous season and exports declined by 6.1 million tonnes, mainly due to changes in common wheat use. Animal feed use slightly decreased to 167 million tonnes, resulting in an almost unchanged domestic use of 271.3 million tonnes. Consequently, cereal stocks were estimated at the low level of 36.9 million tonnes at the end of June 2012, roughly the same level as the previous marketing year and equal to 13.6% of domestic use.

The 2012 EU cereal harvest is expected to be about 3.0% lower than in 2011 with a usable production of 276.2 million tonnes. The sharpest drop would be for maize, with the usable production declining by 15.5% to 57.5 million tonnes, due to much lower yields caused in particular by the drought in Romania, Hungary and Bulgaria. Also, common wheat usable production is estimated to decline compared to the previous year by 2.4% to 125.6 million tonnes, mainly due to lower yields. On the other hand, barley usable production is expected to increase to 54.4 million tonnes. During the present marketing year, imports are expected to stay below last year's level, as those from the Black Sea area are considerably curbed. The expected decline of EU pork production, combined with expected high feed prices, is seen to reduce feed demand leading to a lower total domestic demand for cereals. Overall, the combination of a slightly lower crop production and stagnant demand is expected to keep the cereal balance tight, with stocks declining leading to a stock-to-use ratio of 12%.

Market outlook

The medium term prospects for the EU cereals markets are characterised by relatively tight market conditions, low stocks and prices which are above the long term averages (Graph 2.4). The EU remains a net exporter of cereals but due to domestic demand growing faster than production this gap narrows.

Graph 2.4 EU cereal market developments (million t)

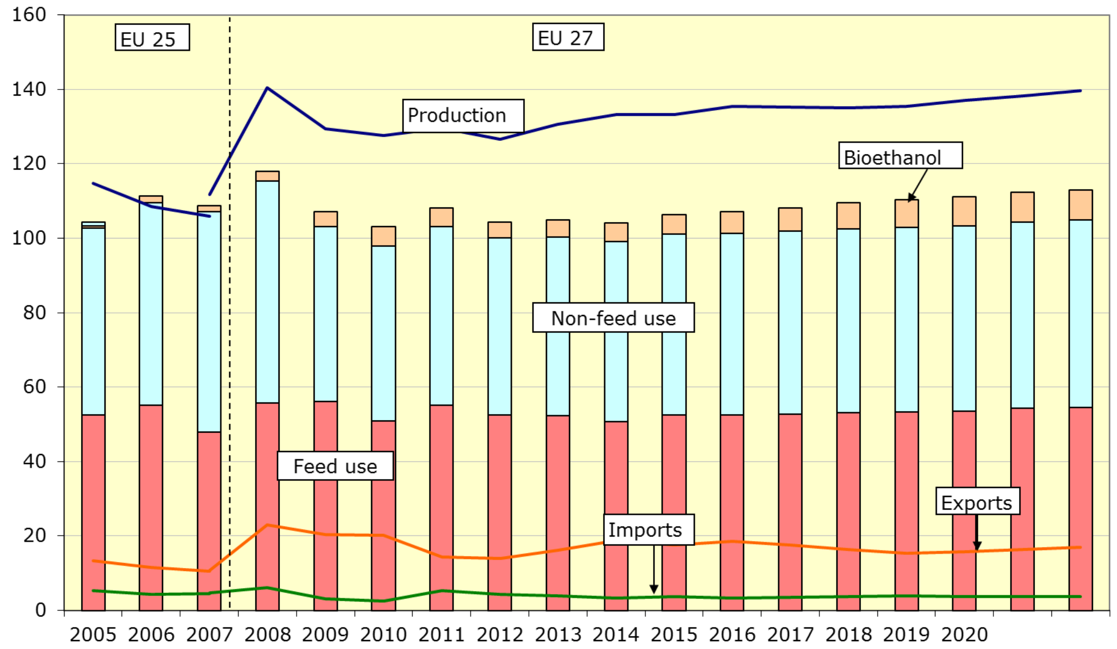


On the demand side, the most dynamic section is the demand for cereals as ethanol feedstock. The demand for food or feed use is stable throughout the baseline horizon. On the production side, a steady growth based on slightly increasing yields is expected. The effect of the yield variations are discussed in more detail in Chapter 9.

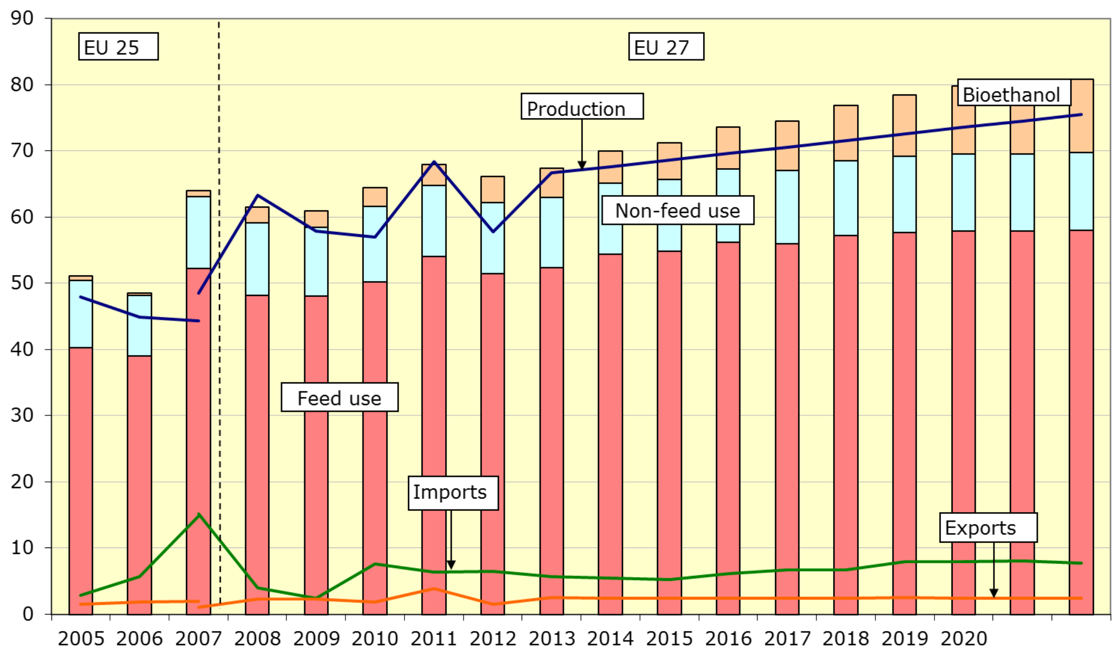
As can be seen from Graph 2.4, in the recent past, including the current marketing year, market balance has been tight due to a production shortfall in the EU. The expectation of generally favourable prices throughout the projection horizon will result in a slower reduction of cereal acreage and might induce a transition to increased productivity. This could lead to an increasing yield growth following years of declining growth rates for yield.

In terms of single cereals, the concentration on common wheat and maize is expected to continue during the coming decade. The smaller cereals and barley continue to lose their share. Regarding the use and the trade pattern, common wheat and maize are the best examples to describe the EU cereals market. In the case of common wheat the EU is a considerable net exporter and will remain so. The use of common wheat includes a strong food component (Graph 2.5).

Graph 2.5 EU common wheat market developments (million t)



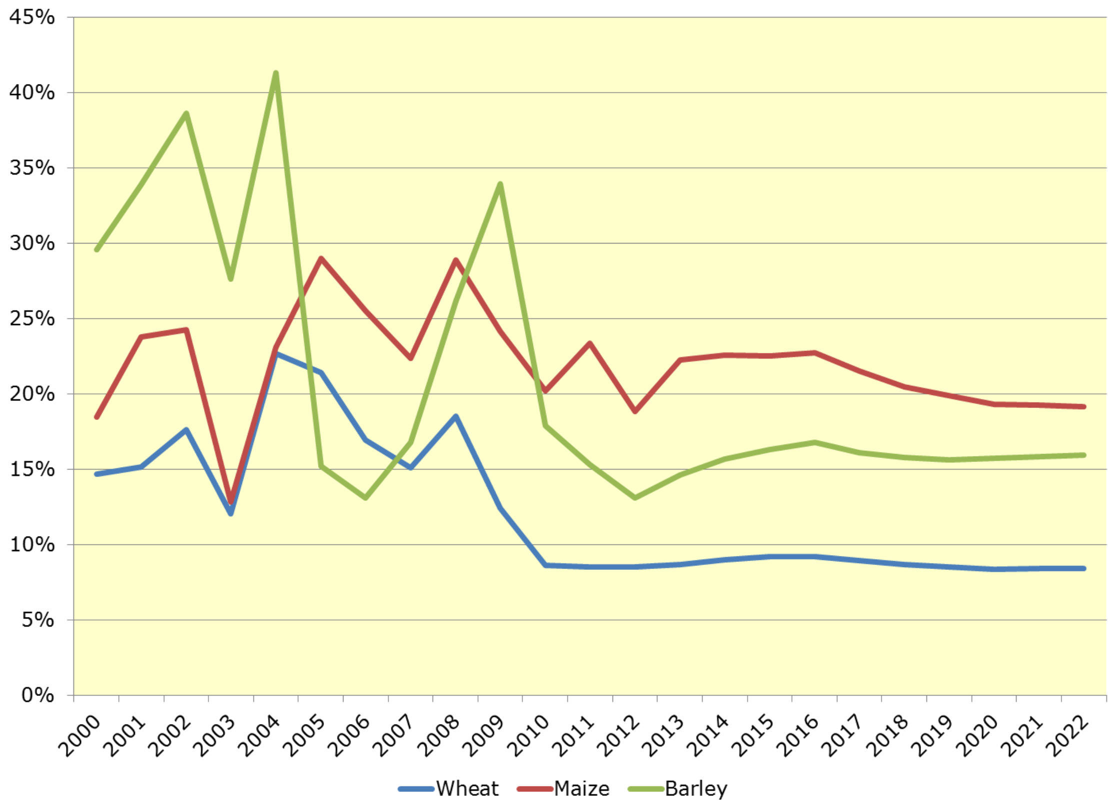
Graph 2.6 EU maize market developments (million t)



The maize outlook is clearly dominated by prospects for feed demand. This currently accounts for 80% of EU maize usage. Due to the expected increase in the use of maize as an ethanol feedstock, it is expected that this share will decline in the coming decade to about 72% by 2022. Although maize production in the EU is increasing fastest than all cereals, there is still a shortfall in terms of overall demand, and the EU is expected to remain a net importer throughout the baseline period (Graph 2.6).

Overall, the markets for cereals are expected to remain tight. A recovery from the current very tight season is expected, but the stock-to-domestic usage ratios for the major cereals in the EU will remain below the average values of the last decade (Graph 2.7). This implies that prices are likely to react more strongly to a shortfall in production in the EU or major supplying regions in the world, e.g. South America or the Black Sea region. The stock-to-domestic usage ratio of maize is considerably higher than those of the other cereals due to the fact that the reference point is the end of June and the main EU harvest starts only in September.

Graph 2.7 EU stock-to-domestic use ratios for major cereals



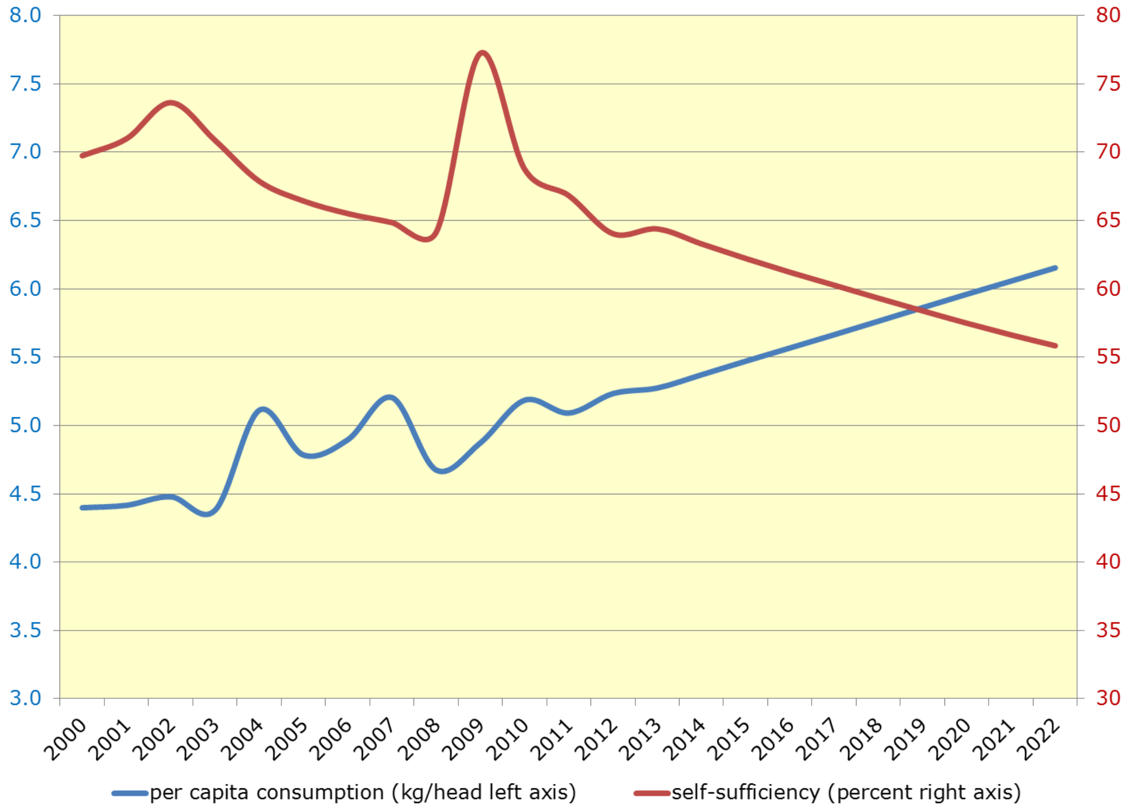
In summary, the cereal outlook points to high prices, albeit lower than present levels, and the EU is expected to be able to maintain its position as a net exporter of cereals. But markets are expected to remain tight, and thus price rallies could occur in the event of production shortfalls.

2.3. Rice

Rice is an important cereal at world level, especially in the Asian diet. Rice is not one of the major arable crops in the EU but due to rising consumption and its importance for the rest of the world it has been included in the medium term prospects as of this year.

The EU has some rice production of its own, concentrated in Italy (about 50%) and Spain (about 30%). Due to the very specific production method in the form of paddy fields, a considerable change in the production area is not expected. Thus the most important factor for change lies in the development of yields. Since progress in the last decade was slow, the expectation is also of a low yield increase in the coming decade. In conclusion, EU rice production is expected to remain fairly flat over the next decade.

Graph 2.8 Rice per capita consumption and self-sufficiency



Graph 2.8 illustrates the link between increasing rice consumption and decreasing self-sufficiency in the past ten years and over the future decade. The EU will continue to produce less rice than it needs, and thus continue to import, especially since the rice market consists of a wide range of different varieties (Indica, Japonica, Basmati etc.) for specific uses.

2.4. Oilseed complex

Recent market developments

The 2011 EU oilseed harvest increased to 29.2 million tonnes (+1.7%) due to a sharp increase in sunflower seed production. Soybean imports, at 11.5 million tonnes during the July 2011-June 2012 period, were noticeably below the 13.1 million tonnes of the previous year. Unchanged production of oilseed meals (soybean, rapeseed and sunflower meal), combined with increasing imports of sunflower meal, increased meal use by 1% to 49.5 million tonnes in 2011/12, thus compensating the lower feed grain usage.

In 2012, the EU oilseeds harvest is expected to be lower for all crops covered. The expected oilseed production is estimated at 18.6 million tonnes for rapeseed (down from 19.1 million tonnes) and at 7.0 million tonnes for sunflower seed (down from 8.8 million). In the case of rapeseed, considerable winterkill occurred in the major production regions. Sunflower seed was affected even more than maize by the drought in Romania, Hungary and Bulgaria, reducing the EU yield by 19.8%.

Market outlook

Oilseeds are an important crop in the EU, mainly rapeseed and sunflower seed, with soybeans, the most important oilseed worldwide, having a very low share in EU production. In the aggregate used by the OECD and FAO in AGLINK-COSIMO, groundnuts and cottonseed are added. They are produced in the EU, but on such a low scale that in the following they are not discussed further.

More than 90% of the oilseeds in the EU are crushed into their two main components: protein meal and vegetable oil. Protein meal is an important ingredient in the compound feed ratios used by the EU livestock industry. Vegetable oils, adding also the tropical oils: palm oil, palm kernel oil and coconut oil, are used for human food consumption, industrial uses and especially in the EU for the production of biodiesel. The direct use of oilseeds is of minor importance and will not be further elaborated here.

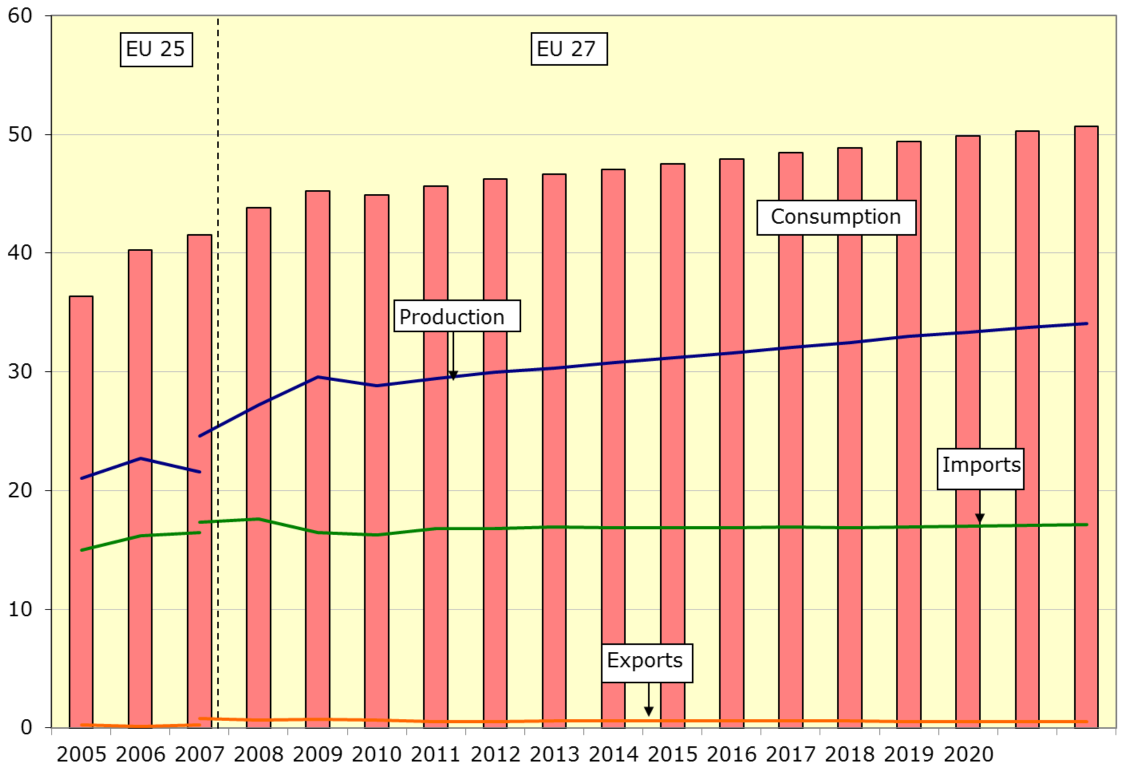
Oilseeds experienced a boom in EU production during the last decade, to a large extent fuelled by the rising production level of biodiesel. The main beneficiary has been rapeseed, the source of the most suitable vegetable oil for the production of biodiesel. It is expected that in the next decade the oilseed area will slightly expand but at a much slower pace. Although these increases are considerable, the EU remains a strong net importer of oilseeds, protein meals and vegetable oils. These net imports consist mainly of soybeans, their respective meal, and palm oil.

Oilseeds

Oilseed production in the EU increased considerably during the last decade and a further expansion is expected to occur during the coming decade. Nevertheless, the EU remains a considerable net importer of oilseeds, predominately soybeans (Graph 2.9).

The share of rapeseed in the production is about two-thirds, and the share of soybeans in imports is slightly higher, about 73%. These shares show only a slight shift during recent years and the outlook period. Due to the increasing production and constant expectations for imports, the share of rapeseed in the overall use of oilseeds increases and reaches about 53% by the end of the outlook period. By then the share of soybeans would be, at 28%, slightly below the current level.

Graph 2.9 EU oilseed market development (million t)

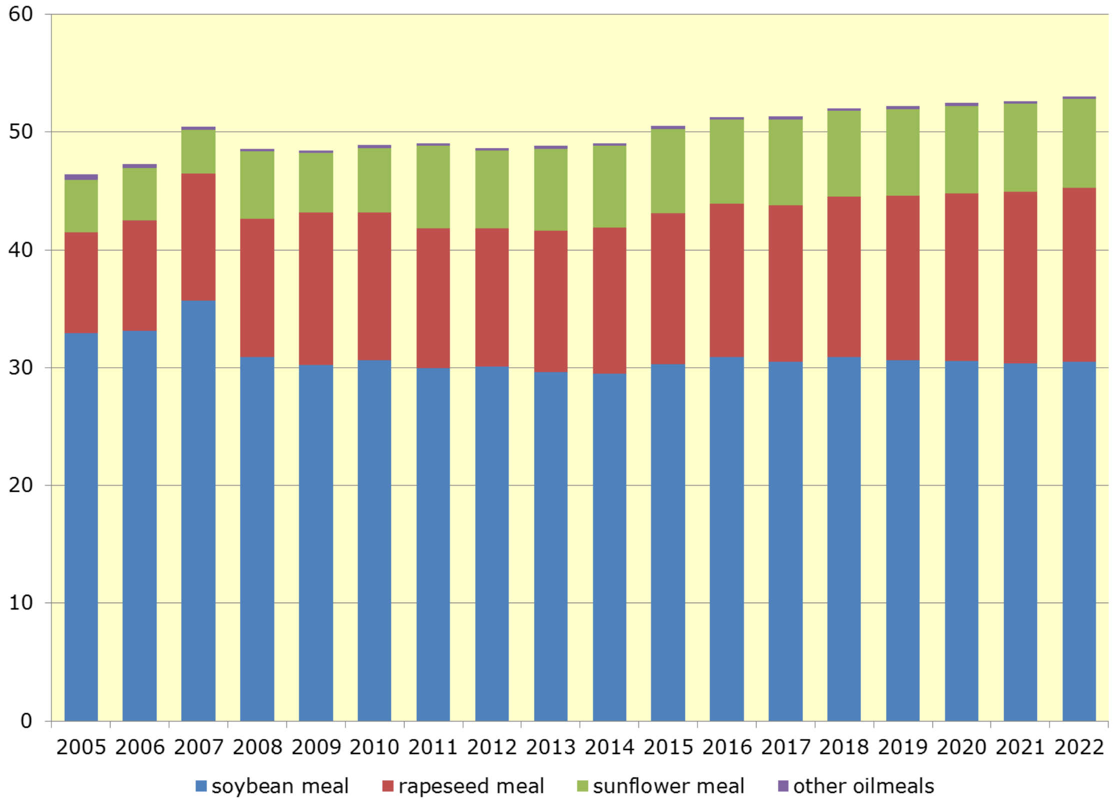


The use of oilseeds is dominated by the crushing into protein meal and vegetable oil, which accounts for about 92% of the EU use of oilseeds. The remainder is used as direct feed or food, e.g. sunflower seed, groundnuts. Therefore, the demand side is assessed via the EU protein meal and vegetable oil markets.

Protein meal

The EU is the second largest user of protein meal in the world, in the form of a feed ingredient in animal feed production. Only recently has China surpassed the EU. The favoured protein meal, soybean meal, is only available in very limited quantities from domestic crops. Therefore, the EU is a major importer of soybean meal and also soybeans for the domestic crushing into oil and meal. The prospects for the coming decade indicate that the overall feed demand will increase, with the demand for soybean meal remaining constant and rapeseed meal gaining market share (Graph 2.10).

Graph 2.10 Protein meal feed use in the EU (million t)



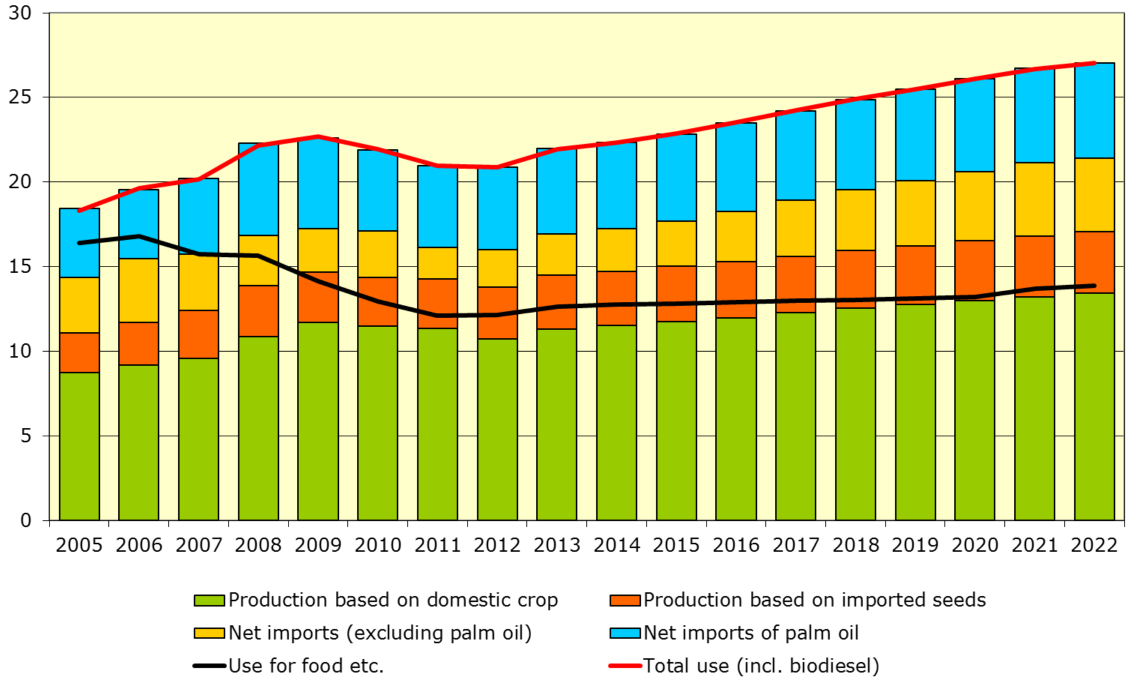
Vegetable oil

The vegetable oils included cover the most important vegetable oils produced and used in the EU. The most important one not included is olive oil, for which a separate medium term outlook for the main EU producing countries has been published in 2012[1]. The EU demand for vegetable oil has increased substantially in recent years mainly fuelled by the rising demand for feedstock for the production of biodiesel (Graph 2.11).

On the other hand, the demand for human consumption has fallen in the recent past, and is expected to stay relatively constant during the next decade. On the production side, , domestically produced oilseeds crushed for oil cover a larger share of overall demand. It is expected that during the coming decade the food demand could be covered by domestically produced vegetable oils.

[1]Agricultural Markets Briefs N° 2 'Prospects for the Olive Oil Sector in Spain, Italy and Greece 2012-2020' http://ec.europa.eu/agriculture/analysis/markets/market-briefs/02_en.pdf

Graph 2.11 EU vegetable oil origin and use (million t)



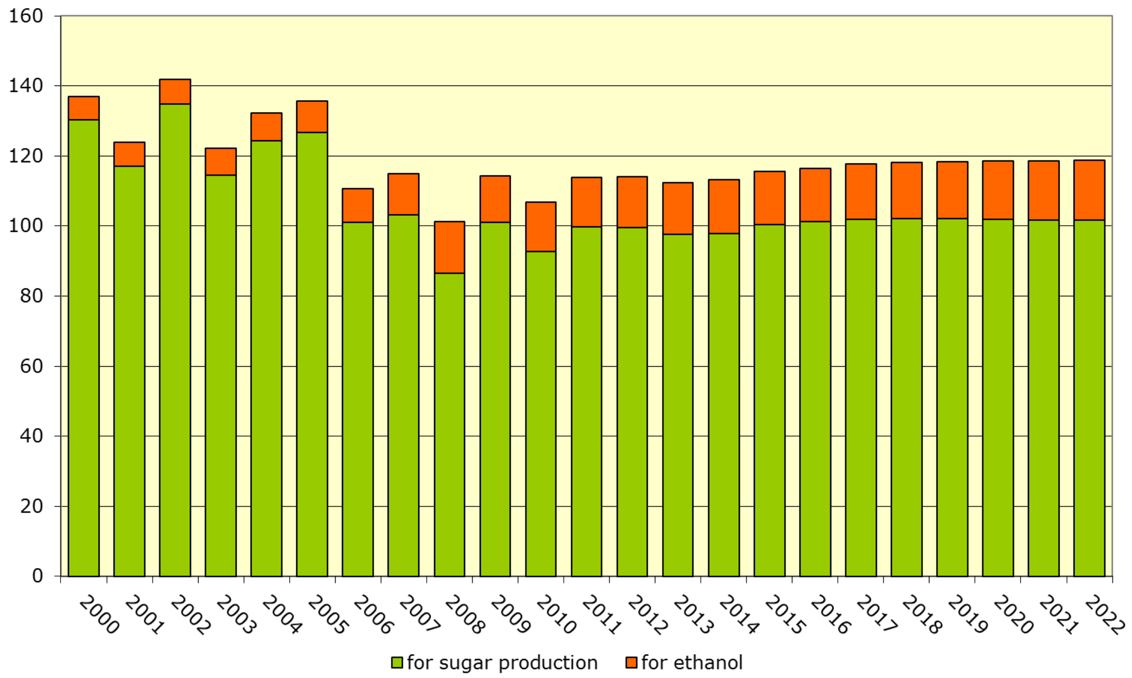
Despite improvement in domestic supply, the EU remains nevertheless highly dependent on the imports of vegetable oils either in the form of oilseeds crushed in the EU or in the form of direct imports of vegetable oils, mainly palm oil. The imports of other vegetable oils are expected to consist more and more of rapeseed oil which will be used as a biodiesel feedstock.

2.5. Sugar beet and sugar

Very high sugar beet yields and also the high sugar content have resulted in a large out-of-quota production of about 5 million tonnes of white sugar equivalent in 2011 (compared to a quota level is 13.3 million tonnes). The 2012 harvest is expected to be considerably lower although, it should exceed the EU sugar quota.

Projected developments in world prices and growing demand for ethanol, as well as the impact of the assumed end of the quota scheme, result in a projected sugar beet production expansion in the coming decade (Graph 2.12). With sugar beet as an important feedstock for ethanol production in the EU, the overall increase in demand for ethanol would lead to increased utilisation of sugar beet for ethanol. On the other hand sugar processing is expected to remain largely unchanged from its current level.

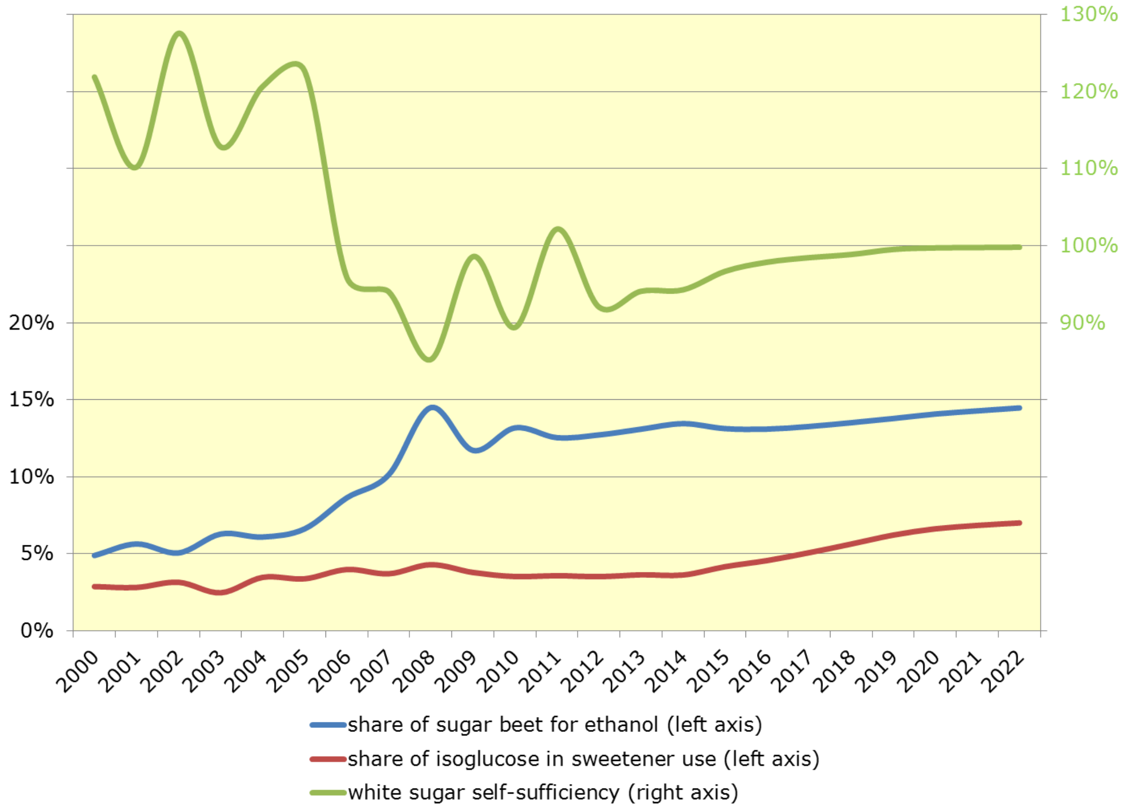
Graph 2.12   EU-27 sugar beet production by use (million t)



The market balance for sugar looks fairly steady over the projection period as can be seen also in the statistical annex. Since the EU sugar reform in 2006, the EU has turned from a net exporter into a net importer of sugar. This implies that the EU self-sufficiency in white sugar has declined from around 120% to between 90% and 100% (Graph 2.13). In the projection period it is expected that, the EU will move even closer to self-sufficiency and indeed from time to time be a net exporter, especially after the expiry of the sugar quota.

Competition on the domestic market will also arise from isoglucose which will benefit from the expiry of quota too. Although its share in overall sweetener consumption is expected to increase (Graph 2.13) it will remain far below the share of 40% observed in the US. The development of isoglucose will curb the potential to expand domestic sugar use in the EU. The expiry of the sugar quota will lead to a reduction of the domestic sugar price in the EU, and make imports less attractive. Therefore, it is expected that sugar imports will decline from current levels.

Graph 2.13 Indicators of the EU sugar market (%)

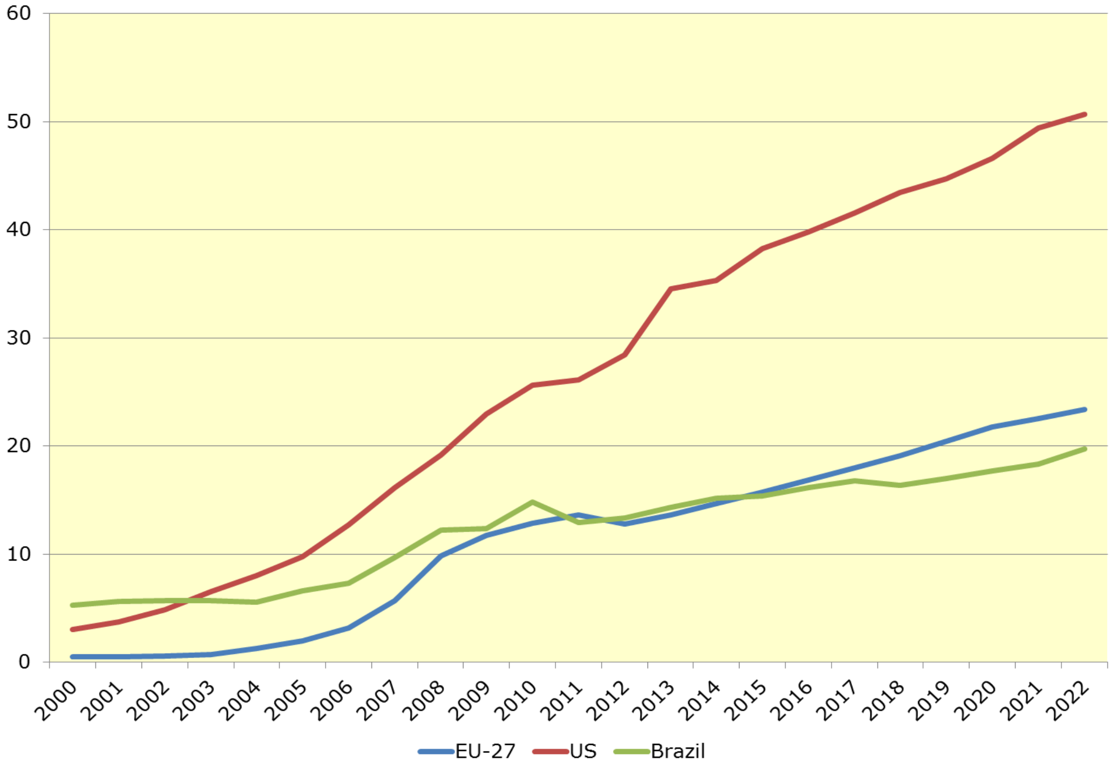


As Graph 2.13 shows, the increase in ethanol produced from sugar beet occurred mainly during the restriction of the EU sugar industry following the EU sugar reform in 2006. It is expected that the share continues to increase, albeit at a very slow pace.

2.6. Biofuels

Cereals, sugar and oilseeds markets are increasingly affected by the development of biofuel markets. The three major biofuel producers and consumers in the world are the United States, Brazil and the EU. The former two are mainly based on ethanol whereas the EU has a more mixed approach with a higher biodiesel share. Brazil was the first country where biofuels achieved a considerable market importance. The US developed rapidly in the last decade to become the leading consumer and producer. The EU has reached the same absolute consumption level as Brazil in recent years (Graph 2.14).

Graph 2.14 Biofuel consumption by main consumers (million t.o.e.[2])



Biofuel markets are still strongly dependent on policies for their development. In the EU, the Renewable Energy Directive (RED) entered into force in 2009, setting out an overall binding target to source 20% of EU energy needs from renewables such as biomass, hydro, wind and solar power by 2020. As part of the overall target, each Member State has to achieve at least 10% of their transport fuel consumption from renewable sources (including biofuels).

These policies are further elaborated in the Fuel Quality Directive. Together, the two directives set out sustainability criteria for biofuel production and procedures for verifying that these criteria are met. These criteria are currently under review and a European Commission Proposal (COM(2012)595) has been published on 17 October 2012, entering the legislative procedure.

The present baseline has to be seen against this background and does not anticipate any changes which might have considerable effects on the EU biofuel markets.

For the purpose of the baseline and the focus on agricultural markets the biofuel baseline is very simplified and only separates two biofuel types, ethanol and biodiesel. The land use implications of biomass-based processes to produce biofuels are not considered in this baseline as they are rather small due to the infant stage of the production process. The specific assumptions for biofuels are:

1. The consumption estimates for diesel and petrol type fuels originate from the recent baseline developed at the JRC-IPTS with the POLES model in collaboration with the European Commission’s Directorate-General for Energy;

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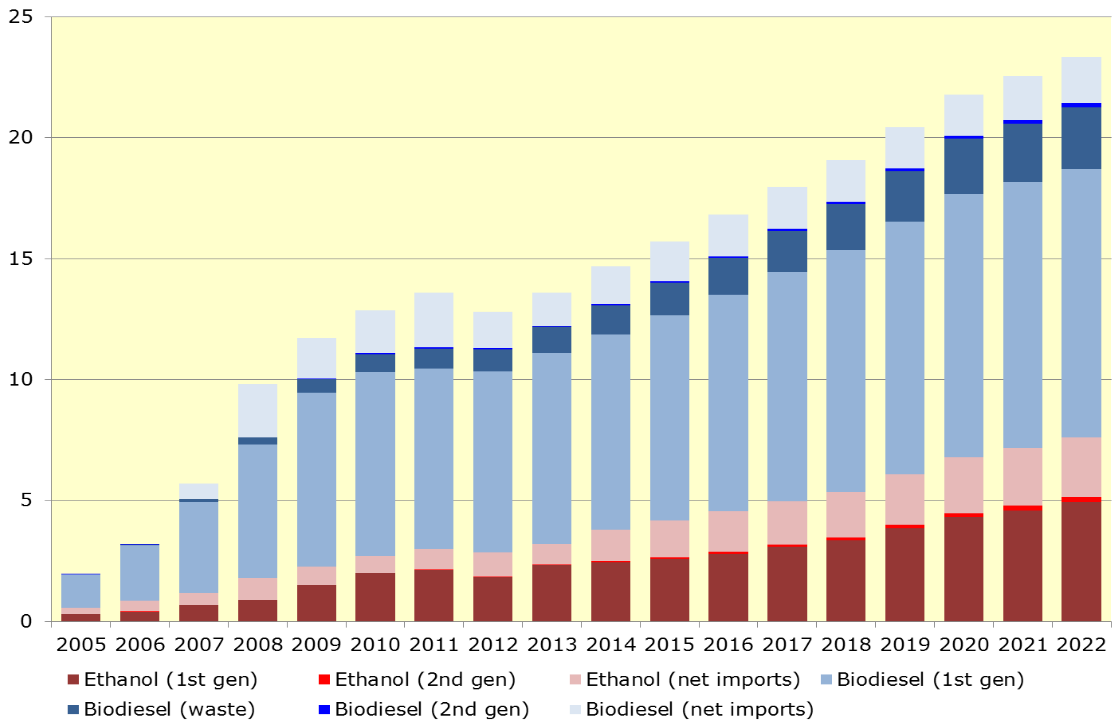
[2] t.o.e.= 'tonnes oil equivalent' is used to focus on the energy content rather than the quantity.

2. In line with the above baseline, it is assumed that by 2020, biofuels will account for about 8.5% of the total EU transport energy consumed, with the 10% target to be reached after that date due to the initial delays in implementation;
3. Due to low investments and the time lag required for the development of second-generation biofuels (excluding biodiesel based on waste oils), these are assumed to remain in their infant stage throughout the baseline period and only reach 0.13% of all transport energy consumed.

The specific assumption that the 10% target will not be reached has been fuelled by the low progress made in the expansion of biofuel use in recent years and business information suggesting a limited expansion potential for ethanol and second-generation capacity. Yet demand for feedstock would further increase and remain the most dynamic part of the EU demand for agricultural products.

Most of the EU biofuel demand is expected to be satisfied by domestically produced biofuels from agricultural feedstock (first-generation biofuels) (Graph 2.15). Ethanol is expected to develop more dynamically but biodiesel would still dominate in absolute terms. The only other important domestic source would be biodiesel based on waste oils which benefit, in the same way as second-generation biofuels, from double-counting in achieving the RED target for transport fuels.

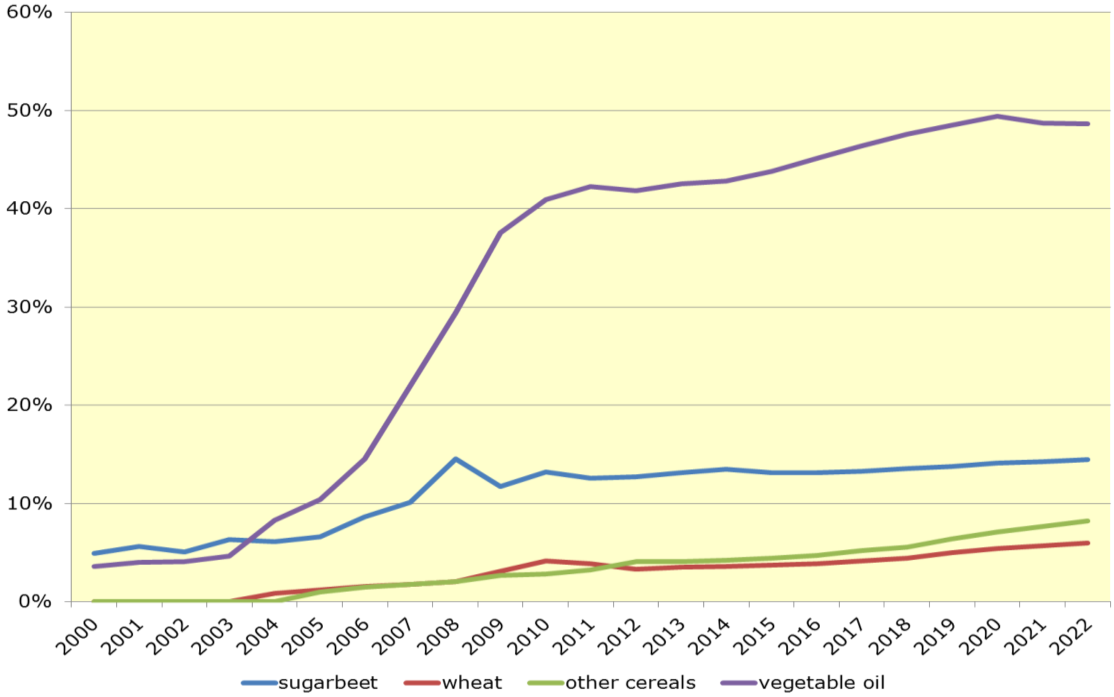
Graph 2.15 EU biofuel consumption by source (million t.o.e)



Second-generation processes are starting to produce quantities at an industrial stage, but investment activities remain rather low. In addition to all domestic sources partly based on imported feedstock a considerable share of the EU biofuel demand is satisfied by imported biofuels either as such or in blends

The implication for the EU feedstock market is the main reason for this baseline to include biofuels. The main feedstock for the production of biodiesel is vegetable oil and here the preferred feedstock is rapeseed oil. In the EU vegetable oil market, biodiesel production accounts for more than 40% of demand. Thus, any change in biodiesel production considerably impacts the price formation in this market.

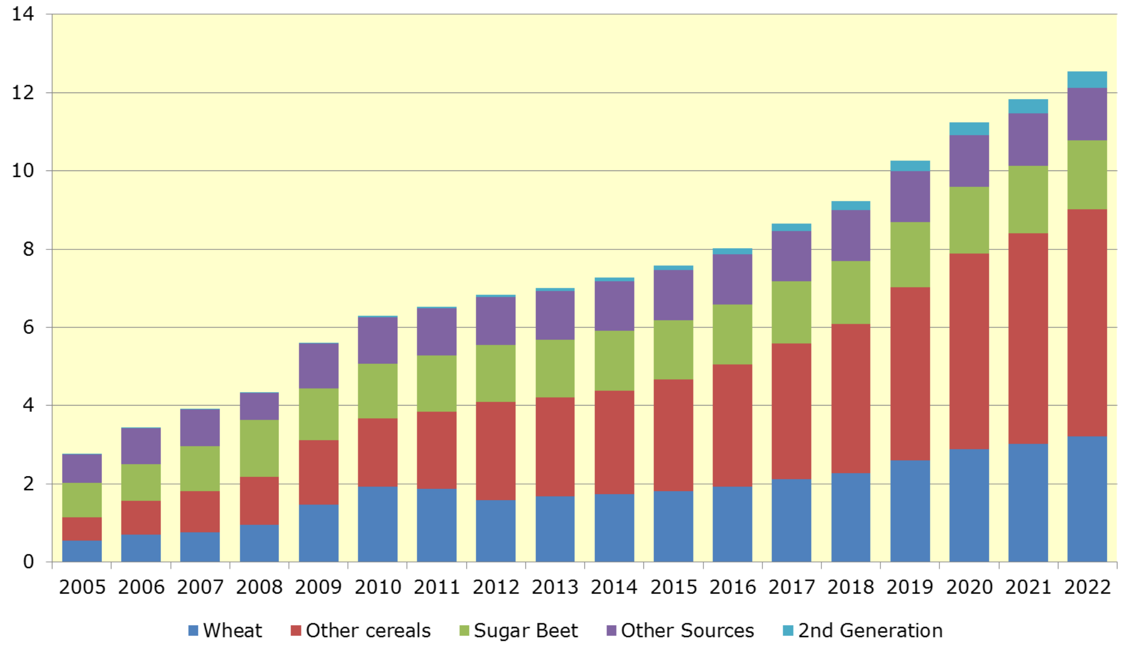
Graph 2.16 Share of biofuel feedstock demand in overall EU demand



For ethanol, multiple feedstocks are used and the main crop-based feedstocks are sugar beet and cereals (Graph 2.17). In the case of sugar beet, ethanol can be produced from most intermediate products between the harvested beet and the final white sugar but for reasons of simplicity the feedstock is referred to as sugar beet in this medium term prospects. The share of sugar beet destined for the production of ethanol has increased in the last decade to more than 10% but currently no considerable further increase is expected.

The production of ethanol based on cereals, the main technological process in the US, has increased significantly in the last decade and is expected to continue to rise. Nevertheless, it is expected that the share in the overall demand for EU cereals will clearly remain below 10%. Consequently the changes in ethanol production will have fewer effects on the respective feedstock markets.

Graph 2.17 EU ethanol production by feedstock (billion litres)



3. Meat products

The assumptions retained for the EU and world market environment imply that medium term prospects for the EU meat commodity markets would be characterised by higher input costs, and consequently into firm meat prices. The latter would in turn slow the demand for all meats on aggregate. Against this background, poultry meat would show the most favourable outlook for all meats in terms of production, consumption and net trade.

The decline in the production of beef and sheep meat would continue partly as a result of the long-lasting trend in destocking herds. Pig meat production would remain stable while total consumption would slightly increase and net trade deteriorates. Poultry meat consumption would grow the most, although pig meat remains the preferred meat in the EU. As regards trade, the EU is expected to maintain its position as a net importer of pig and poultry meat and a net exporter of beef and sheep meat.

3.1. Recent market developments

The EU meat sector in 2011 was supported by a relatively strong world demand driven by the favourable global economic situation. Animal disease incidents in the Far-East (Korea) and high feed costs - despite the reasonably good harvest in the EU, US, Canada and Russia – constrained the global meat supply.

As a consequence, world prices remained at elevated levels throughout the year, favouring a good EU export performance (+17% against 2010). However, the further contraction in the EU animal herd in 2011 led to tight supply conditions as from 2012, with limited meat availabilities and record price profile for the main meats though to a lesser extend in the sheep sector.

3.2. General meat market prospects

EU share in world meat exports declining

The impact of the drought in various world regions, and notably in the US in the first half of 2012, put additional pressure on the global meat supply through higher feed costs. In addition, the EU market is likely to be affected by the on-going economic downturn and historically high levels of unemployment, which tend to push EU demand towards cheaper meat options. The new animal welfare requirements in the pig sector are also expected to play an important role in the near future.

As a consequence, total EU meat production, after having increased during both 2010 and 2011, will contract by -0.6% in 2012 and -1.4% in 2013. After this reduction, total meat production is projected to steadily recover over the ten year horizon and to reach 44.7 million tonnes in 2022, approximately the same level recorded in 2011. Increased competition on the global meat market would see the EU share in world meat exports declining from 13.7% to 10.1%.

Steady demand to drive world market perspectives

At global level, total meat demand is projected to recover from the setback induced by the economic crisis and exports, after recovery of supply in main exporters, are expected to grow at a rate of 1.8% per year over the medium term (on aggregate by 22%), with all species recording positive trends (on aggregate, beef meat +28%, sheep +27%, poultry +25% and pig meat +10% above the 2011 level). World meat consumption continues to grow at one of the highest rates among the major agricultural commodities (around 1.7% p.a. slightly below the 2% for the vegetable oil)[3]. The growth will stem mostly from large economies from Asia, Latin America and the Middle East; and developing countries will also increase their demand for meats as their income gets stronger. In contrast, the developed countries, confronted with declining population and lower income growth, would reduce their meat demand.

Macroeconomic environment has mixed impact on meat market prospects

The underlying macroeconomic assumptions suggest a weakening of the EU's export potential as the Euro is assumed to strengthen against the US dollar over the outlook period (from 2015 onwards) reverting the trend recorded in the short run. On the other hand, the assumed economic recovery and continued population growth imply improved prospects for total meat consumption in the EU and worldwide. One of the most important factors determining meat production prospects is the gradual increase in the crude oil price through its impact on input costs (energy, fertilizer and feed costs in particular).

Domestic policy setting will play a role in the meat markets

In the pig sector, the new animal welfare provisions on group housing of pregnant sows[4], which will become obligatory from 2013, are likely to play a significant role in production next year. Beef production would be indirectly affected by the phasing out and abolition of the milk quota system, through its impact on milk production and thus on the size of the dairy cow herd.

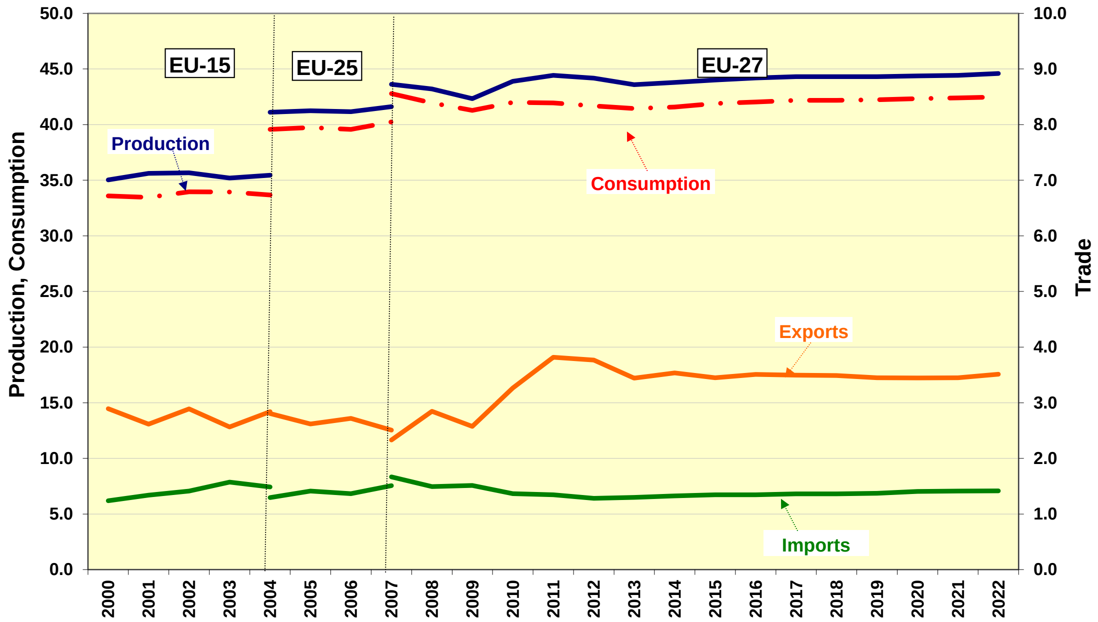
Total meat production relatively stable, but the EU net trade position deteriorates

Meat production in 2022 is projected to stand at 44.7 million tonnes, approximately the same level as recorded in 2011. This unchanged level, however, hides a continued decline in sheep meat production (-16%), a 4% reduction in beef production and a pronounced increase in poultry meat production (+4%). Pig meat production remains roughly unchanged, at around 23 million tonnes over the projection horizon.

[3] OECD FAO Agricultural Outlook 2012-2021

[4] Council Directive 2008/120/EC laying down minimum standards for the protection of pigs.

Graph 3.1 EU aggregate meat market developments (million t)

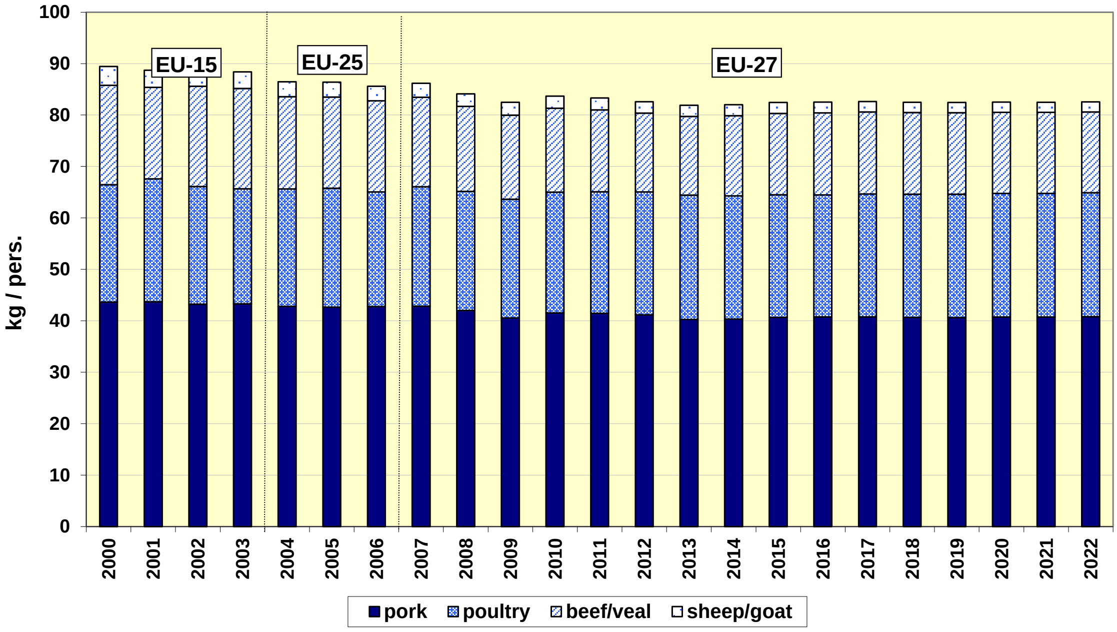


After a short term improvement driven by the weaker EUR, the net trade position of the EU is projected to deteriorate over the outlook period, driven by a decrease in meat exports (especially of pig meat) on higher imports over the medium term. Aggregate meat imports are expected to grow by 5% and meat exports to decline by 8% against 2011 levels.

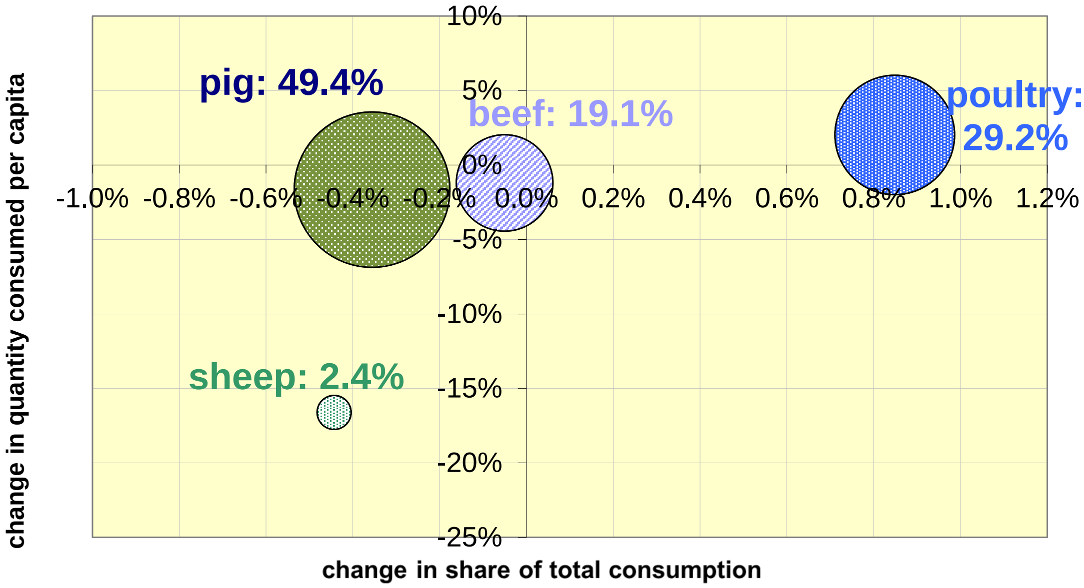
Meat production is mainly driven by increasing poultry and pork meat consumption, as well as by a firm external demand and higher prices. On a per capita basis, EU meat consumption in 2022, at 82.6 kg, would be at approximately the same level as it was in 2009 and 1% lower than in 2011, despite the improved macroeconomic context. Although the average per capita consumption would be higher in the EU-15 than in the EU-N12 (85 kg/capita versus 73kg/capita), the trend 2011-2022 would be more favourable in the new Member States (+1.4% against -1.6% in the old Member States).

By 2022, poultry would be the only meat to record positive developments (Graph 3.3) both in share and quantity consumed. Beef meat would maintain its share in total consumption at the 2011 level, but overall consumption would decline. Pig meat is expected to remain the most consumed meat in the EU with 40.8 kg/capita, which represents roughly half of total meat consumption; nevertheless the graph illustrates a declining trend both in terms of share and consumption. Sheep meat continues the declining trend in both per capita consumption and share.

Graph 3.2 EU total meat consumption developments (kg/capita)



Graph 3.3 EU meat consumption in 2022 compared to 2011



*The size of the bubble represents the share on total meat consumption in 2022

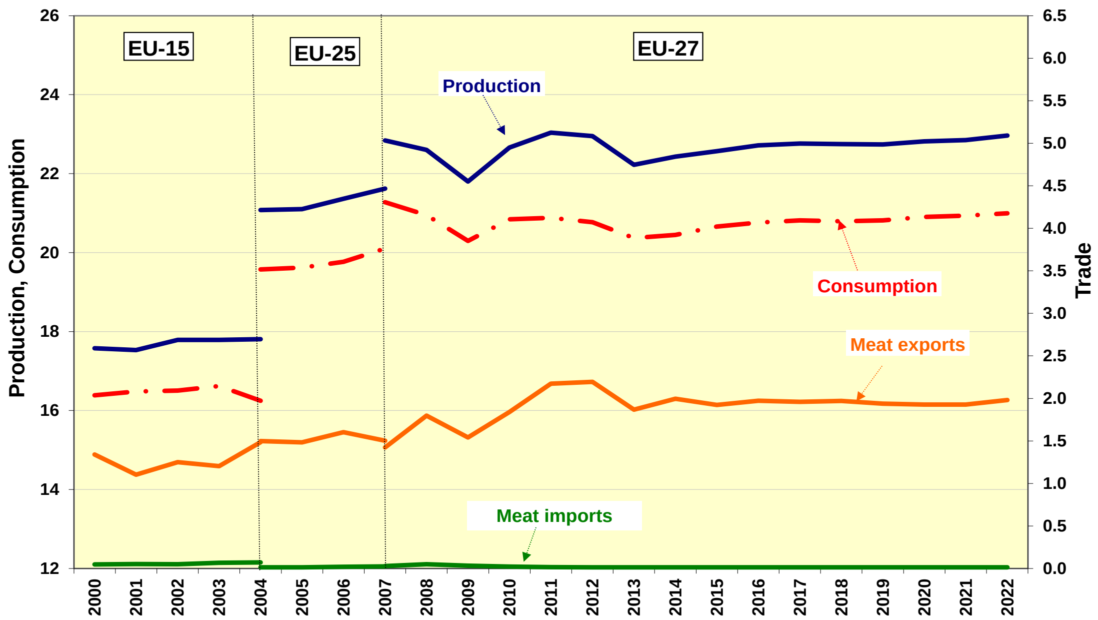
3.2.1. Pig meat – the most consumed meat in EU

The contraction in the pig herd in 2011 compared to 2010 (-1.7%), and more markedly in breeding sows (-3.2%), generates a marginal decline in EU pig meat production in 2012 (-0.4%). In 2013, the decrease is expected to be even larger (-3.2%), as it will cumulate with the impact of mandatory welfare standards coming into force as of January 2013 and of higher feed costs incurred due to the US drought.

After its fall in 2012 and 2013, pig meat production is projected to resume its growth from the second half of 2014, as production is expected to respond to high prices, with farmers progressively adjusting to the new welfare requirements. By 2022 pig meat production would roughly settle at the level of 2011, i.e. approximately 23 million tonnes.

Increased feed prices as a result of the drought in the US during the first half of 2012 were compensated by high pig meat prices which led to stable producers' margins. After reaching the historical high of 1 900 EUR/t in September 2012 (31% more than the 2007-2011 average), prices fell slightly in October (-0.5% against the previous month). Piglet prices have so far followed the seasonal trend and are situated around 470 EUR/t.

Graph 3.4 EU pig meat market developments (million t)



As regards trade, January-August 2012 data confirm stronger EU exports, 5% higher than the same period last year, mainly due to the weak Euro and the strong global demand, particularly from China, Russia, Ukraine and Japan. Overall, 2012 is projected to end with an estimated 1% increase in exports compared to the already very high level registered in 2011.

Lower availabilities in 2013 would trigger a projected decline of 15% in EU exports, followed by a rebound in 2014, when production is expected to recover; this trend would be of short duration as exports would then start decreasing again (-9% on aggregate over 2011-2022).

Overall EU pig meat consumption is expected to increase by 4.3% (+3% and +10% in the EU-15 and EU-N12 respectively). Although EU per capita consumption would decrease by 1.6% between 2011 and 2022, pig meat would continue to represent half of EU total meat consumption. It is worth observing that, at world level, poultry meat would represent the most consumed meat overtaking pig meat (on average 14.5 kg/capita versus 12.7 kg/capita).

The EU is more than self-sufficient in pig meat, producing about 110% of its domestic consumption and this trend is expected to continue throughout the outlook period. However, increased competition from other producing countries (for example China) would see the EU production share in global production slowly decline.

3.2.2. Positive prospects for poultry meat

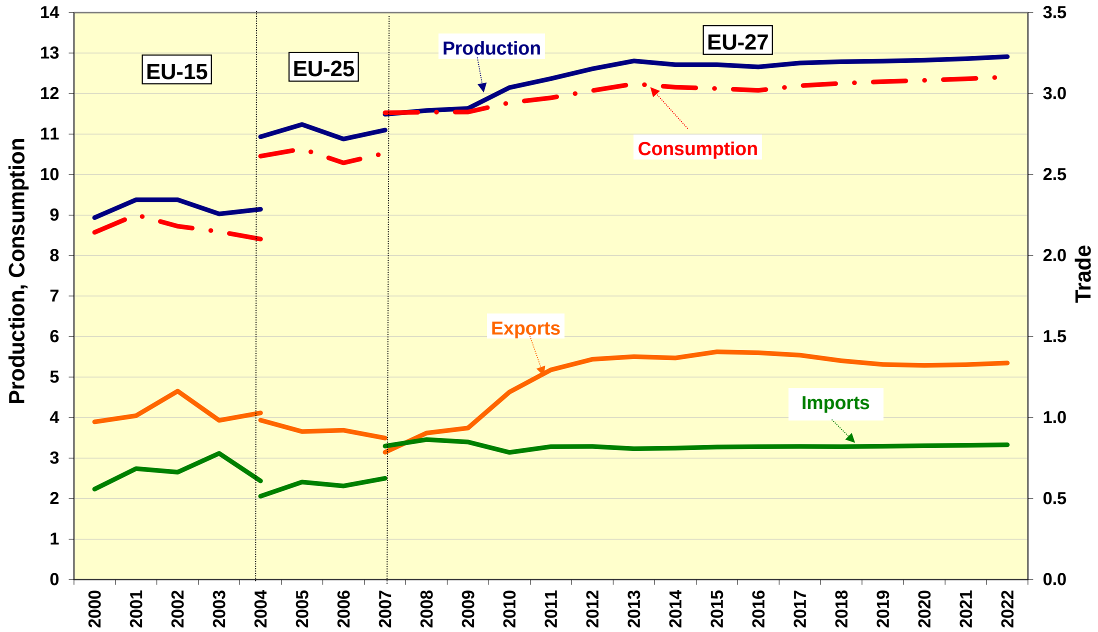
Higher EU demand for poultry in 2011 and its relative price competitiveness *vis-à-vis* other meat types triggered a 1.8% increase in production compared to 2010. This growth is expected to continue in 2012, thus partially compensating the declining availability of other meats. Over the outlook period, poultry meat would be the only meat with increased levels of production (+4.4% on aggregate compared to 2011), driven by higher global and domestic demand. The increasing production also reflects the capacity of poultry to adjust more rapidly to market shocks, both on the demand and the supply side.

EU broiler prices have been at very high levels during 2012, peaking in September (2 040 EUR/t), when they were 16% above the 2007-2011 average.

Overall, poultry meat imports recorded a 3% decrease in the period between January and August 2012 compared to the same period last year, with lower imports from Brazil (-6%), the EU's main supplier, due to high prices and limited supply. On the other hand, imports from Thailand increased by 4%. In July 2012, Thailand regained access to the EU market with frozen salted poultry meat (TRQ of 92 000 tonnes) and, according to trade sources, is still building up capacity to fulfil the quota, although a higher uptake is expected in 2013. In contrast, for the same period, exports registered an increase of around 2%, due to higher demand from African countries (exports to South Africa showing a 74% increase), while exports to Russia and Asia decreased (-6% and -31% respectively).

Over the medium term, EU exports are expected to remain strong (+3.2% in 2022 against 2011), due to growing world demand, especially in Asia, Africa and the Middle East. EU exports would be mainly concentrated on the lower-quality segment, i.e. the parts which do not find an outlet on the domestic market. Overall, imports of poultry meat into the EU would follow the same trend, but at a slower pace, increasing by 1.3%, thus settling at 831 000 tonnes by 2022. World consumption for poultry meat is projected to keep growing over the medium term (+25%), a trend from which EU exports can benefit.

Graph 3.5 EU poultry meat market developments (million t)



EU poultry meat consumption is expected to increase by 4.3% on average and reach 24.1 kg/capita by 2022, mainly driven by the increasing volumes consumed in the EU-N12.

3.2.3. Beef meat net imports would expand further as production shrinks

The EU beef market is strongly influenced by evolutions in the dairy sector, given that around two thirds of all cows held in the EU are dairy cows (the share in the EU-N12 is remarkably higher, at around 90%). Data available up to August indicate that 2012 EU beef production is expected to decline by around 5%, due to the long-lasting reduction trend in the cattle herd amplified during the last two years by the good export performance which led to lower slaughtering.

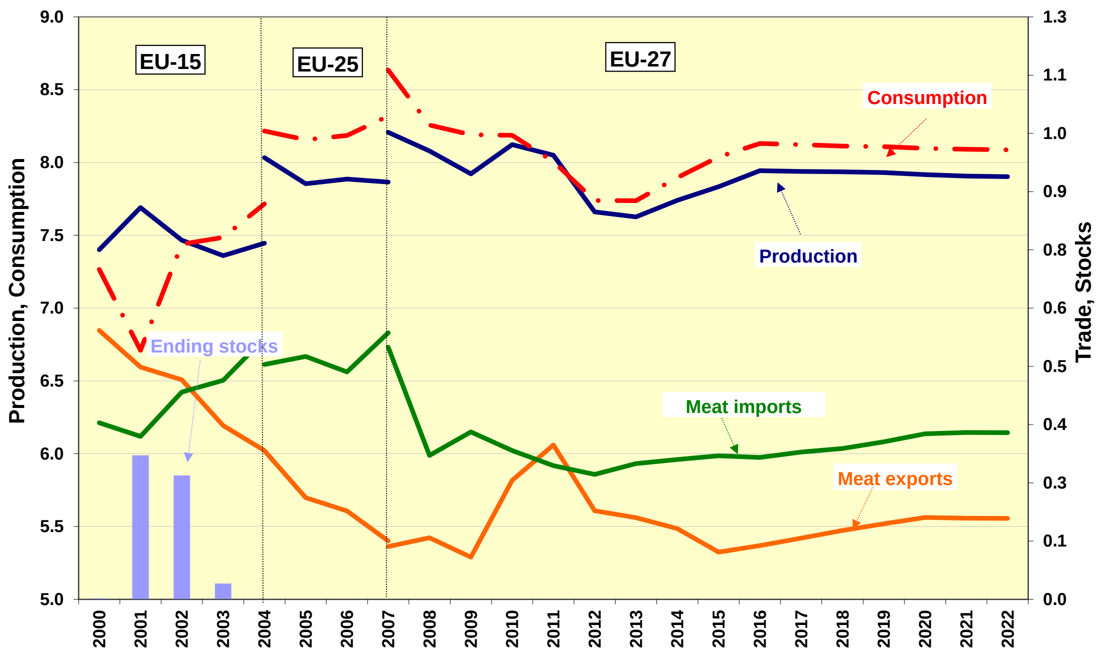
A further contraction is expected to take place in 2013, though at a slower rate. After the fall in 2012-2013, beef production is expected to recover gradually at a pace of 0.3% per year on average, notably as an indirect result of the phasing out of milk quotas, expiring in 2015, which would allow the rebuilding of the herd. Overall, beef meat net production is depicted to decline by 3% between 2011 and 2022, thus staying below 8 million tonnes by the end of the outlook period, approximately the same level as in 2009.

EU beef (adult male bovine) prices remained at exceptionally high levels throughout 2012, recording 3 900 EUR/t in October (21% higher than the 2007-2011 average), thus softening the effect of higher feed costs and reducing the pressure on producer margins.

As regards foreign trade, the first eight months of 2012 confirm the declining trend of EU beef imports (-5.1% against the same period last year). In particular, the number of shipments from Argentina and Uruguay has been declining year after year driven by lower production, strong demand from emerging countries and the relatively weak Euro. Despite the decline in 2012, EU beef meat imports are expected to grow in the projection period to reach 357 000 tonnes by 2022, while exports, after reaching their lowest point in 2015, would then partially recover to 174 000 tonnes by 2022.

After the exceptional trade performance observed in 2011, it is likely that the EU trade position for beef would deteriorate over the medium term, mainly due to lower production and partly driven by the declining competitiveness from a strengthening Euro. EU beef meat imports would grow by 25% between 2011 and 2022, while exports would decline. As such, the EU will maintain its position as a net importer of beef meat.

Graph 3.6 EU beef meat market developments (million t)



Beef and veal meat consumption is projected to improve slightly over the medium term (+1%) to go beyond 8 million tonnes in 2022. Per capita consumption is projected to reach at 15.7 kg in 2022, 1.2% lower than in 2011.

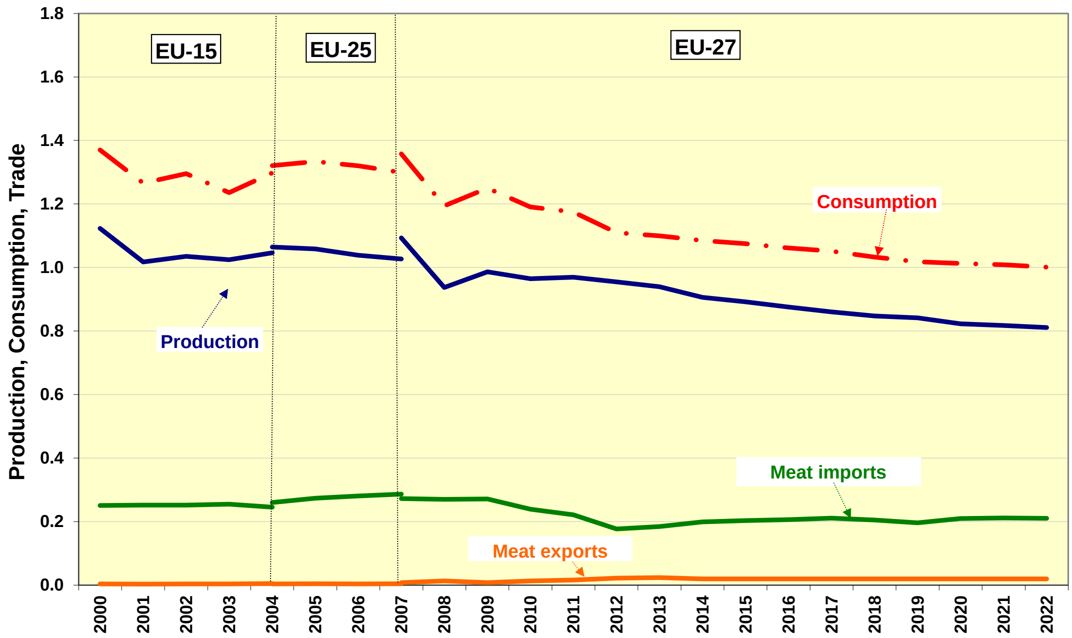
3.2.4. Sheep and goat meat production declines further

EU sheep and goat production is projected to continue its decrease, at a pace of 1.6% per year on average, due to a reduction in the flock size, and by 2022 would fall to 831 000 tonnes.

World market prices are at a relatively high level due to the overall limited supply. The EU price for heavy lamb increased up to May 2012 and slowed down afterwards, but from mid-June it did not follow the usual seasonal pattern, but instead increased, due to the shortage in production. In October, it stood at 4 740 EUR/t, which represents an 11% increase compared to the 2007-2011 average. The light lamb price was situated at 6 280 EUR/t, 4% above the average level.

Regarding trade with third countries, January-August 2012 data signal a considerable drop in sheep meat imports compared to the same period in 2011 (-20%). This is driven by a reduced supply from New Zealand as a consequence of decreased production, export expansion to Asia and strengthening of the NZ Dollar against a weaker Euro, on top of sluggish EU demand. Over the projection period, sheep meat imports would decline by 5% compared to 2011, to situate at 210 000 tonnes in 2022.

Graph 3.7 EU sheep and goat meat market developments (million t)



The domestic demand for sheep and goat meat is expected to shrink further, with consumption projected to decrease by 15% by 2022 and per capita consumption to fall below 2 kg.

4. Milk and Dairy Products

The most important driver for long term market prospects remains the expectation of continued demand growth in emerging economies, facilitated by economic growth, increasing population and preference for dairy products.

4.1. Recent market developments

After two consecutive years of favourable price developments, dairy commodity markets witnessed decreasing prices over the first five months of 2012 due to greater supplies, both at EU and world level. During the second part of 2012 this trend started to revert and prices to recover. Strong market turbulence characterised previous years: unprecedented high prices in 2007 and a sharp drop in 2008 and early 2009 that led to the milk crisis in the EU and worldwide when, due to low output prices and high costs, farmers saw their margins shrink and turn negative. Price variations on the commodity markets were reflected in the farm gate price paid to milk producers, albeit with a certain delay and only partially, among others, prompting the European Commission to reflect on the functioning of the supply chain through a High Level Expert Group on Milk.

After an estimated increase of 2% in 2011, EU cow's milk deliveries to dairies are expected to further expand by 1.1% in 2012. Total EU milk production would reach 153.1 million tons in 2012, thanks to a continuous increase in milk yields both in the EU-15 group and in the EU-N12 (new Member States) which compensates for the contraction in the herd. The 2012 milk production figure incorporates the impact of the severe drought in the US and in certain EU Member States, which heavily limited coarse grain production and led to a sharp increase in feed prices in summer months.

Various EU regions have been distressed by the drought. The impact has been felt both by farms highly dependent on purchased feed that would be affected because of increased feed costs and by farms with a larger source of own feed which also faced difficulties due to the impact of the drought on the growing of grass for immediate grazing, on future availability of grass silage for the winter months, as well as on home-grown grains. These farms are likely to have to turn to purchased grains and concentrates, increasing the share of feed in their operating costs, especially in a year of high grain prices.

Despite a rather favourable global market situation over 2011 and the first 9 months of 2012 expectations for the short term very much depend on the extent of increased milk production both in the EU and in the main supplying countries (New Zealand, Australia, US, etc.) and the sustainability of strong demand on the world market. Factors contributing to the price recovery of the second part of 2012 have been linked to adverse weather conditions in the US and strong import demand on the world market led by China and other countries in South–East Asia as well as by the Near and Middle East. World import demand expansion is expected to result in increasing prices for cheese, SMP and WMP. As a consequence producers' gross margins may improve, although this is conditional upon a stable relationship between milk prices and commodity prices, and stable cereal prices.

4.2. Market prospects

Excellent export performance, world demand the key driver

Medium term prospects for milk and dairy products appear favourable. The continued expansion of world demand, resulting from global population and economic growth, and increasing preference for dairy products are expected to be the main drivers, fuelling EU exports and sustaining commodity prices. The best export performance is shown by cheese and SMP, whose exports over the outlook period would expand by two thirds and triple respectively (Graph 4.1). Their market share (percentage of EU exports on total world exports) will improve, reaching 32% in both cases. Butter and WMP products' market shares are projected to deteriorate, partly due to greater dynamicity of other exporting countries.

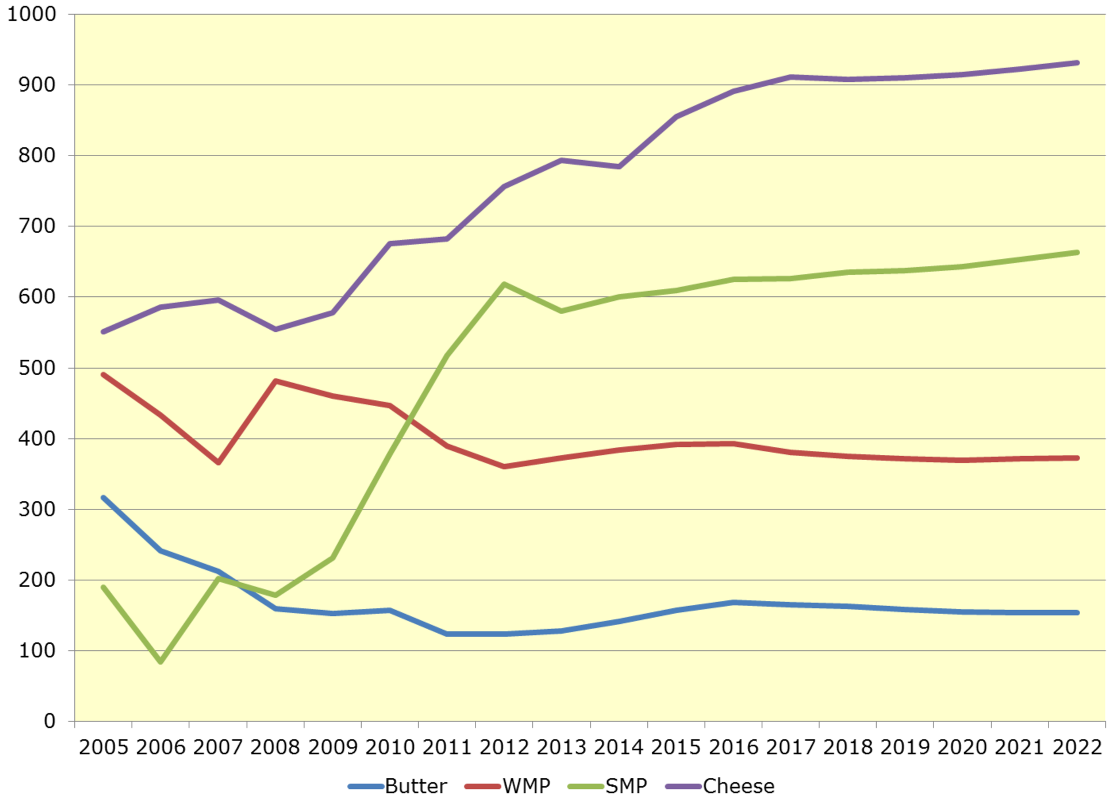
Favourable exchange rates foster exports, macro-economic uncertainties in the short term

This outlook has been built under the assumption of a weak Euro against the US dollar in the near future, although the Euro is assumed to strengthen again, albeit slowly, from 2015 onwards. The assumed exchange rate developments may foster commodity price prospects when expressed in Euro. This suggests potential for improved EU exports, particularly during the early years of the projections. The path of economic recovery in the EU and worldwide constitutes a considerable risk and increases the level of uncertainty regarding the outlook projections. A slowdown in global economic development for 2012 and 2013, not just in the developed world but also in large emerging economies, would negatively impact the demand for EU exports. An expected fragile economic growth in the EU, mainly in certain Member States, would generally translate into modest consumption development for dairy products.

Policy settings create opportunities for milk production

The status quo policy assumptions for the outlook imply an increased potential for milk production through the phasing out and abolition of the milk quota system by 2015. Available market intervention mechanisms following the CAP Health Check, notably intervention buying-in for SMP and butter, as well as the possible use of export refunds do not play a role in the baseline projections, as commodity prices remain above intervention levels throughout the outlook. Intervention stocks have been depleted for butter and the remaining SMP intervention stocks are assumed to be placed on the market over the near term, under the food programme for the most deprived people.

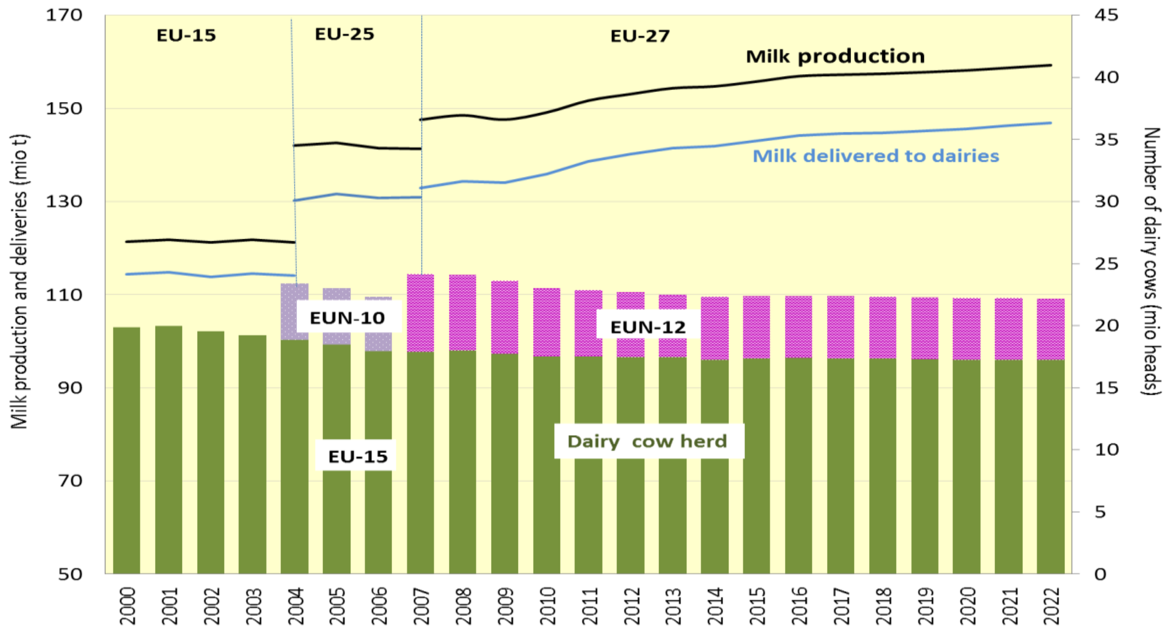
Graph 4.1 EU exports of dairy commodities ('000 tons)



Cow's milk production would continue growing

Milk production is projected to continue increasing from 2012 onwards, at a moderate growth rate (Graph 4.2). Aggregate EU production would remain below the potential growth rate provided by the gradual elimination of the quota regime. EU milk production is projected to reach 159.3 million tonnes in 2022, accounting for a cumulative increase of 5% since 2011. This increase comes as a result of a higher growth rate for milk delivered to dairies (+5.9% from 2011) and a continuous decline of production for on-farm use (-4.9% from 2011). Milk deliveries would reach almost 147 million tonnes in 2022, while production for on-farm consumption would decline to 12 million tonnes. The latter is mainly driven by a gradual contraction of subsistence production in the EU-N12.

Graph 4.2 EU cow's milk supply and dairy herd developments (million t)



The increase in milk production stems from a continued increase in the average yield per dairy cow, that would reach almost 7 200 kg by 2022 (a cumulative growth of 5% from 2011), while the EU dairy herd is projected to contract by 3% to the level of 22.2 million animals in 2022. Developments would be more pronounced in the EU-N12, where the number of dairy cows is projected to decline by 8% (compared to -1.4% in the EU-15) as a result of continuous restructuring. By contrast, the average yield per cow is projected to grow by 8% in the EU-N12, compared to a 7% increase in the EU-15. Despite the higher growth rate, average EU-N12 cow productivity at 6 000 kg will remain below the EU-15 level of 7 600 kg.

Milk deliveries and quota abolition

The utilisation of available milk quotas for deliveries at the aggregate EU level has declined over the recent quota years, from a 1.6% underutilisation in 2007/2008 to a 4.7% underutilisation in 2011/2012 due to the aforementioned developments in milk deliveries and the increase in available delivery quotas.

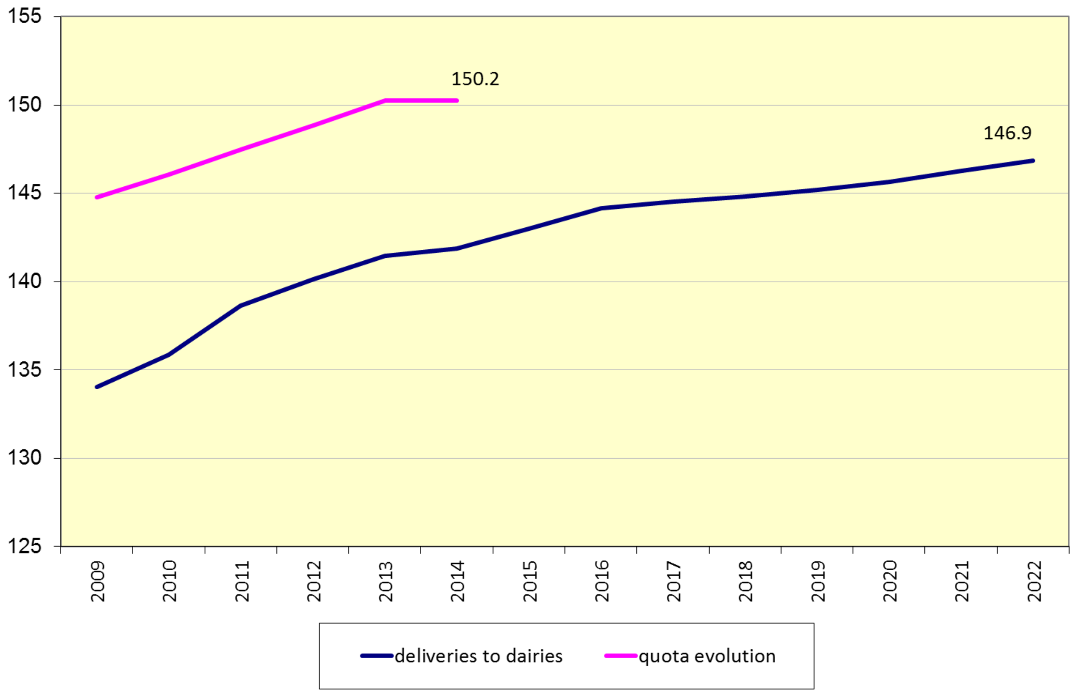
These percentages correspond to a 2.2 million tonne underutilisation in 2007/2008 and about 7 million tonnes in 2011/2012. At Member State level there are significant differences, ranging from a quota overshoot in Austria, Ireland, Germany, Cyprus, Luxembourg and the Netherlands in 2011/12 to underutilisation in Romania (-43%) and Bulgaria (-53%).

Current projections imply that EU milk deliveries would not be able to keep up with the annual increase in quotas over the phasing out period, leading to a steady decline in quota utilisation at aggregate EU level.

By 2014, the last year before abolition, EU milk deliveries are estimated to be at 8.3 million tonnes (or 6%) below the quota level. The underutilisation would reach 4% in the EU-15 and 15% in the EU-N12.

As can be seen in Graph 4.3, quota abolition is projected to have a limited impact on milk deliveries at the aggregate EU level, with deliveries at the end of the projection period remaining well below the (expired) quota level.

Graph 4.3 Milk deliveries and quota evolution for cow's milk (million t)



Demand for value added commodities fuels production and exports

Consumption of higher value-added dairy commodities (fresh dairy products and cheese) is expected to grow in the EU over the outlook period, at a relatively faster rate in the near future. International demand would remain robust, sustained by increasing imports from main deficit countries led by China, South-East Asia and the Middle East (Map 4.1). Economic growth and an increasing population in these countries would encourage consumption of dairy products and boost prices.

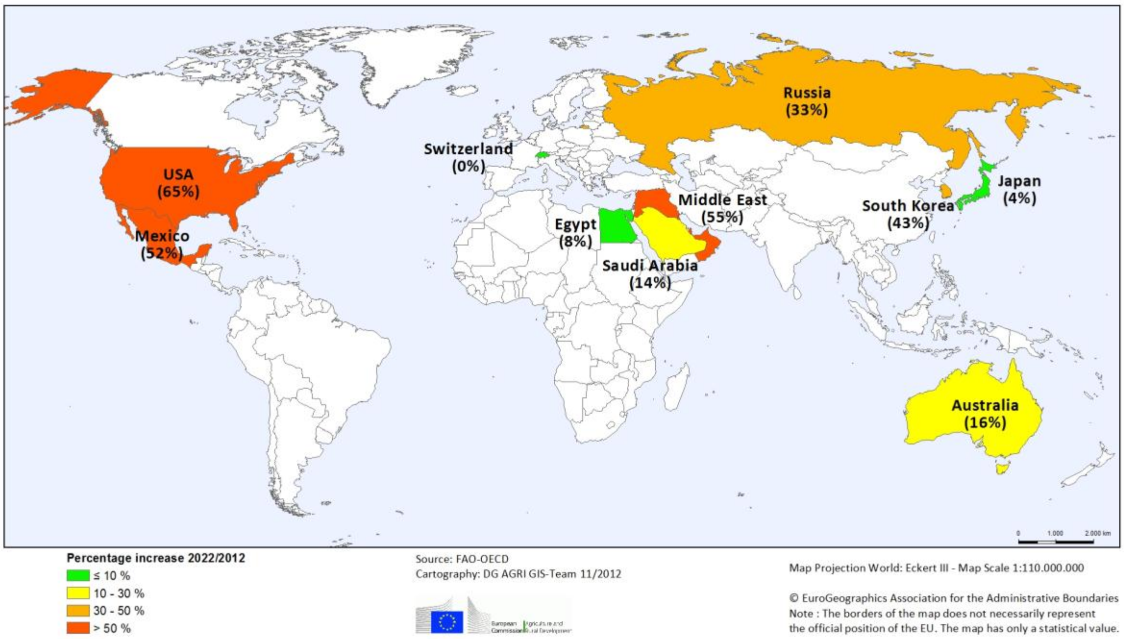
Cheese consumption in the EU is expected to return to the positive trend observed prior to 2007, although at a lower rate. EU cheese consumption per capita is projected to reach 17 kg in 2022, exceeding the 2011 level by more than 4%. This positive domestic consumption projection derives from the existing room for per capita consumption growth in the EU-N12.

Cheese output is seen to grow by almost 7% on aggregate from 2011 to 2022, reaching 9.6 million tonnes by the end of the outlook (Graph 4.4).

Demand prospects are positive for both the domestic and world markets, in particular strong import demand from the world market would allow for an increase in EU exports of more than two thirds, reaching 956 000 tonnes in 2022. The positive outlook for exports is based on sustained demand from the EU main cheese importers (Russia, Middle East countries, the US, etc.). Given the high dynamicity of the world markets the EU will see its world market share declining slightly to around 32% of global exports in 2022.

Consumer preference towards fresh dairy products, in particular drinking milk, cream and yogurt, would sustain an expansion in production up to 49.6 million tonnes in 2022 (+8% compared to 2009 and +6.3% compared to 2011).

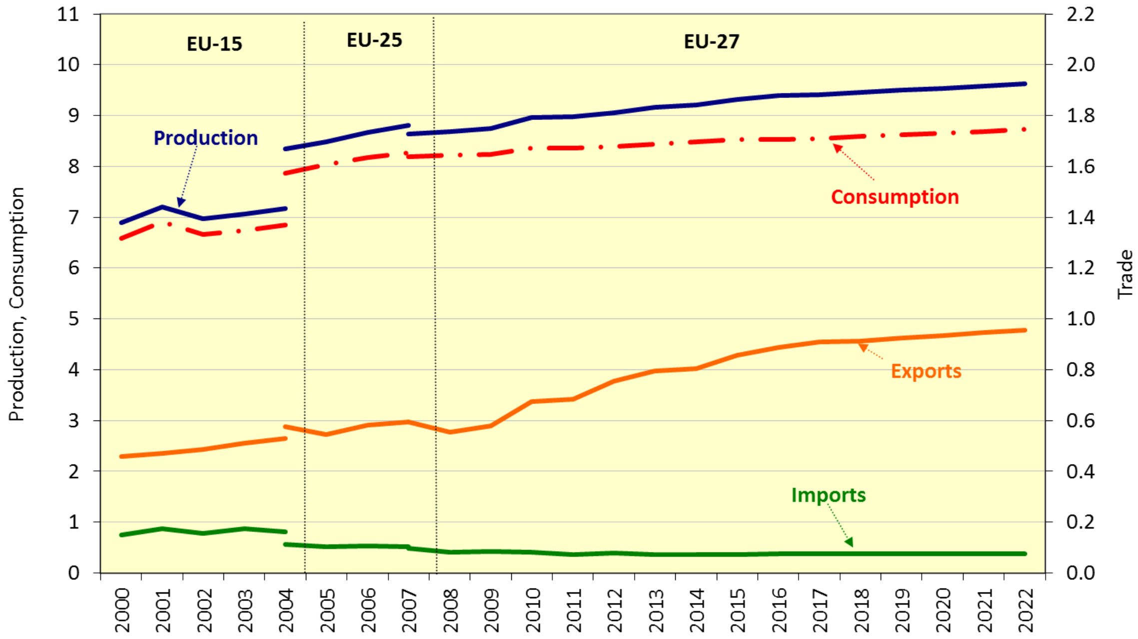
Map 4.1 First 10 importing countries of cheese, % increase 2022/2012



WMP production stable overall

Production fluctuations for whole milk powder (WMP) in past years underline the important role that export potential played for this commodity. WMP markets are envisaged to be in balance with limited export potential. WMP production is expected to stay relatively stable over the projection period, after a partial recovery during the early years, and to reach 700 000 tonnes in 2022 (-2.5% with respect to 2011). EU consumption would stabilise at around 330 000 tonnes during the last years of the outlook. Although WMP world demand led by China and other Asian countries would expand significantly over the projection period, EU exports are projected to stay at 372 000 tonnes in 2022. The EU market share of global exports would decline gradually to 14% by 2022 (from 17% in 2011) as a consequence of lower competitiveness against supplies from Oceania.

Graph 4.4 Cheese market developments (million t)



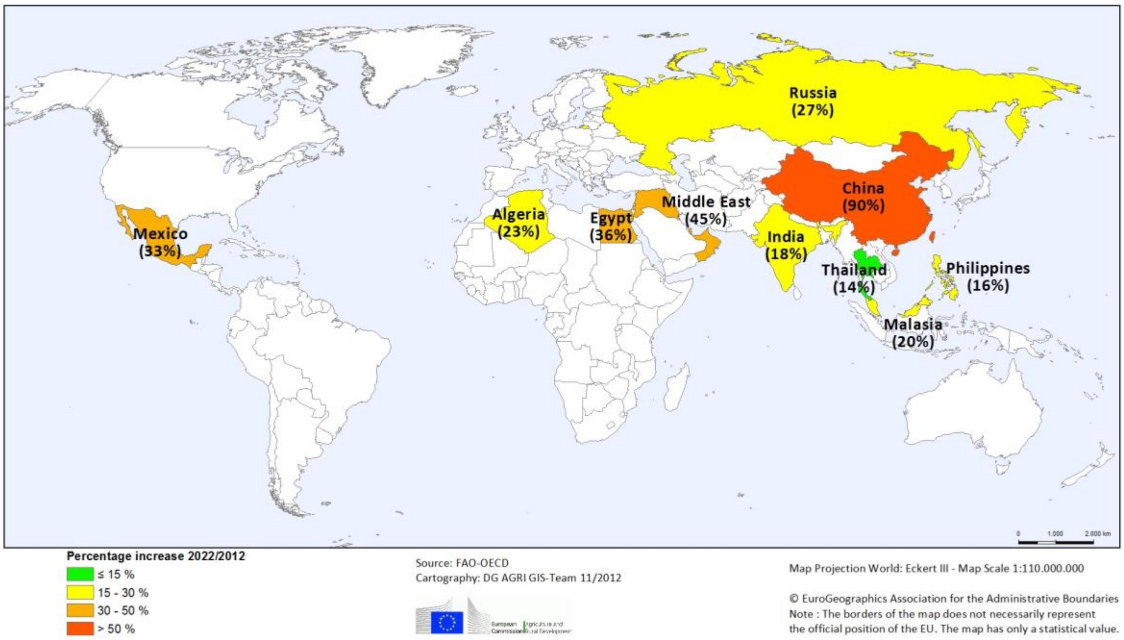
SMP exports booming

The SMP market situation in 2011 and 2012 has been favourable due to robust import demand on the world market. China is gradually becoming an important player in world SMP imports; while exports to North African countries have also substantially increased. SMP intervention stocks built up in 2009 are expected to be completely exhausted by the end of 2012 through a combination of sales by open tender and assumed release under the most deprived persons scheme.

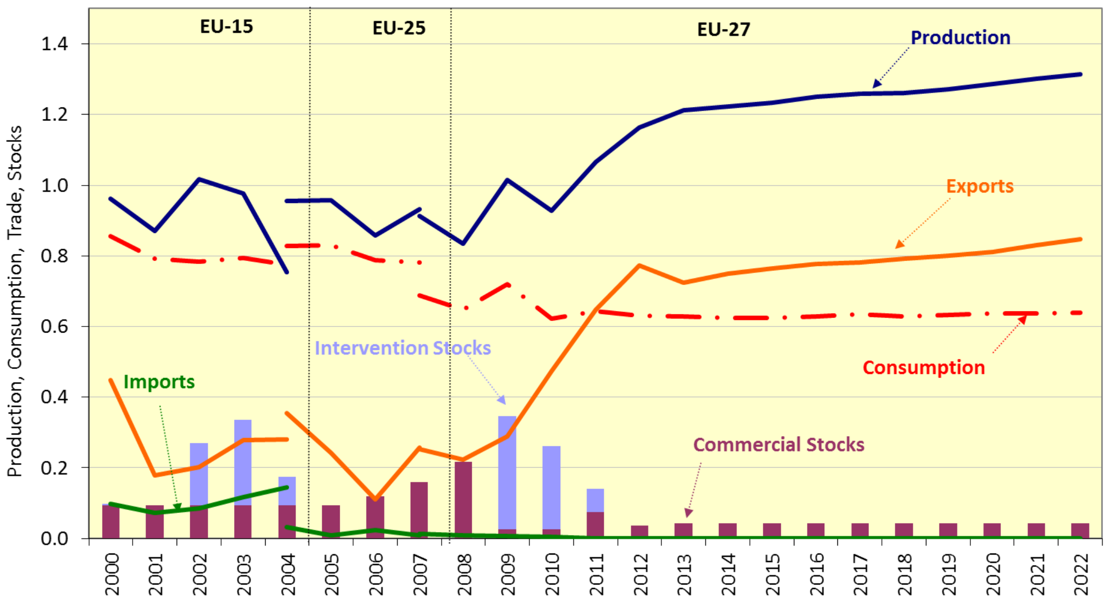
The strong global import demand continues to contribute to market balance, driving a favourable outlook for SMP exports. EU production is projected to increase by 23% throughout the outlook to reach around 1.3 million tonnes in 2022 (Graph 4.5). Domestic consumption prospects are expected to stabilise at 638 000 tonnes by 2022 (-0.8% compared to 2011). Feed use would continue to contract, driving a steady decline in EU SMP use to 247 000 tonnes by 2022, which is 6% above the level of 2011.

Exports would reach 678 000 tonnes by the end of the outlook (30% more than in 2011 and almost three times more than 2009). Such positive export prospects are based on sustained demand from China, Algeria and Middle East countries. The EU could see its world market share stabilise at 32% of global exports in 2022, supported by a stronger orientation by competing exporters towards cheese, butter and WMP.

Map 4.2 First 10 importing countries of SMP, % increase 2022/2012



Graph 4.5 SMP market developments (million t)



Butter markets expected to remain balanced

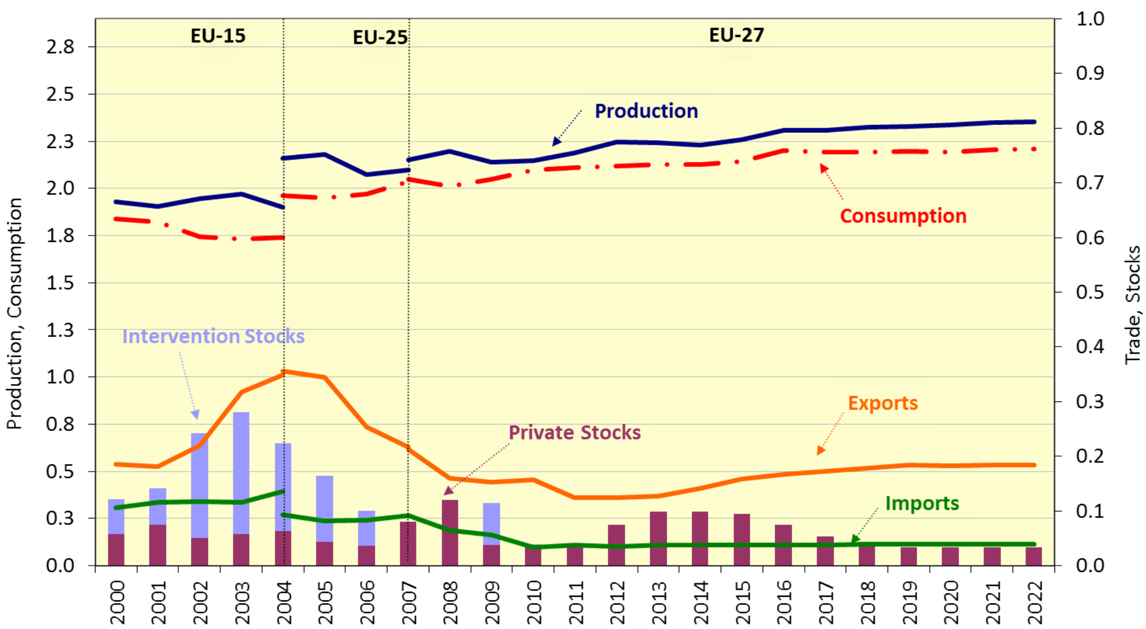
After a year of high prices during 2011 due to a limited butter supply and strong demand, the output recovery in 2012 has put downturn pressure on prices.

EU exports still remain rather uncompetitive given the existing price gap between EU and world quotations, but sustained demand from Russia would allow exports to stay stable and to expand in the near future. Total butter production is expected to remain constant in the short run, and to recover in the years soon after the quota expiry, reaching 2.4 million tonnes in 2022 (+8% with respect to 2011).

Projections (Graph 4.6) point to continued market stability for butter, thanks to positive market conditions over the outlook period, with prices at relatively high levels and firm EU demand (over 2 million tonnes) during the second part of the outlook period. EU consumption is expected to increase over the medium term reaching 4.3 kg/capita by the end of the outlook (compared to 4.2 kg/capita in 2011).

The relative improvement in consumption is supported by a higher increase in the price of vegetable oils vis-à-vis butter. Although the outlook for butter exports appears relatively less favourable than for other dairy commodities, given the assumed better competitiveness of other exporting countries in world markets, exports are projected to grow and stabilise around the level of 185 000 tonnes by the end of the outlook.

Graph 4.6 Butter market developments (million t)



While the outlook displays continued market stability for butter, it remains conditional on an assumed status quo regarding dietary preferences. The effect of a change towards low(er)-fat dairy commodities would have a direct effect on butter consumption and an indirect effect on butter production, as less milk fat would be used in the production of other dairy commodities (notably cheese and fresh products), increasing residual fat for butter production.

5. Agricultural income

5.1. Historical developments

Between 2000 and 2011, the agricultural income per annual working unit in the EU-27 increased in both nominal and real terms. This evolution corresponds to a moderate expansion of nominal income at sector level (but a decline in real income), accompanied by a progressive reduction in the total workforce employed in agriculture. Overall during this period, the growth of agricultural income per annual working unit in the EU-27 has been quite modest in real terms (+2.6% per year). Furthermore, the income pattern of the last decade has been relatively volatile. After increasing by roughly 17% between 2000 and 2004, real agricultural income per worker fell by more than 10% in 2005. During 2006 and 2007, it rose again by 11.2%, largely due to soaring commodity prices, but it declined over the following two years (-9.6% in 2009 alone) with the burst of the price bubble and the beginning of the economic recession. Finally, 2010 and 2011 were characterised by a noteworthy income recovery (+26.4% over the two years), driven by the upturn in agricultural prices, which brought EU-27 agricultural income to a level that is 35.5% higher than in the year 2000, even above the record level of 2007. The estimate for 2012 brings a moderate increase in agricultural income (+1%), principally driven by very high commodity prices (for grains and meats in particular).

The historical development of agricultural income per annual working unit has been quite different in the EU-15 compared to the EU-N12.

Real income per annual working unit in the EU-15 basically stagnated between 2000 and 2006. Due to the commodity price boom, income increased in 2007 by more than 9% compared to the previous year, but this increase was offset by two successive declines, including the slump in 2009, which caused income to plummet to the lowest level since the beginning of the new century. After the rebound in agricultural prices of 2010 and 2011, EU-15 agricultural income settled above the level of the year 2000 (+8.3%). Finally, in 2012, agricultural income in the EU-15 is estimated to have grown marginally compared to the previous year (+2.8%).

By contrast, in the EU-N12 income has been growing significantly since 2000. Although the 2009 decline in income also strongly affected the EU-N12, the recovery in 2010 and the further boom of 2011 fully restored the historical trend. Thus, EU-N12 real income in Euro per worker in 2011 was 133% higher than in the pre-accession year 2003. This is mainly due to the higher market prices prevailing in the single market and the increase in public support for the farm sector. For 2012, due to unfavourable climate conditions, real income per annual working unit is expected to have decreased by 5.1% . Nevertheless, the gap in the absolute level of agricultural income per worker between old and new Member States in 2012 remains very large, to the advantage of the EU-15.

The estimated 1% increase in EU-27 real agricultural income per working unit in 2012 versus 2011 results from a modest increase in real income at sector level (+0.5%) combined with a reduction in agricultural labour input (-0.5%). The increase in EU-27 income at aggregated level is determined by a significant growth in the value of agricultural output in nominal terms (+3.3%), in spite of the simultaneous increase in expenditure for intermediate consumption (+4.8%) and the marginal rise of fixed capital consumption (+2.2%). Among the products covered by this outlook, the growth in production prices in 2012 is led by cereals (+10.5%) and protein crops (+13%), while it is expected to be lower for meats (+8.4%) and negative for milk (-3.9%). On the inputs side, total expenditure in 2012 would sharply rise for fertilisers (+8.5%) FISIM[5] (+8.1%) and energy and soil improvers (+8.0%).

The expected overall increase in the value of agricultural production in 2012 is mainly driven by rising prices (+7.6% for the crop output), which outweigh the decline in production volumes (-5.4% for overall crops). Variations in volumes were more modest for the main products, and generally negative (with the notable exception of milk, poultry, rye and oats)

5.2. Income prospects

The medium term prospects for the income of the agricultural sector have been compiled on the basis of the projections for the main agricultural markets presented in the earlier chapters. The economic accounts for agriculture constitute the statistical basis of the outlook for agricultural income.

The results of the income outlook for the EU agricultural sector have to be interpreted not only in the context of the economic and policy setting underlying the market projections, but also in light of additional caveats specific to the income estimation. Notably, certain key assumptions had to be made regarding the prospects for agricultural sectors which are not covered by the modelling tools used for the baseline projections – these include the rate of fixed capital consumption, the level of subsidies (established on the basis described below) and the pace of future structural change. These elements impact upon the prospects for agricultural income, in addition to the general uncertainties surrounding the current medium term projections described in the subsequent chapter.

While the medium term changes in the price and volume components of the arable crops and major livestock sectors have been established in line with the market projections, in the remaining agricultural sectors – such as fruit, vegetables, wine and olive oil – it was assumed that income would follow a development related to its historical trend, while also taking into account the main drivers identified for the projections about the main commodities.

The subsidy component of agricultural income has been established on the basis of:

- the estimated evolution of direct payments for 2010-2013 and the assumption that they would remain unchanged in the post-2013 period (single payment scheme and other direct payments following the Health Check decisions);

- the rural development component from the European Agriculture Fund for Rural Development as adopted for the 2007-2013 period for the EU-27. Only the current transfers to agricultural producers as other subsidies on production have been accounted for in the income calculation (thus excluding all the capital grants and investment aids as well as support to operators outside agriculture). Member States have been assumed to fully use the rural development funds available to them (including the co-financing component of rural development funds);

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[5] financial intermediation services indirectly measured

- the main provisions of the Act of Accession regarding direct payments for the EU-N12 (progressive introduction, SAPS and the complementary national direct payments -CNDP or 'top-ups'). The possibility of financing the CNDP from the national budget or from co-financing with rural development EU funds has also been taken into account where relevant. In this context Member States respect the upper limit on the financial envelopes.

On the basis of these assumptions, the EU-27 agricultural income per annual working unit in real terms would be 23.3% higher in 2022 compared to the base period of the five year average of 2008-2012 (Table 5.1). This positive trend is the result of an expected sharp deterioration of the factor income in real terms at sector level (-15%), which is more than compensated by a reduction in the workforce employed in agriculture (-31.3%). In turn, the reduction of the aggregated real factor income over the next decade stems from the limited expansion of the corresponding nominal income, which does not however compensate the development of general inflation.

Table 5.1 Outlook for agricultural income in the EU, 2013-2022 (average 2008-2012 = 100)

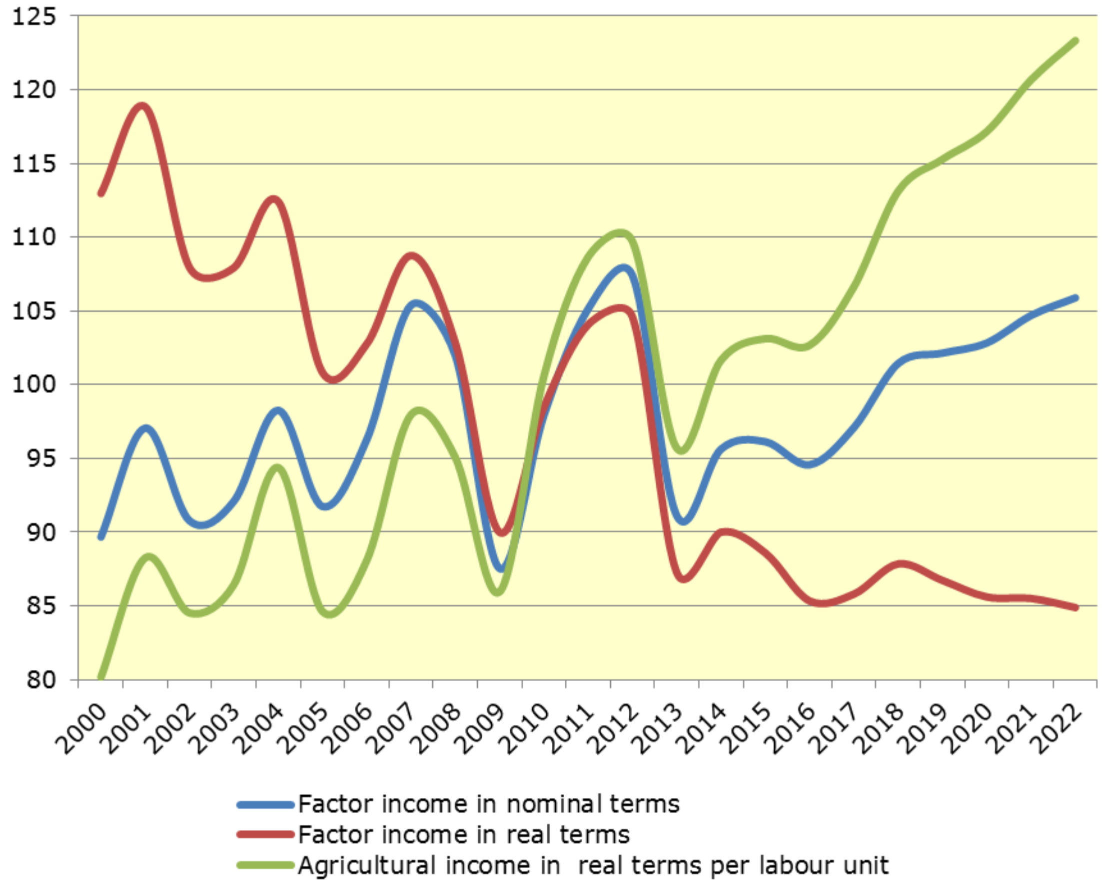
	average 2008-2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Factor income in nominal terms											
EU-27	**100.0**	**91.1**	**95.6**	**96.1**	**94.6**	**97.1**	**101.4**	**102.1**	**102.8**	**104.7**	**105.9**
EU-15	100.0	89.6	94.6	95.0	93.3	95.5	99.3	99.5	99.9	101.9	103.1
EU-N12	100.0	98.1	100.6	101.3	100.6	104.7	111.2	114.6	116.4	117.6	118.8
Factor income in real terms											
EU-27	**100.0**	**87.3**	**90.0**	**88.6**	**85.3**	**85.8**	**87.8**	**86.7**	**85.6**	**85.5**	**84.9**
EU-15	100.0	85.8	89.0	87.6	84.3	84.5	86.2	84.7	83.4	83.6	83.1
EU-N12	100.0	91.2	91.6	90.0	87.2	88.5	92.0	92.8	92.2	91.1	89.9
Labour input											
EU-27	**100.0**	**90.8**	**88.2**	**85.6**	**82.8**	**80.1**	**77.4**	**74.9**	**72.8**	**70.6**	**68.6**
EU-15	100.0	93.9	91.7	89.7	87.7	85.7	83.7	81.8	80.1	78.5	76.9
EU-N12	100.0	87.8	84.8	81.6	78.0	74.8	71.2	68.2	65.6	62.9	60.5
Agricultural income in real terms per labour unit											
EU-27	**100.0**	**95.7**	**101.7**	**103.1**	**102.7**	**106.6**	**113.1**	**115.3**	**117.2**	**120.7**	**123.3**
EU-15	100.0	91.3	96.9	97.6	96.0	98.6	102.9	103.4	104.0	106.3	107.9
EU-N12	100.0	102.8	107.0	109.2	110.6	117.2	128.0	134.6	139.1	143.4	147.2

Against the background of an overall positive trend in real agricultural income per worker, marked differences appear between the EU-15 and EU-N12 aggregates. In the EU-15, agricultural income in 2022 is expected to be around 8% higher than in the base period. On the other hand, in the EU-N12, agricultural income continues to display a positive trend, 47% higher than the reference period by 2022.

This divergence in income partly stems from a different growth pattern in real income at the aggregated level, but is also a consequence of a sharper decline in the agricultural workforce in the EU-N12 (-40%) compared to the EU-15 (-23%), due to stronger structural adjustment taking place in the new Member States.

The evolution growth in EU-27 real agricultural income during the projection period towards 2022 is not expected to follow a steady pattern. After a peak estimated for 2012, agricultural income is projected to fall significantly in 2013, mainly due to the cooling down of commodity prices, which had previously registered record levels after the drought of the first semester of 2012. After a partial recovery in 2014 and 2015, followed by a new slowdown in 2016, agricultural income is projected to return to a steadily rising path as from 2017.

Graph 5.1 Development of agricultural income in the EU-27 (average 2008-2012 = 100)



6. Main drivers, implications and uncertainties stemming from the outlook

The EU agricultural markets and income outlook is the result of expert consensus on a medium term scenario obtained using the AGLINK-COSIMO model[6], which is designed to focus on the potential influence of economic fundamentals, agricultural and trade policies on agricultural markets in the medium term. A first version of the outlook was discussed with market and policy experts during the 'Commodity Market Development in Europe-Outlook' workshop held in Brussels in October 2012; the present version takes into account and incorporates feedback received during the workshop.

The outlook is considered the most likely result under specific assumptions for external factors. Under these assumptions weather conditions develop under seasonal normality; economy shows a slow transition to a relatively weak growth in the developed countries compared to a stronger growth in developing countries; world market developments continue under the current domestic and trade policies; productivity growth in the EU and abroad follows the same trends as today. These assumptions are necessary to generate and induce a set of baseline results that can be used to understand market trends and to serve as a basis for policy analysis.

6.1. Main drivers and their implications

Drivers for change have become more complex over time and whether new or not they are becoming increasingly important. For instance, weather patterns are becoming increasingly variable and extreme, making markets and prices much more volatile than in the past. In addition, when assessing future trade prospects the US dollar is no longer the only exchange rate to consider. Furthermore, policy assumptions need to reflect changing global powers (move to G-20) and market linkages (e.g. Renewable Energy Directive). Table 6.1 lists the main drivers and provides a summary of the possible challenges and opportunities associated with them.

Greater role of the global economy and macroeconomic environment

Analyses of the price boom in 2007-2008 by the OECD and the recent work by the World Bank[7] showed the increasing inter-dependence between the macroeconomic environment and agriculture. These studies highlighted the fact that the crude oil price and exchange rate developments in the main exporting and importing countries are important drivers of agricultural market developments.

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[6] The model has been developed by OECD-FAO in close cooperation with member countries and is based on existing country literature, models, and on formal bilateral review. Consequently, the model specification reflects the views of participating countries. Agricultural markets are modelled specifically to best capture individual policies and particular market settings relevant for each country.
[7] "Global Economic Prospects. Crisis, Finance, and Growth", The International Bank for Reconstruction and Development / The World Bank, 2010.

Table 6. 1 Main drivers and their implications

Macroeconomic environment	*Higher interaction between agriculture and other sectors* ⟷	Crude oil price outlook impacts on biofuel feedstock demand and input costs, a crucial driver for EU agricultural market developments Exchange rates have a key role on trade Economic conditions in the EU and worldwide affect EU markets, particularly prices and trade
Increasing global demand	*Key for trade and world and EU prices* ⟷	Economic and population growth and a continued shift in dietary patterns in emerging countries boost global demand and sustain high world commodity prices
Climate variability	*Variable global supply, greater market volatility* ⟷	Greater uncertainty of baseline results, particularly production and prices Supply volatility affects EU regions differently, although this cannot be seen in this outlook
Evolving multilateral environment	*Changing global powers (move to G-20)* ⟷	Increasing concerns about food security, calls for policy intervention A more complex and longer negotiation process
Trade policies	*WTO negotiations' impasse, shift to regional / bilateral agreements* ⟷	Greater uncertainties regarding ad-hoc trade policy responses in a turbulent economic environment
Domestic policies	*EU and USA in a reforming phase* ⟷	Different policy orientation, similar concerns

The outlook for the crude oil price is likely to be a major determinant of EU agricultural market developments due to its impact on biofuel feedstock demand

and on input costs. Although dependent on assumptions about EU biofuel policy, the assumed setting of mandate-driven growing demand for biofuel feedstock is the single driver of EU crop market developments. In addition, the impact of the crude oil price on input costs limits prospects for growth in producers' margins and thereby farm income. This is true especially for the EU livestock sector where the impact is both direct, in the form of energy costs, and indirect, in the form of feed prices, in spite of the availability of by products like DDGs.

In addition, exchange rate assumptions may have an impact on the EU export potential for most commodities, implying an improvement in the EU terms of trade in the near future and a worsening of terms of trade in the medium term.

The link between agricultural and energy markets, the co-movement of different commodity markets and the financialisation of agricultural commodity markets imply that developments in agriculture are increasingly driven by external factors that are not inherent in agricultural markets or policies.

Developments in 2012 have displayed the sensitive market balance of crude oil, with the outlook for prices conditional upon the situation in the Middle East and North Africa. Developments in alternative energy sources (e.g. shale gas, solar, etc.) as well as environmental concerns could have additional, implications for the future demand for biofuel feedstock. The economic assumptions behind this outlook are subject to uncertainty, with impacts on global demand prospects through unemployment and income and trade prospects linked to access to credit, among others. The implications of alternative assumptions for key EU macroeconomic conditions, the crude oil price and US dollar exchange rate are assessed in Part II.

Increasing global demand

Major market projection institutions foresee a favourable growth in global demand in the long term, driven by expectations concerning sustained economic and population growth and a continued shift in dietary patterns in developing countries[8]. The expected progressive change in diets away from cereals, towards a higher consumption of meat and dairy products in emerging countries (although there is not yet clear evidence of massive change) should support high commodity prices and confirm the end of the long term decline in agricultural commodity prices (highlighting the challenge of improving productivity growth).

Climate variability

Markets have been extremely turbulent over recent years, and given the drivers of this high volatility, there is an increased likelihood of persisting and perhaps more frequent volatility in the future.

Changing weather patterns and a higher frequency of extreme events seem to have become a structural driver of market volatility and yield uncertainties. The drought that hit the US and some Central and Eastern European countries in 2012 showed that crop yield variability has strong implications for the net trade position of the EU crop sector because of the relatively inelastic behaviour of food and feed demand.

[8] See FAO projections for 2050, "Looking Ahead in World Food and Agriculture: perspectives to 2050", FAO, 2011.

The livestock sector is affected through changes in feed prices as well as the general availability of feed (with possible constraints on import availability and substitution).

The results presented here do not reflect such climatic changes, due to the unpredictable nature of events, but Part II outlines the results of uncertainty analyses intended to provide an assessment of alternative assumptions.

Evolving multilateral environment

With the long-running multilateral negotiations in the WTO's Doha Round on hold, the role of the G-20[9] has increased in recent years. The G-20 thus became the key forum for the most important industrial and emerging countries to discuss major issues relating to international currency and financial policy, as well as other important global challenges, drawing attention to, among others, transparency issues and the role of regulation of agricultural markets in reducing price volatility.

Policy drivers

Experience in recent years has shown that policies may have a significant impact on market developments, both from long term policies (e.g. US and EU biofuel policies) and ad-hoc policies as a response to short term market or economic developments (e.g. trade policies).

Future trade policies are at great risk of uncertainty due to: a) the possibility of warranting ad-hoc trade policy responses (e.g. export bans) in a turbulent economic environment; b) greater interest in the conclusion of bilateral agreements; c) the implications of an eventual conclusion of the long-lasting negotiations of the WTO Doha Round.

Both the EU and the US are in the process of reforming their agricultural policies, albeit in diverging paths. The US Farm Bill, the Food, Conservation and Energy Act that regulates commodity support, environment, conservation, research, market access, farm services and food assistance for disadvantaged households expired on 30th September 2012. Since a joint Bill could not be agreed upon by the Senate and the Congress by then, the existing Farm Bill will probably be extended for three or six months.

The Commission presented a set of legislative proposals for "The CAP towards 2020" in November 2011. A fierce public debate about the future of the CAP took place during 2010 and 2011, where the actors involved widened to include environmental NGOs. This debate is followed by an ongoing institutional debate between the European Parliament and the Council of Ministers. A final agreement is expected in 2013.

The most important, and perhaps the more difficult, pieces of the current inter-institutional debate regard direct payments and the redistribution of resources between Member States and within Member States (i.e. criteria) and the definition of greening measures. In the area of market measures the debate focuses around

[9] The G-20 was created in response to both to the financial crises that arose in a number of emerging economies in the 1990s and to a growing recognition that some of these countries were not adequately represented in global economic discussion and governance.

the most adequate instruments to reinforce the position of producers in the food chain while respecting competition rules and the implications of the end of supply management instruments (i.e. sugar quotas, planting rights for wine production and dairy quotas). As far as rural development policy is concerned, mayor changes consist in a set of new priorities and the debate centres on the distribution of funds between Member States.

The high and volatile prices of the recent years have drawn attention to the contribution of EU to food security, productivity improvement and the sustainable use of environmental resources. These aspects are part of the background for the current CAP reform process. Moreover, farmers in some years have not been able to pass on higher costs through higher prices, as exemplified by the milk crisis in 2009. This has raised concerns about the functioning of the food supply chain. The Commission is actively addressing food supply chain-related issues, together with stakeholders and Member State representatives, in the framework of the High Level Forum for a Better Functioning Food Supply Chain. A core stakeholder group under the Business to Business platform of the High Level Forum agreed in November 2011 on principles of good practice for actors at all levels of the food chain to abide by and has been working on a possible implementation framework for the abovementioned principles. Furthermore, information on food prices at successive stages of the food chain is available through the Eurostat Food Price Monitoring Tool, which is now accessible to the public.

The main challenges for future domestic policies relate to:

- Concerns about food security issues, which completely change the way policies are perceived and call for increasing productivity

- EU market orientation and focus on farmers' income which make decoupled payments transparent and questionable

- Climate change which not only affects the outlook results but also calls for policy adjustments in terms of adaptation and mitigation. The answer to this challenge is also addressed through research and technology developments, as well as instruments to cope with volatility.

6.2. Additional uncertainties

The baseline outlook is based on prospects for increasing consumption, which provide incentives for increased EU agriculture competitiveness in the context of declining crop yield growth. It must be acknowledged that most EU demand growth for arable crops is driven by the existing biofuel policies, currently under revision and which are subject to uncertainties linked to environmental concerns and competing sources of renewable energy. Global demand for meat and dairy products could also be subject to changing consumer preferences as a result of debates over the ecological footprint of livestock breeding.

7. Statistical Annexes

Table 7.1 Total cereals balance sheet in the EU, 2009-2022 (million t)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Usable production	**294.1**	**277.5**	**288.4**	**279.3**	**294.5**	**296.9**	**297.7**	**299.5**	**300.7**	**302.0**	**303.6**	**305.5**	**307.5**	**309.0**
of which EU-15	211.8	199.0	201.7	206.1	210.0	211.1	210.9	211.6	211.8	212.1	212.7	213.4	214.1	214.6
of which EU-N12	82.3	78.5	86.7	73.2	84.6	85.8	86.7	87.9	88.8	89.9	91.0	92.1	93.3	94.4
Consumption	**280.1**	**276.8**	**276.8**	**276.2**	**277.2**	**280.1**	**282.4**	**286.2**	**289.7**	**294.0**	**296.3**	**298.4**	**298.3**	**299.1**
of which EU-15	211.0	209.8	207.8	209.4	210.6	212.9	214.8	218.4	221.6	225.7	227.6	229.2	229.0	229.4
of which EU-N12	69.1	67.0	69.0	66.8	66.6	67.2	67.6	67.8	68.1	68.3	68.7	69.1	69.3	69.6
of which food and industrial	99.7	99.8	100.0	101.4	101.6	102.2	103.3	104.7	106.3	107.7	107.8	107.8	106.9	106.0
of which feed	172.4	167.5	167.0	164.5	165.1	167.0	167.6	169.1	169.7	171.5	171.6	171.6	171.3	171.6
of which bioenergy	8.0	9.5	9.8	10.3	10.5	10.9	11.5	12.4	13.7	14.8	17.0	19.0	20.1	21.4
Imports	8.0	13.3	14.4	14.0	12.1	11.7	11.5	12.3	12.4	14.2	15.0	15.2	14.6	14.1
Exports	27.7	31.9	25.7	21.6	25.8	26.5	25.7	24.5	24.4	22.8	22.8	22.7	23.7	24.0
Beginning stocks	60.2	54.4	36.6	36.9	32.4	36.1	38.0	39.1	40.2	39.1	38.4	38.0	37.8	37.8
Ending stocks	54.4	36.6	36.9	32.4	36.1	38.0	39.1	40.2	39.1	38.4	38.0	37.8	37.8	37.9
of which intervention	6.0	0.6	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: the cereals marketing year is July/June

Table 7.2 Total wheat balance sheet in the EU, 2009-2022 (million t)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Usable production	**138.2**	**136.6**	**138.1**	**135.1**	**139.4**	**141.2**	**141.4**	**142.5**	**143.0**	**143.6**	**144.7**	**146.0**	**147.5**	**148.5**
of which EU-15	105.4	105.0	103.3	103.6	105.8	107.0	106.8	107.5	107.6	107.9	108.4	109.2	110.0	110.5
of which EU-N12	32.7	31.6	34.9	31.5	33.6	34.2	34.5	35.0	35.4	35.8	36.2	36.8	37.4	37.9
Consumption	**129.6**	**124.3**	**129.2**	**126.8**	**127.5**	**128.1**	**128.3**	**130.3**	**131.4**	**133.4**	**134.5**	**135.6**	**135.6**	**136.2**
of which EU-15	103.3	99.6	103.6	101.0	102.8	103.3	103.3	105.3	106.2	108.1	109.1	110.0	109.9	110.4
of which EU-N12	26.3	24.6	25.7	25.8	24.8	24.9	25.0	25.1	25.2	25.3	25.4	25.6	25.7	25.8
of which food and industrial	68.9	68.0	68.8	69.8	70.5	70.9	71.4	72.1	72.8	73.4	73.5	73.6	73.4	73.2
of which feed	56.7	51.1	55.4	52.8	52.6	52.7	52.1	53.2	53.1	54.1	54.3	54.6	54.5	54.9
of which bioenergy	4.0	5.2	5.0	4.2	4.4	4.6	4.8	5.0	5.5	5.9	6.7	7.4	7.7	8.1
Imports	5.3	4.5	7.1	6.4	5.6	5.4	5.6	5.5	5.7	5.8	5.8	5.7	5.6	5.5
Exports	21.5	22.2	15.7	14.9	17.2	17.9	18.4	17.5	17.5	16.2	16.1	16.3	17.4	17.8
Beginning stocks	23.7	16.1	10.7	11.0	10.8	11.0	11.6	11.8	12.0	11.7	11.6	11.4	11.4	11.4
Ending stocks	16.1	10.7	11.0	10.8	11.0	11.6	11.8	12.0	11.7	11.6	11.4	11.4	11.4	11.5
of which intervention	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: the wheat marketing year is July/June

Table 7.3 Coarse grains balance sheet in the EU, 2009-2022 (million t)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Usable production	**155.9**	**140.9**	**150.3**	**144.2**	**155.2**	**155.7**	**156.3**	**157.0**	**157.7**	**158.3**	**159.0**	**159.5**	**160.0**	**160.6**
of which EU-15	106.3	94.0	98.4	102.4	104.2	104.1	104.1	104.1	104.2	104.2	104.2	104.2	104.1	104.1
of which EU-N12	49.6	46.9	51.9	41.8	51.0	51.6	52.2	52.8	53.5	54.1	54.7	55.3	55.9	56.5
Consumption	**150.5**	**152.5**	**147.6**	**149.4**	**149.6**	**152.0**	**154.1**	**155.9**	**158.3**	**160.6**	**161.9**	**162.8**	**162.7**	**162.9**
of which EU-15	107.7	110.2	104.2	108.4	107.8	109.7	111.5	113.2	115.5	117.5	118.6	119.2	119.1	119.1
of which EU-N12	42.8	42.3	43.3	41.0	41.9	42.3	42.6	42.7	42.9	43.1	43.3	43.6	43.6	43.8
of which food and industrial	30.8	31.8	31.2	31.6	31.1	31.3	31.9	32.6	33.5	34.3	34.3	34.2	33.6	32.8
of which feed	115.7	116.4	111.6	111.7	112.4	114.3	115.4	115.9	116.6	117.3	117.2	117.0	116.8	116.7
of which bioenergy	4.0	4.3	4.8	6.1	6.1	6.4	6.8	7.4	8.2	8.9	10.3	11.6	12.4	13.3
Imports	2.7	8.8	7.3	7.6	6.5	6.3	5.9	6.7	6.7	8.4	9.3	9.5	9.1	8.6
Exports	6.2	9.7	9.9	6.7	8.6	8.6	7.3	7.0	6.8	6.7	6.6	6.4	6.3	6.2
Beginning stocks	36.5	38.4	25.9	25.9	21.6	25.1	26.5	27.3	28.2	27.4	26.9	26.6	26.4	26.4
Ending stocks	38.4	25.9	25.9	21.6	25.1	26.5	27.3	28.2	27.4	26.9	26.6	26.4	26.4	26.5
of which intervention	5.7	0.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: the coarse grains marketing year is July/June

Table 7.4 Common wheat balance sheet in the EU, 2009-2022 (million t)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Usable production	**129.5**	**127.6**	**129.7**	**126.6**	**130.6**	**132.4**	**132.6**	**133.7**	**134.2**	**134.9**	**135.9**	**137.3**	**138.7**	**139.7**
of which EU-15	96.9	96.2	95.1	95.4	97.3	98.5	98.3	99.0	99.1	99.4	99.9	100.7	101.5	102.0
of which EU-N12	32.6	31.3	34.6	31.2	33.3	33.9	34.3	34.8	35.1	35.5	36.0	36.6	37.2	37.6
Consumption	**119.7**	**114.7**	**120.4**	**117.3**	**118.1**	**118.7**	**118.9**	**120.9**	**121.9**	**123.9**	**125.0**	**126.1**	**126.1**	**126.7**
of which EU-15	93.7	90.4	95.1	91.9	93.8	94.3	94.3	96.3	97.2	99.1	100.1	101.0	101.0	101.4
of which EU-N12	25.9	24.3	25.3	25.4	24.3	24.5	24.6	24.6	24.8	24.8	24.9	25.1	25.2	25.3
of which food and industrial	59.6	58.7	60.2	60.7	61.3	61.8	62.3	62.9	63.7	64.2	64.3	64.4	64.3	64.1
of which feed	56.1	50.8	55.2	52.5	52.4	52.4	51.8	52.9	52.8	53.8	54.0	54.3	54.2	54.6
of which bioenergy	4.0	5.2	5.0	4.2	4.4	4.6	4.8	5.0	5.5	5.9	6.7	7.4	7.7	8.1
Imports	3.1	2.4	5.4	4.4	3.8	3.7	3.8	3.8	3.9	4.0	4.0	4.0	3.8	3.8
Exports	20.4	20.1	14.3	14.0	16.1	16.8	17.3	16.4	16.4	15.1	15.0	15.2	16.3	16.7
Beginning stocks	22.4	14.9	10.1	10.5	10.1	10.3	10.9	11.1	11.3	11.0	10.9	10.7	10.7	10.7
Ending stocks	14.9	10.1	10.5	10.1	10.3	10.9	11.1	11.3	11.0	10.9	10.7	10.7	10.7	10.8
of which intervention	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: the common wheat marketing year is July/June

Table 7.5 Durum wheat balance sheet in the EU, 2009-2022 (million t)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Usable production	**8.7**	**9.0**	**8.4**	**8.5**	**8.7**	**8.8**	**8.8**	**8.8**	**8.8**	**8.8**	**8.8**	**8.8**	**8.8**	**8.8**
of which EU-15	8.6	8.7	8.2	8.3	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5
of which EU-N12	0.1	0.3	0.3	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Consumption	**9.9**	**9.5**	**8.8**	**9.5**	**9.4**	**9.4**	**9.4**	**9.4**	**9.4**	**9.5**	**9.5**	**9.5**	**9.4**	**9.4**
of which EU-15	9.6	9.2	8.4	9.1	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	8.9	8.9
of which EU-N12	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5
of which food and industrial	9.3	9.2	8.6	9.2	9.1	9.1	9.1	9.1	9.1	9.2	9.2	9.2	9.1	9.1
of which feed	0.6	0.3	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
of which bioenergy	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Imports	2.2	2.0	1.7	2.0	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Exports	1.1	2.1	1.4	0.9	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Beginning stocks	1.2	1.2	0.6	0.5	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Ending stocks	1.2	0.6	0.5	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7

Note: the durum wheat marketing year is July/June

Table 7.6 Barley balance sheet in the EU, 2009-2022 (million t)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Usable production	**62.0**	**53.1**	**51.8**	**54.8**	**57.6**	**57.3**	**57.0**	**56.7**	**56.4**	**56.1**	**55.8**	**55.5**	**55.2**	**54.8**
of which EU-15	50.7	43.2	41.7	44.7	47.2	46.9	46.7	46.4	46.2	45.9	45.7	45.4	45.1	44.8
of which EU-N12	11.4	9.9	10.1	10.1	10.4	10.4	10.3	10.3	10.3	10.2	10.2	10.1	10.1	10.0
Consumption	**54.3**	**54.4**	**48.8**	**50.9**	**51.3**	**51.1**	**52.2**	**52.4**	**52.8**	**52.6**	**52.3**	**52.1**	**51.7**	**51.5**
of which EU-15	45.0	45.4	41.5	42.7	43.0	43.0	44.0	44.3	44.8	44.7	44.4	44.1	43.9	43.6
of which EU-N12	9.3	9.0	7.3	8.3	8.2	8.2	8.1	8.1	8.0	8.0	7.9	7.9	7.9	7.9
of which food and industrial	12.0	11.9	12.1	12.2	12.0	11.9	11.8	11.9	11.9	12.0	11.9	11.9	11.8	11.7
of which feed	41.9	42.0	36.1	38.0	38.6	38.5	39.6	39.6	39.9	39.6	39.1	38.8	38.5	38.2
of which bioenergy	0.4	0.5	0.6	0.7	0.7	0.7	0.8	0.9	1.0	1.1	1.2	1.4	1.5	1.6
Imports	0.1	0.2	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Exports	3.5	7.6	5.7	5.0	5.8	6.0	4.7	4.4	4.2	4.0	3.9	3.8	3.7	3.6
Beginning stocks	14.1	18.4	9.7	7.5	6.7	7.5	8.0	8.5	8.8	8.5	8.3	8.2	8.2	8.2
Ending stocks	18.4	9.7	7.5	6.7	7.5	8.0	8.5	8.8	8.5	8.3	8.2	8.2	8.2	8.2
of which intervention	5.5	0.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: the barley marketing year is July/June

Table 7.7 Maize balance sheet in the EU, 2009-2022 (million t)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Usable production	**57.8**	**56.9**	**68.4**	**57.8**	**66.7**	**67.6**	**68.6**	**69.6**	**70.6**	**71.6**	**72.6**	**73.6**	**74.5**	**75.5**
of which EU-15	37.1	35.1	41.1	39.8	40.2	40.5	40.8	41.1	41.5	41.8	42.1	42.5	42.8	43.1
of which EU-N12	20.7	21.9	27.3	18.0	26.5	27.1	27.8	28.4	29.1	29.8	30.5	31.1	31.8	32.4
Consumption	**61.0**	**64.4**	**67.9**	**66.2**	**67.3**	**69.9**	**71.0**	**72.6**	**74.5**	**77.1**	**78.7**	**80.0**	**80.4**	**81.0**
of which EU-15	42.6	45.5	45.5	47.6	47.3	49.3	50.2	51.5	53.2	55.4	56.8	57.8	58.0	58.2
of which EU-N12	18.3	18.9	22.4	18.5	20.0	20.6	20.9	21.1	21.3	21.6	21.9	22.2	22.5	22.7
of which food and industrial	10.4	11.4	10.7	10.6	10.9	11.2	11.7	12.3	13.0	13.7	13.8	13.9	13.4	13.0
of which feed	48.1	50.2	54.0	51.5	52.4	54.4	54.7	55.3	55.7	57.0	57.4	57.6	57.6	57.8
of which bioenergy	2.5	2.8	3.2	4.0	4.1	4.3	4.6	5.1	5.8	6.4	7.5	8.6	9.3	10.2
Imports	2.4	7.6	6.3	6.5	5.7	5.5	5.1	5.9	5.9	7.6	8.5	8.7	8.3	7.8
Exports	2.4	1.8	3.9	1.5	2.5	2.4	2.5	2.4	2.4	2.4	2.5	2.4	2.4	2.4
Beginning stocks	17.8	14.7	13.0	15.9	12.5	15.0	15.8	16.0	16.5	16.1	15.8	15.7	15.5	15.5
Ending stocks	14.7	13.0	15.9	12.5	15.0	15.8	16.0	16.5	16.1	15.8	15.7	15.5	15.5	15.5
of which intervention	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Note: the maize marketing year is July/June

Table 7.8 Other cereals* balance sheet in the EU, 2009-2022 (million t)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Usable production	**36.0**	**30.8**	**30.1**	**31.6**	**30.9**	**30.8**	**30.7**	**30.7**	**30.6**	**30.6**	**30.5**	**30.4**	**30.3**	**30.2**
of which EU-15	18.5	15.7	15.6	17.9	16.8	16.7	16.7	16.6	16.5	16.5	16.4	16.3	16.2	16.2
of which EU-N12	17.5	15.1	14.5	13.7	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1	14.1
Consumption	**35.2**	**33.7**	**30.9**	**32.3**	**31.0**	**31.0**	**30.9**	**30.9**	**31.0**	**30.9**	**30.8**	**30.7**	**30.6**	**30.4**
of which EU-15	20.1	19.3	17.3	18.1	17.4	17.4	17.3	17.3	17.4	17.4	17.4	17.3	17.3	17.2
of which EU-N12	15.2	14.4	13.6	14.2	13.6	13.6	13.6	13.6	13.5	13.5	13.4	13.4	13.3	13.2
of which food and industrial	8.4	8.6	8.3	8.7	8.2	8.3	8.4	8.5	8.6	8.6	8.5	8.5	8.3	8.2
of which feed	25.7	24.2	21.5	22.2	21.5	21.3	21.2	21.0	20.9	20.8	20.7	20.6	20.7	20.7
of which bioenergy	1.1	1.0	1.1	1.3	1.3	1.3	1.3	1.4	1.5	1.5	1.6	1.6	1.6	1.5
Imports	0.1	1.1	0.5	0.8	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4
Exports	0.4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Beginning stocks	4.6	5.2	3.1	2.6	2.4	2.6	2.7	2.8	2.9	2.8	2.8	2.7	2.7	2.7
Ending stocks	5.2	3.1	2.6	2.4	2.6	2.7	2.8	2.9	2.8	2.8	2.7	2.7	2.7	2.7

Note: the other cereals marketing year is July/June; * Rye, Oats and other cereals

Table 7.9 Rice balance sheet in the EU, 2009-2022 (million t milled equivalent)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Usable production	**1.9**	**1.8**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**	**1.8**	**1.8**	**1.8**	**1.8**
of which EU-15	1.8	1.7	1.6	1.6	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
of which EU-N12	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Consumption	**2.4**	**2.6**	**2.6**	**2.6**	**2.7**	**2.7**	**2.8**	**2.8**	**2.9**	**2.9**	**3.0**	**3.1**	**3.1**	**3.2**
of which EU-15	2.0	2.1	2.1	2.2	2.2	2.2	2.3	2.3	2.3	2.4	2.4	2.5	2.5	2.6
of which EU-N12	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6
Imports	0.9	1.0	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.3	1.4	1.4	1.5	1.5
Exports	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2
Beginning stocks	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Ending stocks	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4

Note: the rice marketing year is September/August

Table 7.10 Total oilseed* (grains and beans) market balance in the EU, 2009-2022 (million t)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Usable production	**29.7**	**29.4**	**30.1**	**27.3**	**29.2**	**29.7**	**30.3**	**30.9**	**31.6**	**32.3**	**32.9**	**33.4**	**33.9**	**34.4**
of which EU-15	19.5	18.9	18.9	18.2	18.5	18.8	19.2	19.6	20.0	20.5	20.9	21.2	21.5	21.8
of which EU-N12	10.3	10.5	11.1	9.1	10.8	10.9	11.1	11.3	11.6	11.8	12.0	12.2	12.4	12.6
Consumption	**45.2**	**45.6**	**44.8**	**43.6**	**45.1**	**46.0**	**46.5**	**47.8**	**48.8**	**49.8**	**50.6**	**51.3**	**52.1**	**52.7**
of which EU-15	38.7	39.0	37.8	37.9	38.6	39.4	39.7	40.9	41.7	42.5	43.2	43.8	44.4	45.0
of which EU-N12	6.4	6.5	6.9	5.7	6.5	6.6	6.8	6.9	7.1	7.2	7.4	7.5	7.6	7.8
of which crushing	42.3	41.6	41.0	39.9	41.7	42.2	43.1	43.9	44.7	45.6	46.4	47.1	47.9	48.6
Imports	15.8	16.2	15.8	16.5	16.9	17.0	17.3	17.5	17.7	18.0	18.2	18.4	18.7	19.0
Exports	0.9	0.8	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Beginning stocks	4.9	4.5	3.7	4.2	3.7	4.1	4.1	4.6	4.6	4.4	4.2	4.0	3.9	3.8
Ending stocks	4.5	3.7	4.2	3.7	4.1	4.1	4.6	4.6	4.4	4.2	4.0	3.9	3.8	3.8

Note: the oilseed marketing year is July/June ; * Rapeseed, soybeans, sunflower seed, cottonseed and groundnuts

Table 7.11 Total oilseed meal* market balance in the EU, 2009-2022 (million t)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Usable production	**26.3**	**25.7**	**25.5**	**24.9**	**25.9**	**26.3**	**26.8**	**27.3**	**27.8**	**28.3**	**28.8**	**29.2**	**29.7**	**30.1**
of which EU-15	23.0	22.3	22.0	22.0	22.6	22.8	23.3	23.7	24.1	24.5	24.9	25.3	25.7	26.1
of which EU-N12	3.3	3.4	3.6	2.9	3.4	3.4	3.5	3.6	3.7	3.7	3.8	3.9	4.0	4.1
Consumption	**48.5**	**48.9**	**49.1**	**48.7**	**49.1**	**49.4**	**49.7**	**50.7**	**50.7**	**51.7**	**52.1**	**52.6**	**52.6**	**53.1**
of which EU-15	41.3	41.6	41.8	41.3	41.8	42.0	42.3	43.3	43.4	44.3	44.7	45.2	45.1	45.7
of which EU-N12	7.2	7.3	7.3	7.3	7.3	7.3	7.4	7.4	7.4	7.4	7.4	7.4	7.4	7.4
Imports	22.9	24.2	24.6	24.9	24.3	24.2	24.1	24.6	24.2	24.7	24.6	24.6	24.1	24.3
Exports	0.8	1.0	1.0	1.1	1.1	1.1	1.1	1.2	1.2	1.2	1.2	1.2	1.3	1.3
Beginning stocks	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Ending stocks	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2

Note: the oilseed meal marketing year is July/June; * Rapeseed, soybeans, sunflower seed, cottonseed and groundnuts based protein meals

Table 7.12 Total oilseed oil* market balance in the EU, 2009-2022 (million t)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Usable production	**14.7**	**14.4**	**14.3**	**13.8**	**14.5**	**14.7**	**15.0**	**15.3**	**15.6**	**15.9**	**16.2**	**16.5**	**16.8**	**17.1**
of which EU-15	12.3	11.9	11.7	11.7	12.1	12.2	12.5	12.7	13.0	13.2	13.4	13.7	13.9	14.1
of which EU-N12	2.4	2.4	2.6	2.1	2.4	2.5	2.5	2.6	2.7	2.7	2.8	2.9	2.9	3.0
Consumption	**16.1**	**15.9**	**15.3**	**15.1**	**15.6**	**16.0**	**16.5**	**17.1**	**17.9**	**18.4**	**19.0**	**19.5**	**20.0**	**20.3**
of which EU-15	13.5	13.3	12.7	12.5	12.9	13.3	13.7	14.2	14.9	15.4	15.9	16.4	16.9	17.2
of which EU-N12	2.6	2.7	2.6	2.6	2.7	2.7	2.8	2.8	2.9	3.0	3.1	3.1	3.1	3.1
Imports	2.0	2.3	1.9	2.0	2.2	2.3	2.4	2.7	3.0	3.4	3.6	3.9	4.1	4.1
Exports	0.6	0.8	0.9	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Beginning stocks	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7
Ending stocks	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7

Note: the oilseed oil marketing year is July/June; * Rapeseed, soybeans, sunflower seed, cottonseed and groundnuts based oils

Table 7.13 Total vegetable oil* market balance in the EU, 2009-2022 (million t)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Usable production	**14.7**	**14.4**	**14.3**	**13.8**	**14.5**	**14.7**	**15.0**	**15.3**	**15.6**	**15.9**	**16.2**	**16.5**	**16.8**	**17.1**
of which EU-15	12.3	11.9	11.7	11.7	12.1	12.2	12.5	12.7	13.0	13.2	13.4	13.7	13.9	14.1
of which EU-N12	2.4	2.4	2.6	2.1	2.4	2.5	2.5	2.6	2.7	2.7	2.8	2.9	2.9	3.0
Consumption	**22.7**	**21.9**	**21.0**	**20.9**	**21.5**	**22.0**	**22.5**	**23.2**	**24.1**	**24.7**	**25.3**	**25.9**	**26.5**	**26.9**
of which EU-15	19.7	19.0	18.0	17.9	18.4	18.9	19.3	19.9	20.6	21.2	21.7	22.2	22.8	23.2
of which EU-N12	2.9	3.0	3.0	3.0	3.1	3.2	3.2	3.3	3.4	3.5	3.6	3.7	3.7	3.7
of which food and other use	14.2	13.0	12.1	12.2	12.2	12.5	12.5	12.6	12.8	12.9	13.0	13.0	13.5	13.7
of which bioenergy	8.5	9.0	8.8	8.7	9.3	9.6	10.0	10.6	11.2	11.8	12.3	12.9	13.0	13.1
Imports	8.7	8.5	7.7	8.0	8.3	8.5	8.7	9.0	9.4	9.8	10.1	10.4	10.8	10.8
Exports	0.8	1.0	1.1	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9
Beginning stocks	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Ending stocks	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Note: the vegetable oil marketing year is July/June; * Rapeseed, soybeans, sunflower seed, cottonseed and groundnuts based oils plus palm oil, palmkernel oil and coconut oil

Table 7.14 Area under arable crops in the EU, 2009-2022 (million ha)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Cereals	**58.4**	**56.4**	**55.9**	**57.4**	**57.0**	**57.1**	**56.9**	**56.8**	**56.7**	**56.6**	**56.5**	**56.4**	**56.4**	**56.3**
of which EU-15	35.4	34.4	34.2	35.2	35.0	35.1	34.9	34.9	34.8	34.7	34.6	34.6	34.5	34.5
of which EU-N12	23.0	22.0	21.7	22.2	22.0	22.0	21.9	21.9	21.9	21.9	21.9	21.9	21.9	21.8
Common wheat	22.8	23.2	23.2	23.1	23.3	23.5	23.5	23.6	23.6	23.6	23.6	23.8	23.9	23.9
Durum wheat	2.8	2.9	2.5	2.8	2.7	2.7	2.7	2.7	2.7	2.6	2.6	2.6	2.6	2.6
Barley	13.9	12.3	12.0	12.5	12.4	12.3	12.2	12.1	12.0	11.9	11.8	11.7	11.6	11.5
Maize	8.4	8.1	8.9	9.7	9.3	9.3	9.4	9.5	9.5	9.6	9.6	9.7	9.7	9.7
Rye	2.8	2.6	2.2	2.4	2.3	2.3	2.3	2.2	2.2	2.2	2.2	2.1	2.1	2.1
Other cereals	7.7	7.3	7.1	7.0	6.9	6.9	6.8	6.8	6.7	6.7	6.6	6.6	6.5	6.5
Rice	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.4**	**0.4**	**0.4**
Oilseeds	**10.7**	**11.0**	**11.4**	**10.7**	**11.2**	**11.2**	**11.3**	**11.3**	**11.4**	**11.5**	**11.5**	**11.6**	**11.6**	**11.6**
of which EU-15	6.0	6.0	6.2	6.0	6.1	6.1	6.1	6.2	6.2	6.2	6.2	6.3	6.2	6.2
of which EU-N12	4.7	5.0	5.2	4.8	5.1	5.1	5.1	5.2	5.2	5.3	5.3	5.3	5.3	5.4
Rapeseed	6.5	6.9	6.7	6.1	6.5	6.5	6.6	6.6	6.7	6.8	6.8	6.9	6.9	6.9
Sunflower seed	3.9	3.8	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.2	4.2	4.2	4.2
Soybeans	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5
Sugar beet	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**	**1.6**
Protein crops	**0.9**	**1.2**	**1.0**	**0.9**	**0.9**	**0.9**	**0.9**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**
Total selected arable crops	**72.1**	**70.7**	**70.4**	**71.1**	**71.2**	**71.2**	**71.1**	**71.1**	**71.0**	**70.9**	**70.9**	**70.9**	**70.8**	**70.8**
Total utilised agricultural area	179.0	179.2	178.7	178.7	178.6	178.5	178.3	178.1	177.9	177.8	177.6	177.4	177.2	177.1

Table 7.15 Biofuels balance sheet in the EU, 2009-2022 (million tonnes oil equivalent)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Usable production	**10.6**	**11.5**	**11.6**	**11.8**	**12.5**	**13.0**	**13.7**	**14.6**	**15.6**	**16.6**	**17.8**	**18.9**	**19.5**	**20.1**
Ethanol	2.8	3.2	3.3	3.4	3.5	3.6	3.8	4.0	4.3	4.6	5.1	5.6	5.9	6.3
…based on wheat	0.7	1.0	0.9	0.8	0.8	0.9	0.9	1.0	1.1	1.1	1.3	1.5	1.5	1.6
…based on other cereals	0.8	0.9	1.0	1.3	1.3	1.3	1.4	1.6	1.7	1.9	2.2	2.5	2.7	2.9
…based on sugar beet	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.9	0.9	0.9
…2nd-gen.	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2
Biodiesel	7.8	8.4	8.3	8.3	9.0	9.3	9.9	10.6	11.3	12.0	12.6	13.3	13.6	13.8
…based on vegetable oils	7.2	7.6	7.5	7.4	7.9	8.1	8.5	9.0	9.5	10.0	10.4	10.9	11.0	11.1
...based on waste oils	0.5	0.8	0.8	0.9	1.1	1.2	1.4	1.5	1.7	1.9	2.1	2.3	2.4	2.6
…other 2nd-gen.	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2
Consumption	**13.0**	**14.0**	**14.7**	**14.4**	**14.7**	**15.8**	**16.9**	**18.0**	**19.1**	**20.2**	**21.6**	**22.9**	**23.7**	**24.5**
Ethanol for fuel	2.3	2.7	3.0	2.8	3.2	3.8	4.2	4.5	5.0	5.4	6.1	6.8	7.2	7.6
non fuel use of ethanol	1.3	1.1	1.1	1.6	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Biodiesel	9.4	10.1	10.6	9.9	10.4	10.9	11.5	12.3	13.0	13.7	14.4	15.0	15.4	15.7
Net trade	**-2.4**	**-2.5**	**-3.1**	**-2.5**	**-2.2**	**-2.8**	**-3.2**	**-3.4**	**-3.5**	**-3.6**	**-3.8**	**-4.0**	**-4.2**	**-4.4**
Ethanol imports	0.8	0.8	0.9	1.1	0.9	1.3	1.6	1.7	1.8	1.9	2.1	2.3	2.4	2.5
Ethanol exports	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Biodiesel imports	1.7	1.8	2.3	1.6	1.4	1.6	1.7	1.8	1.8	1.8	1.8	1.8	1.9	2.0
Biodiesel exports	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Energy shares:														
Biofuels (RED counting)	**4.1**	**4.6**	**4.9**	**4.7**	**5.0**	**5.4**	**5.8**	**6.2**	**6.6**	**7.0**	**7.5**	**8.0**	**8.3**	**8.6**
1st-gen.	3.7	4.1	4.3	4.0	4.2	4.5	4.8	5.1	5.4	5.6	6.0	6.3	6.5	6.7
based on waste oils	0.2	0.3	0.3	0.3	0.4	0.4	0.5	0.5	0.6	0.6	0.7	0.7	0.8	0.8
other 2nd-gen.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Ethanol	2.3	2.9	3.2	3.1	3.5	4.2	4.7	5.1	5.6	6.1	7.0	7.8	8.3	8.8
Biodiesel	4.8	5.0	5.2	4.9	5.1	5.3	5.6	5.9	6.1	6.4	6.6	6.9	7.0	7.2
Petrol consumption	99.8	96.7	95.4	93.8	92.5	91.8	90.8	90.3	90.1	89.7	89.1	88.6	88.1	87.7
Diesel consumption	199.1	201.4	202.7	203.7	205.0	206.8	208.1	210.4	213.1	215.4	217.1	218.5	219.5	220.6

Table 7.16 Total sugar balance sheet in the EU, 2009-2022 (million tonnes white sugar equivalent)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Sugar beet harvest (million t)	**114.4**	**106.8**	**114.0**	**114.0**	**112.3**	**113.1**	**115.5**	**116.5**	**117.6**	**118.1**	**118.4**	**118.6**	**118.6**	**118.8**
of which EU-15	97.3	90.6	96.3	95.2	94.2	95.0	96.8	97.7	98.6	98.9	99.1	99.2	99.1	99.2
of which EU-N12	17.0	16.2	17.7	18.8	18.0	18.1	18.6	18.8	19.0	19.2	19.3	19.4	19.5	19.6
of which for ethanol	13.4	14.1	14.3	14.5	14.7	15.2	15.2	15.3	15.6	16.0	16.3	16.7	16.9	17.2
of which processed for sugar	101.0	92.7	99.7	99.5	97.6	97.9	100.3	101.3	102.0	102.1	102.1	101.9	101.7	101.6
Sugar production*	**16.6**	**15.9**	**18.0**	**16.4**	**16.2**	**16.3**	**16.7**	**16.8**	**16.9**	**16.9**	**16.9**	**16.8**	**16.8**	**16.8**
Sugar quota	13.3	13.3	13.3	13.3	13.3	13.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
of which EU-15	14.1	13.4	15.1	13.6	13.5	13.6	13.9	14.1	14.1	14.1	14.1	14.0	14.0	14.0
of which EU-N12	2.5	2.5	2.9	2.8	2.7	2.7	2.7	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Consumption	**16.8**	**17.8**	**17.6**	**17.8**	**17.2**	**17.2**	**17.2**	**17.2**	**17.1**	**17.1**	**16.9**	**16.9**	**16.8**	**16.8**
Imports	3.0	4.1	3.8	3.5	2.7	2.7	2.2	2.2	2.0	1.8	1.7	1.6	1.6	1.5
Exports	3.2	1.9	3.2	2.4	1.8	1.8	1.9	1.9	1.7	1.8	1.7	1.7	1.6	1.6
Beginning stocks**	2.0	1.6	2.0	2.9	2.6	2.5	2.4	2.1	2.0	2.1	1.9	1.8	1.7	1.7
Ending stocks**	1.6	2.0	2.9	2.6	2.5	2.4	2.1	2.0	2.1	1.9	1.8	1.7	1.7	1.6

Note: the sugar marketing year is October/September; * Sugar production is adjusted for carry forward quantities and does not include ethanol feedstock quantities; ** Stocks include carry forward quantities.

Table 7.17 Milk supply and utilisation in the EU, 2009-2022

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Dairy cows (million heads)	**23.6**	**23.1**	**22.9**	**22.7**	**22.5**	**22.3**	**22.4**	**22.4**	**22.4**	**22.3**	**22.3**	**22.2**	**22.2**	**22.2**
of which EU-15	17.7	17.5	17.5	17.5	17.5	17.3	17.4	17.4	17.4	17.4	17.3	17.3	17.3	17.3
of which EU-N12	5.9	5.5	5.4	5.2	5.1	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.9	4.9
Milk yield (kg/cow)	**6 255**	**6 467**	**6 631**	**6 746**	**6 858**	**6 931**	**6 961**	**6 999**	**7 026**	**7 050**	**7 081**	**7 113**	**7 144**	**7 175**
of which EU-15	6 761	6 956	7 092	7 155	7 225	7 320	7 347	7 381	7 411	7 437	7 471	7 506	7 539	7 571
of which EU-N12	4 727	4 920	5 127	5 371	5 590	5 598	5 629	5 667	5 683	5 698	5 719	5 740	5 765	5 789
Milk production (million t)	**147.6**	**149.1**	**151.7**	**153.1**	**154.3**	**154.8**	**155.8**	**156.9**	**157.2**	**157.5**	**157.8**	**158.2**	**158.7**	**159.3**
of which EU-15	119.8	121.9	124.2	125.1	126.1	126.5	127.5	128.6	128.9	129.1	129.4	129.8	130.2	130.7
of which EU-N12	27.8	27.2	27.5	27.9	28.2	28.3	28.3	28.3	28.3	28.3	28.4	28.4	28.5	28.6
Delivered to dairies (million t)	**134.0**	**135.9**	**138.6**	**140.1**	**141.4**	**141.9**	**143.0**	**144.2**	**144.5**	**144.8**	**145.2**	**145.6**	**146.3**	**146.9**
of which EU-15	115.5	117.7	120.1	121.2	122.1	122.5	123.5	124.6	124.9	125.2	125.4	125.8	126.3	126.8
of which EU-N12	18.5	18.1	18.5	19.0	19.3	19.4	19.5	19.5	19.6	19.7	19.7	19.8	20.0	20.1
On-farm use and direct sales (million t)	13.6	13.3	13.1	12.9	12.9	12.9	12.8	12.8	12.7	12.6	12.6	12.5	12.5	12.4
of which EU-15	4.4	4.2	4.1	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.9
of which EU-N12	9.2	9.1	9.0	8.9	8.9	8.9	8.8	8.8	8.7	8.7	8.6	8.6	8.5	8.5
Delivery ratio (%)	90.8	91.1	91.4	91.5	91.6	91.7	91.8	91.9	91.9	92.0	92.0	92.1	92.1	92.2
of which EU-15	96.4	96.6	96.7	96.8	96.8	96.8	96.9	96.9	96.9	96.9	96.9	97.0	97.0	97.0
of which EU-N12	66.7	66.6	67.3	68.0	68.4	68.6	68.8	69.0	69.2	69.4	69.6	69.8	70.1	70.3
Fat content (in %)	4.03	4.04	4.04	4.04	4.03	4.03	4.03	4.03	4.03	4.03	4.03	4.02	4.02	4.02
Non-fat solid content (in %)	9.28	9.29	9.29	9.29	9.29	9.29	9.29	9.29	9.29	9.29	9.29	9.29	9.29	9.29

Table 7.18 Fresh Dairy Product supply projections for the EU, 2009-2022 ('000 t)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Production	**45 947**	**46 524**	**46 670**	**47 008**	**47 134**	**47 322**	**48 045**	**48 556**	**48 629**	**48 847**	**49 028**	**49 226**	**49 421**	**49 619**
of which EU-15	40 159	40 577	40 902	41 188	41 287	41 348	41 914	42 212	42 282	42 458	42 631	42 808	42 983	43 160
of which EU-N12	5 788	5 947	5 768	5 820	5 846	5 974	6 130	6 344	6 348	6 389	6 397	6 418	6 438	6 460

Table 7.19 Cheese market projections for the EU, 2009-2022 ('000 t)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Production	**8 738**	**8 956**	**8 976**	**9 061**	**9 155**	**9 212**	**9 314**	**9 394**	**9 416**	**9 453**	**9 497**	**9 539**	**9 586**	**9 631**
of which EU-15	7 550	7 743	7 752	7 823	7 907	7 935	8 009	8 049	8 040	8 065	8 095	8 124	8 157	8 186
of which EU-N12	1 188	1 213	1 223	1 239	1 248	1 277	1 305	1 344	1 376	1 388	1 401	1 415	1 429	1 445
Imports	84	82	74	79	73	73	74	75	75	76	76	76	76	76
Exports	578	676	683	756	794	805	857	888	910	914	926	934	947	956
of which subsidised	281	64	0	0	0	0	0	0	0	0	0	0	0	0
Consumption	**8 244**	**8 362**	**8 366**	**8 385**	**8 434**	**8 480**	**8 531**	**8 531**	**8 541**	**8 590**	**8 622**	**8 656**	**8 690**	**8 725**
of which EU-15	7 165	7 406	7 391	7 321	7 359	7 397	7 440	7 433	7 435	7 476	7 500	7 526	7 552	7 579
of which EU-N12	1 079	957	975	1 064	1 074	1 083	1 091	1 099	1 106	1 114	1 122	1 130	1 138	1 146
per capita consumption (kg)	16.48	16.67	16.62	16.61	16.67	16.73	16.79	16.75	16.74	16.80	16.83	16.87	16.91	16.95
of which EU-15	18.05	18.58	18.46	18.22	18.26	18.30	18.35	18.27	18.23	18.28	18.30	18.32	18.34	18.36
of which EU-N12	10.44	9.27	9.46	10.34	10.45	10.55	10.63	10.71	10.79	10.88	10.96	11.05	11.14	11.24

Table 7.20 Butter market projections for the EU, 2009-2022 ('000 t)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Production	**2 140**	**2 147**	**2 190**	**2 248**	**2 241**	**2 229**	**2 259**	**2 310**	**2 308**	**2 323**	**2 330**	**2 338**	**2 351**	**2 355**
of which EU-15	1 886	1 900	1 940	1 994	1 982	1 962	1 976	2 028	2 027	2 042	2 049	2 058	2 070	2 073
of which EU-N12	253	247	249	254	259	267	283	283	282	281	281	281	281	282
Imports	56	34	38	35	37	38	38	38	38	39	39	40	40	39
Exports	152	157	124	124	128	141	158	167	173	178	184	183	184	185
of which subsidised	91	0	0	0	0	0	0	0	0	0	0	0	0	0
Consumption	**2 049**	**2 098**	**2 109**	**2 120**	**2 125**	**2 126**	**2 144**	**2 201**	**2 194**	**2 194**	**2 195**	**2 195**	**2 207**	**2 209**
of which EU-15	1 808	1 861	1 865	1 873	1 890	1 887	1 906	1 962	1 955	1 955	1 956	1 955	1 968	1 970
of which EU-N12	241	237	244	247	235	239	239	239	239	239	239	239	239	239
per capita consumption (kg)	4.09	4.18	4.19	4.20	4.20	4.19	4.22	4.32	4.30	4.29	4.29	4.31	4.31	4.31
of which EU-15	4.55	4.67	4.66	4.66	4.69	4.67	4.70	4.82	4.79	4.78	4.77	4.76	4.78	4.77
of which EU-N12	2.33	2.29	2.36	2.40	2.29	2.32	2.33	2.33	2.33	2.34	2.34	2.34	2.35	2.35
Ending Stocks	115	40	35	74	99	99	94	74	54	44	34	34	34	34
of which private	38	38	35	74	99	99	94	74	54	44	34	34	34	34
of which intervention	77	2	0	0	0	0	0	0	0	0	0	0	0	0

Table 7.21 SMP market projections for the EU, 2009-2022 ('000 t)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Production	**1 015**	**927**	**1 065**	**1 164**	**1 212**	**1 222**	**1 234**	**1 250**	**1 258**	**1 261**	**1 272**	**1 286**	**1 301**	**1 315**
of which EU-15	854	802	914	982	1 038	1 040	1 041	1 051	1 054	1 052	1 059	1 068	1 082	1 096
of which EU-N12	162	126	152	182	174	182	193	199	204	208	213	218	219	219
Imports	6	4	0	1	1	1	1	1	1	1	1	1	1	1
Exports	231	379	518	618	580	600	611	622	625	633	640	649	664	678
of which subsidised	162	0	0	0	0	0	0	0	0	0	0	0	0	0
Consumption	**720**	**621**	**644**	**630**	**628**	**624**	**624**	**629**	**634**	**629**	**633**	**638**	**638**	**638**
of which EU-15	645	541	568	553	552	547	547	550	554	548	552	556	554	554
of which EU-N12	75	80	76	76	76	77	78	79	80	81	82	82	84	85
Ending Stocks	278	209	113	30	35	35	35	35	35	35	35	35	35	35
of which private	20	20	60	30	35	35	35	35	35	35	35	35	35	35
of which intervention	258	189	53	0	0	0	0	0	0	0	0	0	0	0

Table 7.22 WMP market projections for the EU, 2009-2022 ('000 t)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Production	**735**	**741**	**719**	**678**	**695**	**708**	**715**	**714**	**704**	**698**	**697**	**695**	**699**	**700**
of which EU-15	672	684	662	624	640	651	656	654	641	634	631	628	629	628
of which EU-N12	63	57	56	53	54	57	58	60	62	64	66	68	70	72
Imports	1	2	2	2	2	2	2	2	2	2	2	2	2	2
Exports	460	447	390	360	373	383	393	391	380	373	371	368	371	372
of which subsidised	91	0	0	0	0	0	0	0	0	0	0	0	0	0
Consumption	**276**	**296**	**331**	**320**	**324**	**327**	**324**	**325**	**326**	**327**	**328**	**329**	**330**	**331**
of which EU-15	240	257	294	283	286	290	287	288	289	290	291	292	293	294
of which EU-N12	36	39	37	37	37	37	37	37	37	37	37	37	37	37

Table 7.23 Beef and veal meat market projections for the EU, 2009-2022 ('000 t c.w.e.)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Gross Indigenous Production	**7 982**	**8 239**	**8 206**	**7 831**	**7 756**	**7 860**	**7 943**	**8 043**	**8 028**	**8 016**	**8 006**	**7 987**	**7 971**	**7 961**
of which EU-15	7 158	7 421	7 402	7 075	6 986	7 088	7 169	7 265	7 254	7 248	7 241	7 226	7 213	7 205
of which EU-N12	824	818	804	756	770	772	774	778	774	768	765	762	758	756
Imports of live animals	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Exports of live animals	61	116	156	170	130	120	110	100	90	80	75	70	65	58
Net Production	7 923	8 124	8 050	7 661	7 626	7 740	7 833	7 943	7 938	7 936	7 931	7 917	7 907	7 903
Imports (meat)	359	319	287	268	291	300	308	305	316	324	338	355	358	358
Exports (meat)	91	255	331	190	175	151	101	115	131	147	162	176	174	174
Net trade	-269	-64	44	-78	-116	-149	-207	-189	-185	-176	-176	-179	-184	-184
Consumption	**8 191**	**8 188**	**8 006**	**7 739**	**7 737**	**7 896**	**8 039**	**8 131**	**8 123**	**8 113**	**8 108**	**8 097**	**8 091**	**8 087**
of which EU-15	7 573	7 616	7 454	7 204	7 203	7 348	7 481	7 562	7 557	7 547	7 544	7 535	7 529	7 527
of which EU-N12	618	572	552	535	534	548	558	569	566	565	564	563	561	559
per capita consumption (kg)	16.37	16.32	15.90	15.33	15.29	15.58	15.82	15.96	15.92	15.86	15.83	15.78	15.74	15.71
of which EU-15	19.08	19.11	18.62	17.93	17.87	18.18	18.44	18.59	18.53	18.46	18.40	18.34	18.28	18.24
of which EU-N12	5.98	5.54	5.35	5.20	5.20	5.34	5.44	5.54	5.53	5.52	5.51	5.50	5.50	5.49

Table 7.24 Sheep and goat meat market projections for the EU, 2009-2022 ('000 t c.w.e.)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Gross Indigenous Production	**991**	**976**	**991**	**979**	**957**	**926**	**912**	**895**	**880**	**867**	**861**	**842**	**837**	**831**
of which EU-15	888	871	890	879	862	834	821	806	792	779	774	757	752	747
of which EU-N12	103	104	101	100	95	91	91	90	89	88	88	86	85	84
Imports of live animals	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exports of live animals	4	11	22	24	18	20	20	20	20	20	20	20	20	20
Net Production	987	965	969	955	939	906	892	875	860	848	841	823	817	811
Imports (meat)	271	239	221	177	184	199	203	206	211	205	196	210	212	210
Exports (meat)	8	13	16	22	24	20	20	20	20	20	20	20	20	20
Net trade	-263	-226	-205	-155	-160	-179	-183	-186	-191	-185	-177	-190	-192	-190
Consumption	**1 250**	**1 191**	**1 175**	**1 110**	**1 100**	**1 085**	**1 075**	**1 062**	**1 051**	**1 033**	**1 018**	**1 013**	**1 009**	**1 001**
of which EU-15	1 176	1 113	1 097	1 031	1 022	1 008	999	986	976	958	945	939	935	928
of which EU-N12	74	78	78	79	78	77	76	76	75	74	73	74	74	73
per capita consumption (kg)	2.50	2.37	2.33	2.20	2.17	2.14	2.12	2.08	2.06	2.02	1.99	1.97	1.96	1.95
of which EU-15	2.96	2.79	2.74	2.56	2.54	2.49	2.46	2.42	2.39	2.34	2.30	2.28	2.27	2.25
of which EU-N12	0.72	0.76	0.76	0.77	0.76	0.75	0.74	0.74	0.73	0.73	0.71	0.72	0.72	0.72

Table 7.25 Pig meat market projections for the EU, 2009-2022 ('000 t c.w.e.)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Gross Indigenous Production	**21 921**	**22 741**	**23 111**	**23 000**	**22 297**	**22 495**	**22 635**	**22 783**	**22 825**	**22 813**	**22 804**	**22 883**	**22 914**	**23 028**
of which EU-15	18 600	19 246	19 570	19 512	18 904	19 081	19 190	19 308	19 341	19 319	19 315	19 374	19 401	19 493
of which EU-N12	3 321	3 495	3 540	3 488	3 393	3 414	3 445	3 475	3 485	3 494	3 489	3 509	3 513	3 535
Imports of live animals	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exports of live animals	120	78	71	49	75	65	65	65	65	65	65	65	65	65
Net Production	21 801	22 663	23 040	22 951	22 222	22 431	22 570	22 718	22 761	22 748	22 739	22 818	22 849	22 963
Imports (meat)	34	22	15	14	14	15	15	15	14	14	15	15	15	14
Exports (meat)	1 540	1 839	2 174	2 196	1 867	1 996	1 923	1 973	1 960	1 971	1 939	1 928	1 927	1 981
Net trade	1 506	1 817	2 158	2 181	1 854	1 981	1 908	1 958	1 946	1 956	1 924	1 913	1 912	1 967
Consumption	**20 295**	**20 845**	**20 881**	**20 770**	**20 368**	**20 449**	**20 662**	**20 760**	**20 815**	**20 792**	**20 815**	**20 905**	**20 936**	**20 996**
of which EU-15	15 986	16 463	16 411	16 521	16 226	16 257	16 457	16 522	16 576	16 538	16 565	16 645	16 677	16 737
of which EU-N12	4 309	4 383	4 470	4 248	4 142	4 192	4 205	4 237	4 239	4 254	4 250	4 261	4 259	4 259
per capita consumption (kg)	40.56	41.55	41.48	41.15	40.26	40.33	40.66	40.76	40.79	40.66	40.63	40.74	40.74	40.79
of which EU-15	40.27	41.31	40.99	41.12	40.26	40.21	40.58	40.62	40.64	40.44	40.41	40.51	40.49	40.55
of which EU-N12	41.70	42.45	43.35	41.30	40.29	40.82	40.97	41.32	41.36	41.51	41.53	41.68	41.71	41.77

Table 7.26 Poultry meat market projections for the EU, 2009-2022 ('000 t c.w.e.)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Gross Indigenous Production	**11 630**	**12 147**	**12 369**	**12 610**	**12 806**	**12 712**	**12 713**	**12 656**	**12 754**	**12 784**	**12 800**	**12 824**	**12 858**	**12 912**
of which EU-15	9 154	9 597	9 763	9 769	9 845	9 814	9 817	9 774	9 846	9 851	9 862	9 880	9 906	9 944
of which EU-N12	2 476	2 550	2 606	2 841	2 961	2 898	2 896	2 883	2 909	2 933	2 937	2 944	2 952	2 968
Imports	849	784	821	822	808	811	818	821	822	820	823	826	829	832
Exports	935	1 158	1 295	1 360	1 376	1 367	1 406	1 400	1 385	1 351	1 328	1 322	1 326	1 337
Net trade	86	373	474	538	568	556	588	579	563	531	504	496	498	505
Consumption	**11 544**	**11 774**	**11 895**	**12 072**	**12 238**	**12 156**	**12 125**	**12 077**	**12 191**	**12 253**	**12 295**	**12 328**	**12 361**	**12 407**
of which EU-15	9 116	9 443	9 544	9 675	9 771	9 704	9 681	9 647	9 690	9 712	9 747	9 768	9 797	9 826
of which EU-N12	2 427	2 331	2 351	2 397	2 467	2 452	2 445	2 430	2 501	2 541	2 548	2 560	2 563	2 581
per capita consumption (kg)	23.07	23.47	23.63	23.92	24.19	23.98	23.86	23.71	23.89	23.96	24.00	24.02	24.05	24.11
of which EU-15	22.96	23.69	23.84	24.08	24.24	24.00	23.87	23.72	23.76	23.75	23.78	23.77	23.79	23.81
of which EU-N12	23.49	22.58	22.80	23.30	24.00	23.88	23.82	23.69	24.41	24.79	24.90	25.04	25.10	25.32

Table 7.27 Aggregate meat market projections for the EU, 2009-2022 ('000 t c.w.e.)

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Gross Indigenous Production	**42 524**	**44 103**	**44 676**	**44 419**	**43 816**	**43 993**	**44 203**	**44 378**	**44 488**	**44 480**	**44 470**	**44 536**	**44 581**	**44 732**
of which EU-15	35 800	37 136	37 625	37 236	36 597	36 819	36 998	37 153	37 232	37 197	37 191	37 237	37 273	37 389
of which EU-N12	6 724	6 967	7 052	7 184	7 219	7 175	7 205	7 225	7 256	7 283	7 279	7 300	7 308	7 343
Imports of live animals	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Exports of live animals	185	205	249	243	223	205	195	185	175	165	160	155	150	143
Net Production	42 341	43 898	44 428	44 177	43 594	43 789	44 008	44 193	44 314	44 315	44 311	44 382	44 431	44 589
Imports (meat)	1 514	1 365	1 345	1 281	1 297	1 325	1 344	1 346	1 363	1 363	1 372	1 406	1 413	1 415
Exports (meat)	2 574	3 265	3 816	3 767	3 442	3 535	3 450	3 508	3 496	3 489	3 448	3 445	3 448	3 511
Net trade	1 060	1 900	2 471	2 487	2 145	2 210	2 107	2 162	2 132	2 126	2 076	2 039	2 035	2 097
Consumption	**41 281**	**41 998**	**41 957**	**41 690**	**41 443**	**41 587**	**41 901**	**42 029**	**42 181**	**42 190**	**42 237**	**42 343**	**42 397**	**42 492**
of which EU-15	33 852	34 634	34 506	34 431	34 222	34 318	34 617	34 718	34 799	34 756	34 800	34 886	34 939	35 019
of which EU-N12	7 429	7 364	7 452	7 260	7 221	7 268	7 284	7 312	7 382	7 434	7 436	7 457	7 457	7 473
per capita consumption (kg)	82.51	83.70	83.34	82.61	81.92	82.03	82.45	82.52	82.65	82.50	82.45	82.52	82.49	82.56
of which EU-15	85.27	86.91	86.20	85.69	84.90	84.88	85.35	85.35	85.32	84.99	84.89	84.90	84.83	84.85
of which EU-N12	71.89	71.33	72.26	70.57	70.25	70.79	70.98	71.30	72.03	72.55	72.66	72.94	73.04	73.29
of which Beef and Veal meat	16.37	16.32	15.90	15.33	15.29	15.58	15.82	15.96	15.92	15.86	15.83	15.78	15.74	15.71
of which Sheep and Goat meat	2.50	2.37	2.33	2.20	2.17	2.14	2.12	2.08	2.06	2.02	1.99	1.97	1.96	1.95
of which Pig meat	40.56	41.55	41.48	41.15	40.26	40.33	40.66	40.76	40.79	40.66	40.63	40.74	40.74	40.79
of which Poultry meat	23.07	23.47	23.63	23.92	24.19	23.98	23.86	23.71	23.89	23.96	24.00	24.02	24.05	24.11

8. Introduction - Uncertainties

As pointed out in Chapter 6, the outlook for EU agricultural markets and income (the baseline) presented in Part I of this publication is based on a specific set of assumptions regarding the future economic, market and policy environment. In addition, the baseline assumes normal weather conditions, steady yield trends and no disruptions caused by factors like animal disease outbreaks or food safety issues. The projections are not intended as a forecast of future outcomes, but instead as a description of what may happen given a specific set of assumptions and circumstances, which at the time of making the projections were judged plausible. As such, they serve as a reference for policy simulations. It follows that the baseline projections depict rather smooth market developments, while in reality markets tend to move along a more volatile path as observed in the past and particularly over recent years.

As in former years, the draft version of the 2012 outlook of EU agricultural market and income was presented and discussed with experts at a Workshop on 'Commodity Market Development in Europe - Outlook', held in Brussels on 16-17 October 2012. On this occasion, it was considered that the assumptions underlying the outlook that are subject to the greatest uncertainty are those concerning the general economic outlook. Apart from macroeconomic aspects, there are also other uncertain factors that can have far-reaching implications for EU agricultural markets, such as the biofuel policy, feed cost increases, the path of technological change and future climatic conditions. A detailed analysis of the potential impact of these uncertainties on the market projections in the EU is presented here in Part II.

The uncertainty analysis was carried out at the JRC-IPTS using three different agricultural sector models, namely the Commission's updated AGLINK-COSIMO[10], CAPRI[11] and ESIM[12]. All these models are part of the iMAP modelling initiative[13]. As outlined in the report 'Prospects for Agricultural Markets and Income in the EU. Background information on the baseline construction process and uncertainty analysis'[14], the models CAPRI and ESIM are calibrated to the outlook for EU agricultural markets presented in Part I (the deterministic baseline) to ensure their internal coherence and consistency. These models complement the deterministic baseline by providing results at Member State and regional level (NUTS2), thereby capturing some of the diverse impacts across different regions in Europe.

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[10] The results of any analysis based on the use of the AGLINK-COSIMO model by parties outside the OECD are not endorsed by the OECD Secretariat, and the Secretariat cannot be held responsible for them. It is therefore inappropriate for outside users to suggest or to infer that these results, or interpretations based on them, can in any way be attributed to the OECD Secretariat or to the Member countries of the Organisation.

[11] Britz, W., H.-P. Witzke (eds.) (2008): 'CAPRI Model Documentation 2008: Version 2 p.' Institute for Food and Resource Economics, University of Bonn. http://www.capri-model.org/docs/capri_documentation.pdf . The CAPRI model is calibrated to the EU baseline established with AGLINK-COSIMO.

[12] Banse, M., H. Grethe (2008): 'European Simulation Model (ESIM) in GAMS: Model Documentation (Version 2.0).' Model documentation prepared for Directorate General for Agriculture and Rural Development, European Commission, The Hague and Berlin.

[13] M'barek, R., et al. (2012): 'An integrated Modelling Platform for Agro-economic Commodity and Policy Analysis (iMAP)'. JRC Scientific and Technical Report, European Commission, JRC 69667. http://ftp.jrc.es/EURdoc/JRC69667.pdf

[14] For more details, refer to iMAP modelling team (2011): 'Prospects for Agricultural Markets and Income in the EU. Background information on the baseline construction process and uncertainty analysis'. JRC Technical Report, European Commission, JRC 67803. http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=4879

The uncertainty scenarios analysed here focus on the impacts of i) the variability of input costs at regional level on farmers' income, ii) climate change on the agricultural sector, and iii) different EU biofuel policy scenarios on feedstock markets.

This outlook publication extends the presentation and interpretation of the baseline with a partial stochastic analysis focusing on macroeconomic and crop yield uncertainties in order to assess the sensitivity of agricultural markets to these uncertainties. The partial stochastic simulations incorporating yield uncertainty carried out with AGLINK-COSIMO and ESIM follow a similar approach (namely, repeated solution of the model using different values taken from the multivariate probability distribution of crop yields). ESIM provides detailed results at EU Member State level but has a relatively simple representation of the rest of the world whereas AGLINK-COSIMO gives aggregated results for the EU-15 and the EU-N12 as well as for the most important producing and trading third countries. AGLINK-COSIMO was also used for partial stochastic analysis that analyses uncertainties in yields and macroeconomic variables simultaneously.

The chapters are organised according to the different methodological approaches, and each focuses on one or more of the sources of uncertainty affecting the markets covered in this report. This presentation mode has been chosen to facilitate the reader's understanding and interpretation of the complex methodological issues related to uncertainty analysis. Results are presented at different spatial scales, including EU-27, EU-15, EU-N12, individual EU Member States and the regional level (NUTS2).

Chapter 9 describes partial stochastic simulations that were undertaken to examine the impact of arable crop yield uncertainties and alternative macroeconomic settings on agricultural market developments. ESIM was used to run partial stochastic simulations based on a range of 'possible' crop yields in individual EU Member States, focusing on the differences in yield distribution between Member States. AGLINK-COSIMO embodies the EU markets within a global context, assessing the uncertainties in EU macroeconomic variables and global-regional crop yields. The sensitivity of the deterministic market projections to particular uncertainties is explored by selecting simulations based on specific assumptions about uncertain 'states of the world'. The selected subsets highlight the consequences on the projections if the Euro would be stronger relative to the US dollar than in the baseline, if the maize yield would be lower in the US, if the feed costs in the EU would be higher and if the oil price would be higher than the one assumed in the baseline.

Chapter 10 shows the impacts of higher farm input costs in the EU on production, trade balances and on farm incomes at regional level, for which the CAPRI model provides a more traditional sensitivity analysis. The analysis points out in particular the consequences of higher feed costs that could result from an increase in meat demand in China.

Chapter 11 reports medium-run economic impacts of climate change in EU regions, based on yield changes. These yield changes induced by climate change have been provided by the JRC biophysical modelling platform BIOMA[15] and

[15] BioMA (Biophysical Models Applications) is a software framework developed for analysing, parameterizing and running modelling solutions based on biophysical models against a database that includes spatially explicit units. See http://bioma.jrc.ec.europa.eu/

introduced into the CAPRI model. This chapter compares the market developments in case farmers would not adapt to the changes in climate conditions to a situation where farmers would change their practices to maximise their yields.

Chapter 12 reports the impacts of uncertainty concerning EU biofuel policy and usage. The first scenario assumes a situation where the EU achieves the mandated 10% of transport fuel consumption from renewable energy by 2020 (instead of the 8% envisaged in the baseline). A second scenario analyses the possible consequences for the projections of adopting the European Commission's proposal for more sustainable biofuel production (COM(2012)595), which would limit the permitted contribution of first-generation biofuels towards the Renewable Energy Directive target to 5%.

9. Consequences of macroeconomic and yield uncertainties – Partial stochastic simulations

Section 9.1 of this chapter analyses the consequences of the arable crop yield uncertainties using the ESIM model, and focuses on differential yield uncertainties at EU Member State level. This is followed by results of partial stochastic simulations involving uncertainties in EU macroeconomic and arable crop yield simultaneously. This analysis takes into account arable crop yield uncertainties in the major crop producing regions worldwide. However, the EU is divided into only two blocks, EU-15 and EU-N12.

9.1. Uncertainties in EU arable crop yields: assessment of the consequences at Member State level

Uncertainty of prices, from one market year to the next, has been a topic of much discussion in recent times. Part of the crop price variation observed in the past can be explained by changes in supply due to crop yield variation caused by fluctuations in weather patterns. Partial stochastic simulation is a way of investigating the consequences of crop yield uncertainty on annual market outcomes. The simulations presented here were carried out using the European Commission's partial stochastic version of ESIM.

9.1.1. Scenario settings

The ESIM was adapted[16] to enable partial stochastic simulation of yields of common wheat, barley, maize, rapeseed, soybeans, sunflower seed and sugar[17] in the EU (at Member State level), Turkey, the US and the aggregate 'rest of the world'. The yields presented in the deterministic baseline are a function of EU arable crop prices, individual commodity price cost indexes and a time trend including technical progress. For this work, the stochastic yield equations include an additional variable to reflect differences between the time trend[18] (corresponding to the expected yield in normal weather conditions) and the observed yield. This variable measures the yield forecast error. It is assumed that the forecast errors follow a joint normal distribution and the historical correlations between crops and EU Member States, Turkey, the US and the 'rest of the world' are maintained. The model is run stochastically only in the year 2022. In this year, for the stochastic solutions, area and yield are fixed so as to simulate the inability of farmers to adapt to short term weather shocks.

Results include coefficients of variation (CV); it is the ratio between the standard deviation and mean of a particular variable. The box plots give the minimum value, the lower quartile, the median, the upper quartile and the maximum value, as well as points considered as outliers. They are a practical way of describing the distribution of the variables in absolute terms. The CV measures dispersion in relative terms and facilitates the comparison of the degree of uncertainty of variables with different units of measurement and different mean levels.

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[16] The model has been adapted following Artavia, M. (2013): 'Stochastic Multi-Market Modelling with Efficient Quadratures: Does the Rotation of Stroud's Octahedron Matter?' Ph.D. Thesis, Humboldt University of Berlin.
[17] Sugar in ESIM is handled as a crop with a yield and an area equation.
[18] In ESIM the time trend is taken from 'Outlook on EU Member States Yield Growth Rates: A Pragmatic Approach', Artavia (2012) available at: http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=5499

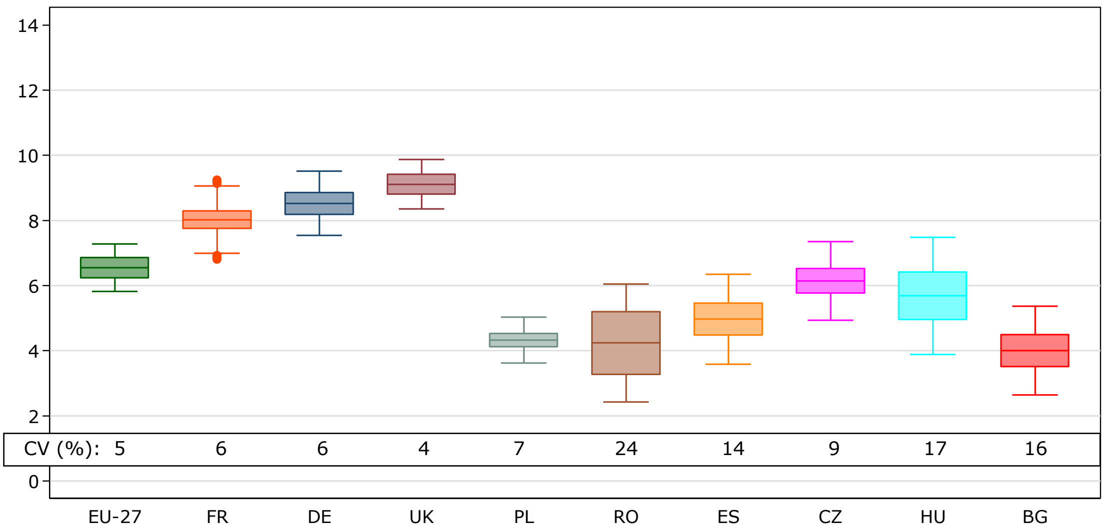
9.1.2. Results

Yield uncertainty at aggregate EU level and in individual Member States

Graph 9.1, Graph 9.2 and Graph 9.3 give the distributions of common wheat, maize and rapeseed yields in the EU at the aggregate and individual level. Only a selection of Member States is presented. The selection has been made essentially according to Member States' shares in EU production in 2022, in decreasing order from left to right.

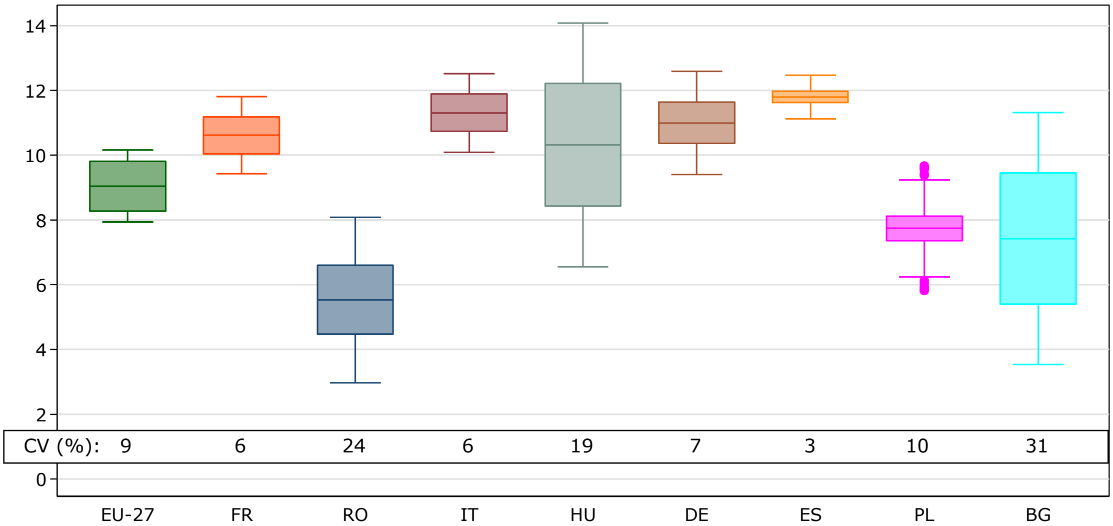
At the aggregate EU level, yield uncertainty is often lower than at Member State level. For example, the CV of common wheat yield is on average 5% in the EU whereas it varies from 4% in the UK to 24% in Romania (see Graph 9.1). This is because the yield forecast errors between Member States in different regions of the EU are not strongly correlated. Apparently, off-trend weather conditions are not highly linked over such a large area. Thus, when some Member States experience negative yields others may present normal or positive ones, resulting in the observed lower yield variation on aggregate. Maize is an exception in that at the EU level maize yield uncertainty is higher than in many Member States, for example France, Italy, Germany and Spain (see Graph 9.2). This is because a substantial share of EU production (33% for 2022 in ESIM) is produced in Romania and Hungary, which are Member States with high correlated yield uncertainty.

Graph 9.1 Distribution of common wheat yield for the EU and in some selected Member States (t/ha)



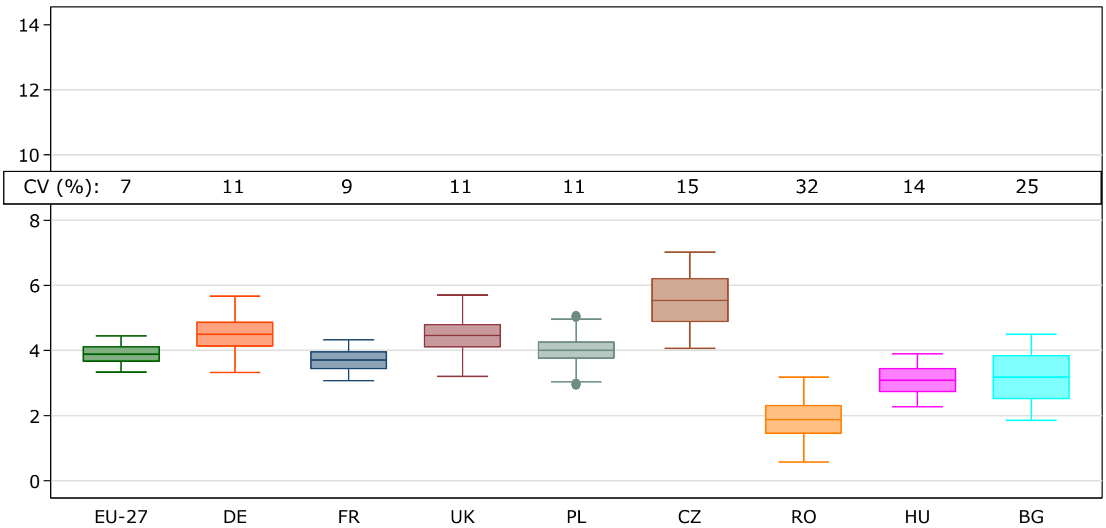
The level of uncertainty is higher in the Member States of the EU-N12, especially in Hungary, Romania and Bulgaria (see Graph 9.1, Graph 9.2 and Graph 9.3). For these three countries one of the main explanations for the higher uncertainty is the higher frequency of extreme weather events, for example droughts. Another factor is the degree of development of farm infrastructure and mechanisation, which is lower than in the EU-15. For example, in farms and regions without irrigation systems, the effect of droughts is much greater than in farms with irrigation systems. In the EU-15, Spain is the Member State with the highest level of uncertainty, thereby highlighting its greater exposure to extreme weather conditions. Again, maize is the exception: maize farms in Spain have invested in irrigation systems reducing their sensitivity to short run weather shocks.

Graph 9.2 Distribution of maize yield for the EU and in some selected Member States (t/ha)



With a coefficient of variation of 7.2% at the aggregate EU level, rapeseed presents a higher yield uncertainty than common wheat or sugar (CV at 5.3% and 4.0% respectively). In this case, the lower level of yields may play an important role; weather consequences for low yields have a higher relative effect. By contrast, sugar yield has low uncertainty at EU level and the differences in uncertainty between the main producing Member States are small.

Graph 9.3 Distribution of rapeseed yield for the EU and in some selected Member States (t/ha)

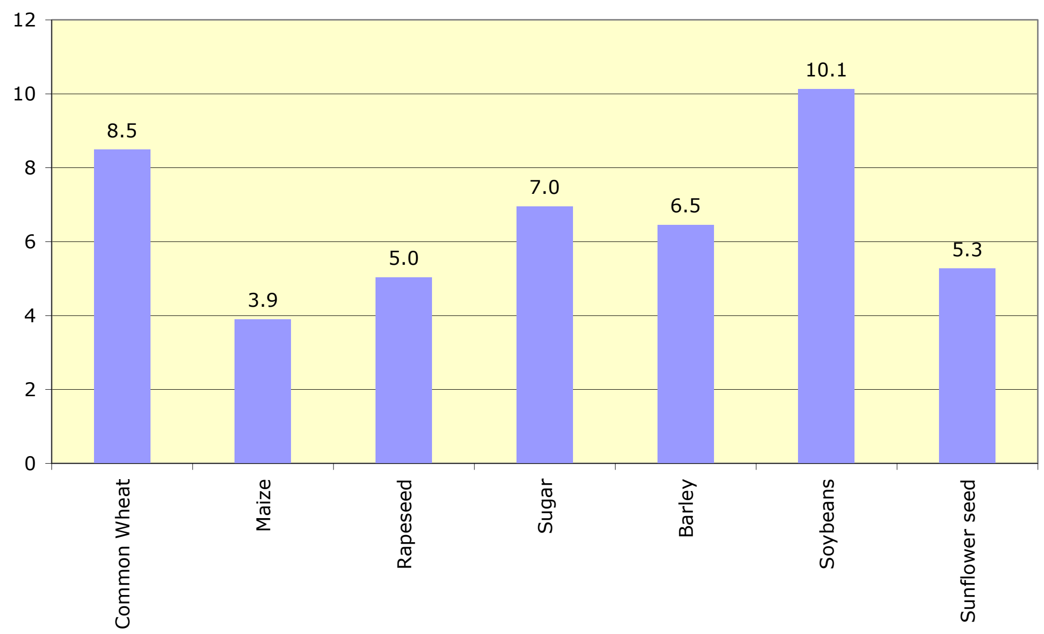


Price uncertainty

The reaction of world trade to price changes is the main factor contributing to the level of price variation obtained from the market model. For this reason, an understanding of EU price uncertainty depends on knowledge of supply and demand in the main trading partners, in this case the EU, the 'rest of the world' and the US. It has been assumed that farmers are not able to adapt (the area allocation or the use of inputs) to price changes originating from short run yield drops or increases due to abnormal weather. Thus, the only element affecting the supply side is the simulated yield uncertainty. On the demand side, the level of reaction is determined by the price elasticity of its different components, namely human demand, feed demand, processing demand and seed demand.

Graph 9.4 compares the degree of price variability at EU level between different crops. Common wheat and soybeans present rather high price variation (CVs of 8.5% and 10.1% respectively) while maize, rapeseed and sunflower seed have lower price variation (CVs of 3.9%, 5.0% and 5.3% respectively). Common wheat and soybean prices variation are relatively high due mainly to inelastic human demand. Maize has low price uncertainty due to the combination of two factors. On the demand side, the US contributes to the compensation of the supply shocks since its processing demand for ethanol production is elastic (with a CV of 7.2%) and it represents a considerable share (about 35%) of global maize use. On the supply side, the CVs in the 'rest of the world' and the US, the large world producers, are low (3.2% and 3.9% respectively). In the case of rapeseed, the processing demand for oil for human consumption and for biodiesel production takes a very large share of world demand and is elastic; thus, this demand absorbs the supply shocks without there being much effect on prices. In the case of sunflower seed, the processing demand for oil production for human consumption is more important than in the case of rapeseed; the share dedicated to biodiesel production is less. Thus, demand is elastic but not as much as for rapeseed.

Graph 9.4 Uncertainty in EU domestic prices of selected crops (CV in %)

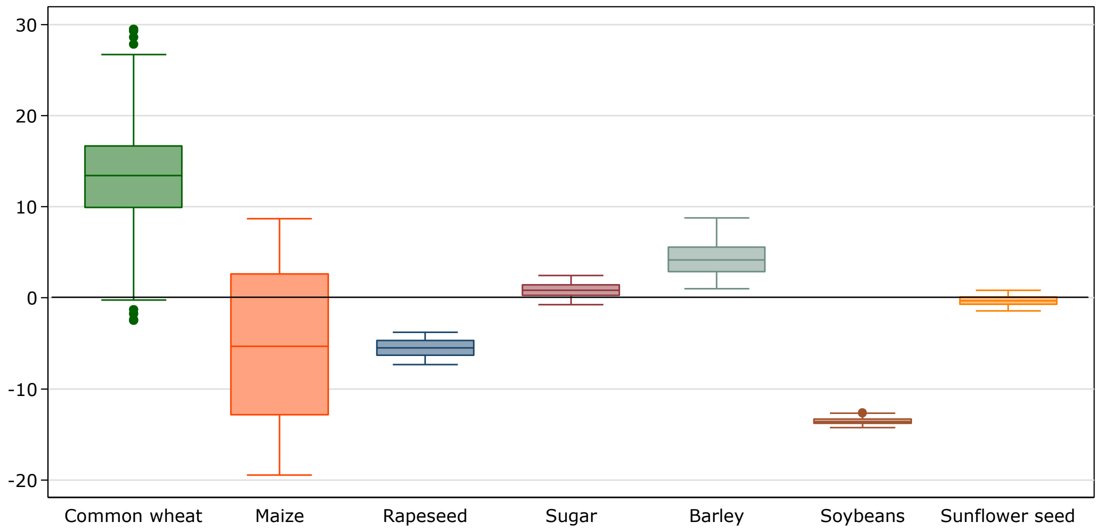


Net trade

Yield uncertainty translates into uncertainty regarding the EU net trade position for common wheat and for maize. In a few of the 200 simulations performed for 2022, the EU is a net importer of common wheat, otherwise it is a net exporter; in about 30% of the cases, the EU is a net exporter of maize.

The effect of yield uncertainty on EU net trade is transmitted via the size of the supply shocks and the sensitivity of demand to price differences. The variation in the net export position for common wheat is more demand-oriented. Price uncertainty for that commodity is high and the total demand is elastic as large shares of it are used to meet feed demand and ethanol production (42% and 20%, respectively). On the other hand, as shown in Graph 9.1, yield uncertainty is not very high at the EU level (CV of 5%). The variation of net maize exports is to a certain extent a consequence of changes on the supply side. As shown in Graph 9.2, yield uncertainty for maize is significant at the Member State and at the EU level. Furthermore, aggregate EU demand is not as elastic as that of common wheat; maize is more commonly used for animal feed in the EU and less for ethanol.

Graph 9.5 Net trade distribution of selected crops (million t)



9.1.3. Conclusion

In the EU, yield variability is higher for maize than for common wheat or rapeseed. Also, at the aggregate EU level uncertainty may not be such a major issue, although at the individual Member State level it can be very significant. In general, in the EU-N12, Romania, Hungary and Bulgaria show very high yield uncertainty; in the EU-15, Spain presents high yield uncertainty with the exception of maize. Yield uncertainty in the EU, US and 'rest of the world' is transmitted to a significant extent to EU domestic prices and net trade. However, the extent of the resulting uncertainty is different from crop to crop and with respect to prices and net trade. Wheat and soybean prices present high price instability due to inelastic demand while maize presents lower price instability. On the other hand the maize net trade is more uncertain than for the other crops due to the high uncertainty of the EU supply.

9.2. Uncertainties in EU macroeconomic variables and global-regional crop yields: assessment of the consequences at EU level

9.2.1. Scenario setting

The outlook for EU agricultural markets is subject to a number of quantifiable uncertainties that are exogenous to agricultural markets such as macroeconomic developments and yield patterns. This chapter illustrates the implications of these uncertainties for the deterministic baseline using partial stochastic simulation and the AGLINK-COSIMO model[19].

Macroeconomic uncertainties

Non-agricultural markets are exogenous in the AGLINK-COSIMO modelling system and therefore assumptions about the trends followed by key macroeconomic variables are formed exogenously with no accounting for feedback in agricultural markets to the rest of the economy. Inevitably, forecasts of the evolution of the European economy differ from one forecasting organisation to another. This is particularly true for forecasts of macroeconomic drivers like the Brent crude oil price[20].

An assessment of the implications of these uncertainties for the baseline projections of agricultural markets has been undertaken using partial stochastic analysis. The exercise begins by estimating the degree of uncertainty inherent in the following eight macroeconomic variables.

- EU-15 and EU-N12 Gross Domestic Product (GDP) (expressed as an index), which also serves as a proxy for consumer income;
- EU-15 and EU-N12 Consumer Price Index (CPI) (expressed as an index). It measures the price level of consumer goods and services purchased by households;
- EU-15 and EU-N12 GDP Deflator;
- the USD/EUR exchange rate, expressed as the US dollar price of one Euro, which reflects fluctuations in relative competitiveness; and
- the world oil price, which is the Brent crude oil price in USD/barrel.

Macroeconomic uncertainty in non-EU countries is ignored, apart from the endogenous impacts on these countries produced by different assumptions about relative competitiveness and the world oil price.

The European Commission's Directorate-General for Economic and Financial Affairs (DG ECFIN) publishes its main economic forecasts in the spring and autumn of each year. The 18-month forecast errors of the above eight variables are used to

[19] The methodology is detailed in: Burrell, A., Z. Nii-Naate (2013): 'Partial stochastic analysis with the European Commission's version of the AGLINK-COSIMO model' JRC Scientific and Technical Reports, European Commission, JRC76019: http://ftp.jrc.es/EURdoc/JRC76019.pdf

[20] See table 5 – 2013 Growth in prices and monetary indicators of HM Treasury's forecasts for the UK economy: a comparison of independent forecasts (17th October 2012): http://www.hm-treasury.gov.uk/data_forecasts_index.htm

construct alternative possible pathways for the macro economy and the distribution of future 'states of the world', which when fed back into the modelling systems serve as alternative coherent sets of macroeconomic assumptions for the simulation runs.

Arable crop yield uncertainties

Much of the variation in EU arable crop production and market prices observed in the past can be explained by variations in arable crop yields, a significant part of which is due to fluctuations in weather patterns. Partial stochastic simulation of arable crop yields attempts to capture these fluctuations. Analysis of past crop yield fluctuations around the estimated trends in crop yields, together with the assumption that this pattern of variation will persist in the future, permits probabilistic limits to be fixed around the European Commission's agricultural baseline projections of production and prices that take uncertainty in arable crop yields into account. Regional weather blocks are created (EU-15 and EU-N12, Black Sea (Kazakhstan, Russia and Ukraine), North America (Mexico and US), South America (Argentina, Brazil, Paraguay and Uruguay), South East Asia (Indonesia, Malaysia and Thailand) and Australia). Fluctuating weather patterns are correlated within regional blocks but not across regional blocks. It is also assumed that weather fluctuations are not correlated across years.

A combined analysis

In this analysis, the impacts of uncertainty in both macroeconomic variables and arable crop yields around the world are examined simultaneously. The model was simulated 500 times, with a success rate of over 93%.

Table 9.1 Average coefficient of variation (%) of yield for selected arable crops, 2013-2022

	EU-15	EU-N12	Ukraine	Kazakhstan	Russia	Mexico	US	Brazil	Argentina	Indonesia	Malaysia	Thailand	Australia
Wheat*	7	15	33	30	21	13	10	30	14				70
Maize**	8	27	22			17	15	13	14				21
Palm oil										12	7		
Oilseeds	4	9	25	37	8	0	5	2	9				12
Sugar beet***	9	5	0	0	21		15	5	26			46	14

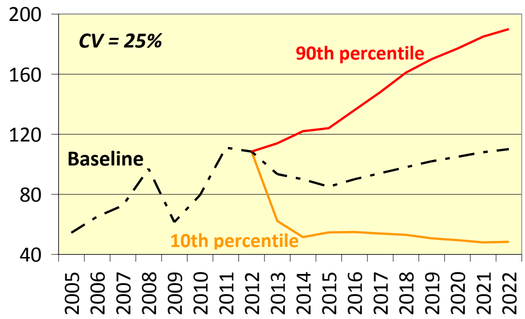
* Common wheat for the EU
** Coarse grains for Ukraine and Australia
*** Sugar cane for Brazil, Argentina, Thailand and Australia

The simulation illustrates that crop yield uncertainty, based on past observations, is greatest in Australia and in the Black Sea region. A summary of the average coefficients of variation for the simulated yields of the major arable crops between 2013 and 2022 is reported in Table 9.1. The results presented below for each uncertain exogenous factor focus on the simulations between the 10^{th} and 90^{th}

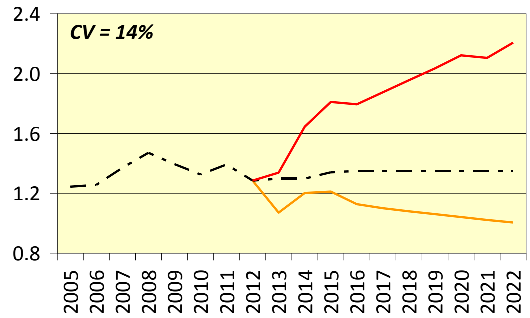
percentiles[21]. This leaves a rather wide range of possible outcomes but removes extreme outlying values that have only a small probability of occurring. The statistic used to assess the uncertainty transmitted to a particular variable is its annual coefficient of variation (the standard deviation of the values between the 10th and 90th percentiles, relative to the mean) averaged over the projection period (2013-

2022).

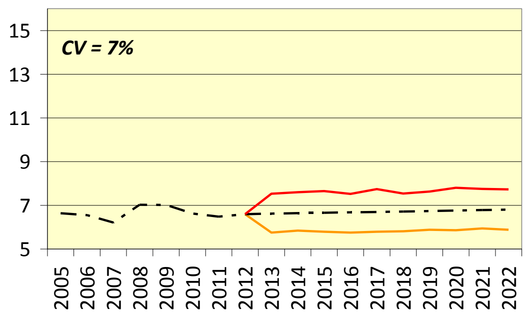
Graph 9.6 Crude Oil Price (USD/barrel)



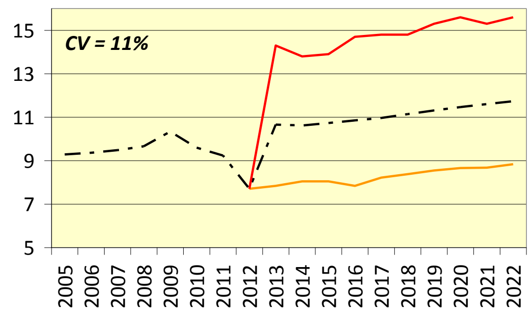
Graph 9.7 USD/EUR Exchange rate



Graph 9.8 EU-15 Common Wheat Yield (t/ha)



Graph 9.9 US Maize Yield (t/ha)



By 2022, the 90th percentile of the world oil price projections is over 190 USD/barrel whereas the 10th percentile is below 60 USD/barrel (see Graph 9.6). This wide spread reflects the extreme uncertainty about this value, which cumulates over time. Throughout the projection period, an increasingly wide distribution of plausible crude oil prices can be seen. Regarding the USD/EUR exchange rate, the value of the 90th percentile (2.1) in 2022 indicates a very large appreciation of the euro relative to the US dollar, which reduces EU competitiveness (see Graph 9.7). This leads to a higher level of commodity imports and lower exports from the EU. However, the 10th percentile at 1.00 indicates a depreciation of the Euro relative to the US dollar, which improves EU competitiveness and allows an improvement in net trade.

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[21] The 10th percentile of the simulation outcomes is the value such that 10% of the values lie below it. The 90th percentile simulation outcome marks the boundary between the 90% smallest outcomes and the 10% largest outcomes. The values between these two percentiles (80% of the outcomes) are the range that is analysed.

Across all the analysed arable crops, the level of uncertainty remains relatively unchanged up to 2022. Two examples (wheat and maize) are reported below. The data suggest that the EU-15 common wheat yield is more stable relatively speaking than that of US maize. This is explained by the comparative frequency of more extreme weather patterns in the US than in Europe.

In this analysis, we use joint probabilities to investigate subsets of the solved stochastic simulations. It means that out of the 467 solved solutions, we isolate subsets of the runs that correspond to hypothetical future states of the world. For example, a subset of runs where the oil price is far above the level assumed in the deterministic baseline and lies between the 60th and 80th percentiles is analysed below. Other criteria are imposed to focus more closely on particular ranges of uncertainty. Depending on the selection criteria, the subset of simulation results analysed may consist of relatively small number of simulations. It should be borne in mind that despite the focus on subsets post-simulation, all the variables treated as uncertain are run stochastically. The results are presented for the year 2022 in the section below.

9.2.2. Market developments sensitivity to a stronger Euro than in the baseline

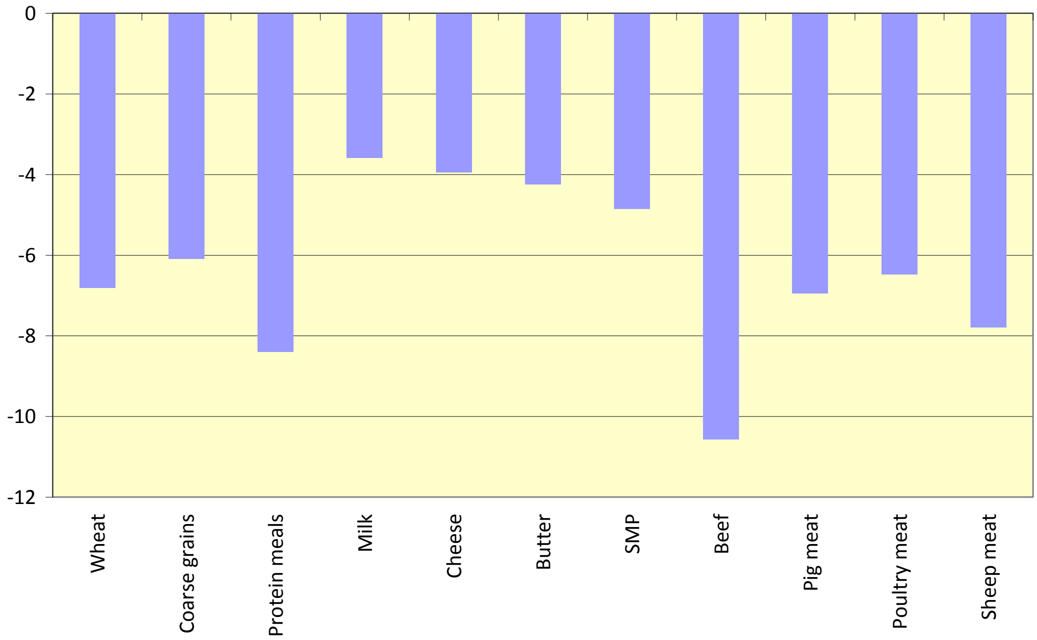
During the 2012 Outlook Workshop, where the preliminary projections were presented, 44% of workshop participants thought that the 2022 USD/EUR exchange rate would be above the baseline assumption of 1.35, but below 1.50. For this reason the focus in this section on a subset of 38 simulations ranging between the 55th and the 65th percentile exchange rate over the 2020-2022 period. It corresponds to an average exchange rate of 1.48 USD/EUR in 2022.

Lower prices and income with a stronger Euro

Graph 9.10 shows the differences with respect to the baseline in the average outcomes for this subset of simulation runs. When the Euro is stronger relative to the US dollar than in the baseline, imports are cheaper but at the same time the EU is less competitive on the world market and export demand is lower. As a consequence EU prices are pushed down. Hence in this scenario wheat and coarse grain prices fall by 7% and 6% respectively. The lower wheat price implies a fall in output of 1.5 million tonnes and reduced availability for animal feed (-2%). Thanks to a small gain in competitiveness, coarse grain and protein meal production increase and maize imports are lower than in the baseline (Graph 9.11).

With the general price decrease and despite the decline in feed costs for livestock producers, the average EU income per Annual Working Unit (AWU) is 12% lower than the baseline level in 2022 (see Table 9.2).

Graph 9.10 Change in EU-27 prices in comparison to the baseline, 2022 (%)



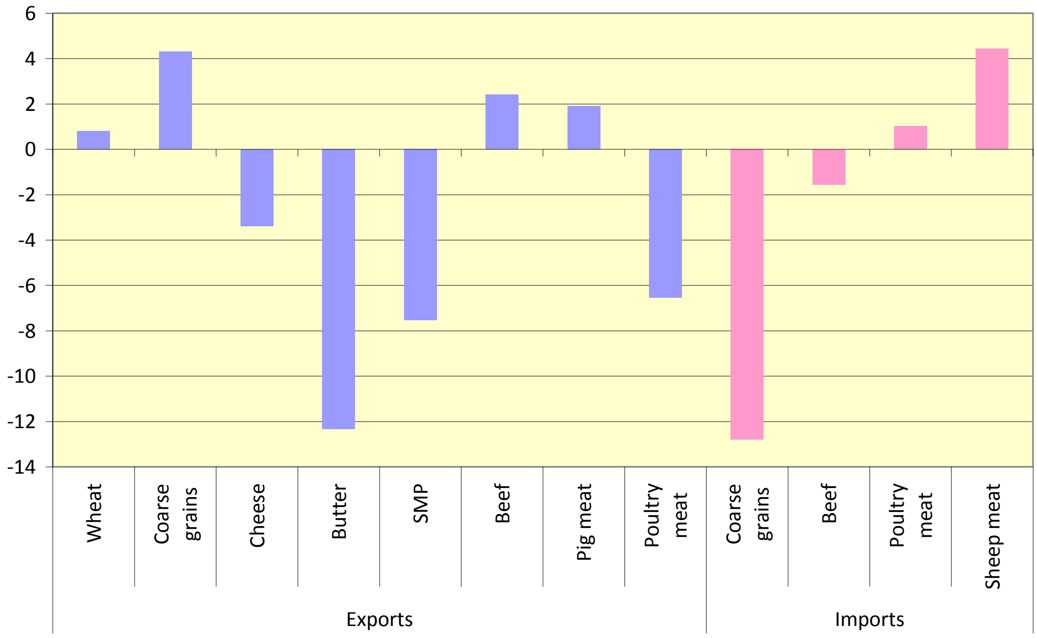
With a stronger Euro, it is cheaper to buy lamb on the world market thus imports are 4% higher than in the baseline. In contrast, beef imports decrease slightly (-2%) and beef exports increase by 2%. Given the decline in feed prices, feed costs are 7% below the baseline and European beef gains competiveness on the world market.

Trade of dairy products and poultry negatively affected by a stronger Euro

The competitiveness of dairy products and poultry is negatively affected by a stronger Euro despite the feed cost decrease. In 2022, butter and SMP exports are lower than in the baseline by 12% and 8% respectively. In addition, SMP production is 4% below the baseline. Given the predominant share of the EU in total world exports and its implied role in cheese price developments, cheese trade is less affected.

Poultry exports are 7% below the baseline, the poultry price decrease on the domestic market leads to slightly higher consumption (+1%).

Graph 9.11 Change in EU-27 trade in comparison to the baseline, 2022 (%)



9.2.3. Market developments sensitivity to lower maize yields in the US

Higher crop prices and feed costs

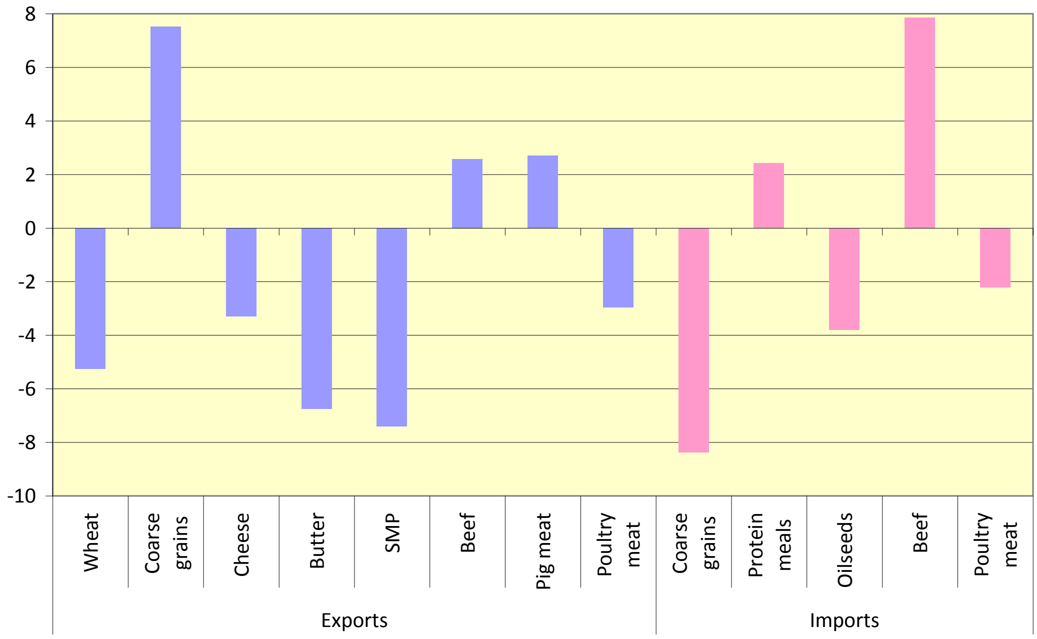
The average US maize yield for 2012 is estimated at 8 tonnes/hectare, it was 10 tonnes/hectare in 2011 (USDA, 2012). Further to this year's drought in the US, a subset of 68 simulations with a low maize yield in the US in 2022 (9.7 tonnes/hectare on average, varying from 8.8 to 10.5 tonnes/hectare, from the 10^{th} to the 30^{th} percentiles) was analysed to assess the sensitivity of the projections to this kind of weather event. The selection criterion applies only to 2022, meaning that for the selected simulations the maize yield in the previous years may be higher than in the baseline. Therefore very limited adaptation of the area allocation can take place.

In the baseline, maize yield is 11.7 tonnes/hectare. In this subset, maize exports are 24% lower than in the baseline. With the US being the largest exporter of maize, world maize prices increase by 12% relative to the baseline. Given the world market attractiveness, the EU increases its exports of coarse grains by 8% (see Graph 9.12). At the same time, high prices imply a substantial decrease in maize imports (-8%). Wheat exports decrease (-5%) as well as the production of wheat-based ethanol and more wheat is used to feed livestock.

Lower exports of dairy products and higher beef consumption

Higher crop prices on the world market cause feed costs to increase by 9%. As a consequence, competitiveness of dairy products decreases, with exports contracting by 7% for butter and SMP and 3% for cheese. For the same reason, poultry exports are 3% lower. Indeed, poultry exports decrease worldwide as feed is more expensive for all producers. As a result, EU poultry prices grow by 4%. Due to substitution by consumers of chicken with beef, for which the price remains stable, beef consumption increases (+1%) and because of this higher demand beef imports increase substantially (+8%).

Graph 9.12 Change in EU-27 trade in comparison to the baseline, 2022 (%)



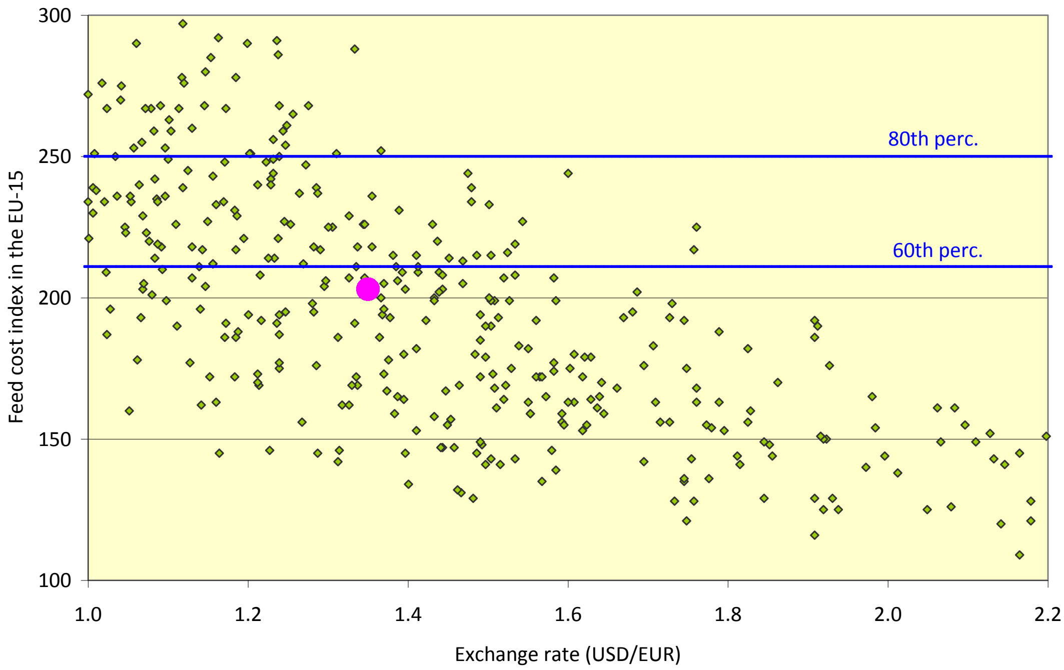
In the event of drought in the US, feed costs are 5% higher than in the baseline and fertiliser and energy costs are up by 7%. Those costs are linked to oil price level and in this subset of runs, the oil price is 5% higher than in the baseline. At the same time, the increase in EU prices translates into a 4% increase in the value of production relative to the 2022 baseline. Further to a drought in the US, crop producers may be better off than livestock producers but the average EU agricultural income remains almost unchanged when both revenue and cost changes for all sectors are taken into account.

9.2.4. Market developments sensitivity to higher feed costs

Feed costs may increase for various reasons, such as reduced availability of grain on the world market due to drought in a major world producer, as analysed above. However, feed costs can also be higher in the EU-27 when the Euro is weaker than the US dollar because importing goods becomes more costly and the gain in EU competitiveness leads to a more attractive world market for exports. There is a fairly strong correlation between these two variables, as illustrated in Graph 9.13.

In this section, we focus on the subset of simulations with a feed cost index between the 60th and 80th percentiles, i.e. with values between 210 and 250 (compared to 200 in the baseline). The average value of the feed cost index in this subset is 230, which is 13% higher than in the baseline. In addition, it should be mentioned that the average USD/EUR exchange rate is 1.20, 12% below the baseline level (see Table 9.2). This is a major difference compared to the subset analysed in section 9.2.3, which had feed costs 9% higher than in the baseline but a similar average exchange rate as in the baseline.

Graph 9.13 Feed cost index and exchange rate, all simulation runs, 2022



Note: Each square represents one simulation. The pink dot is the baseline and the blue lines delimit the selected subset.

More production and exports mainly due to the correlated weaker Euro

In this subset, contrary to the results presented in the previous section, production of milk, coarse grains and poultry meat are all 1% higher than in the baseline. It is to be noted that the selection criterion was applied to three consecutive years, from 2020 to 2022; therefore, in this subset feed costs are higher and the Euro is weaker than in the baseline for three consecutive years, which gives production time to adapt.

The other major difference with the previous results is due to the USD/EUR exchange rate. With a weaker Euro relative to the US dollar, the EU becomes more competitive. Butter, coarse grains, poultry meat and SMP exports are significantly higher than in the baseline. At the same time, domestic prices go up (from +8% for butter to +16% for wheat), which stimulates higher EU production. The increase in poultry meat and milk production drives an increase in feed demand of 3% for wheat and 2% for maize. The higher domestic and export demand for coarse grains lead to a 1% increase in production. However, for wheat the 1% higher demand leads to a smaller production increase and to 15% higher imports. The world wheat price increases less than the EU price and imports become more advantageous. At the same time, on the domestic market coarse grains gain competitiveness against wheat because production costs increase less than for wheat.

A higher income

With the Euro weaker than in the baseline, imports are more costly; poultry and sheep meat imports decrease by 7% and 4% respectively. The picture for beef is again different from the other meats. In the subset of runs analysed here, feed costs are growing more in the EU than in South America the EU's main import supplier where most feeding systems are grass-based. Beef imports are therefore higher than in the baseline (+20%), although they nevertheless remain far below the total tariff rate quota.

The EU price and production increases lead to an increase in the total value of production of 9%, which offsets the increase in production costs. The net result is that the average income per AWU is 8% higher than in the baseline (see Table 9.2).

9.2.5. Market developments sensitivity to higher oil price

At the 2012 Outlook Workshop, 50% of participants thought that the oil price in 2022 would be higher than assumed in the baseline in 2022, while 42% thought the baseline level (110 USD/barrel) was most likely. For this reason it was decided to specifically analyse the simulations with an oil price varying from 126 USD/barrel (the 60th percentile) to 163 USD/barrel (the 80th percentile). On average, in this subset of runs, the oil price is 32% higher than in the baseline. We note also that in this subset the GDP index is 5% above the baseline, given that these two variables are correlated. In addition, the selection criterion, even though applied in 2022 only, implies that in this subset the oil price is on average 30% above the baseline over the 2017-2022 period.

The oil price increase drives the maize price up

In a context of higher oil prices, the production costs for wheat and maize are both higher than in the baseline (by 3% in 2022). However, given the correlation between oil and maize prices, the world maize price is higher than in the baseline (by 5%). This price increase is lower for wheat (+1%). Therefore, wheat is a relatively less attractive crop to producers than maize and wheat production decreases (-1%) to the benefit of coarse grains (+1%). Since total use remains unchanged, the change in production is accommodated by changes in trade flows: barley exports increase by 10%, maize imports decrease by 13% and wheat exports are 2% below the baseline in 2022. A higher oil price is more favourable to biodiesel than to ethanol whose production decreases slightly. The reduced use of cereals for biofuel production is absorbed by an increase in food and feed use.

More consumption of animal products

For the animal products, the prevailing effect in this subset of runs is the higher GDP growth that leads to a higher EU consumption of meat (+1%), and of cheese and fresh dairy products (+1%). Since total EU milk production is almost unchanged, the demand increase is met by a reduction in cheese exports and by a small increase in production of these two dairy products mainly at the expense of SMP. The milk price is 4% higher than in the baseline in 2022. To allow for the increase in meat consumption, poultry exports decrease by 9% and beef imports increase by 10%. Pork exports are unchanged.

A negative effect on income

Because of the higher oil price, energy and fertiliser costs are 26% above the baseline in 2022. The small increase in most of the commodity prices combined with the production decrease for certain products like wheat lead to a small increase in production value (+1%). As a result, in this subset, the EU average income per AWU is 9% below the baseline (see Table 9.2).

Table 9.2 Subsets and uncertainties in the EU, 2022 (% change relative to the baseline)

	Stronger EUR	Lower US maize yield	Higher Feed Costs	Higher oil price
USD/EUR exchange rate	9	-1	-12	3
Feed cost index*	-7	9	13	1
Oil price	9	5	2	32
GDP index	1	2	2	5
Wheat production costs**	-2	1	6	3
Income per AWU	**-12**	**1**	**8**	**-9**

* Non ruminants in the EU-15

** Common wheat production costs index in the EU-15

9.2.6. Conclusion

This partial stochastic analysis highlights that uncertainty in yields and macroeconomic variables have a significant impact on EU market developments and in average EU income (see Table 9.2). In addition, it allows assessing the sensitivity of the projections to the uncertainty of a particular outcome while the other uncertainties are still taken into account. The analysis highlights that higher feed costs may not have the same effect on markets and income when these higher costs are due to lower grain availability on the world market (in our example because of a drought in the US) as when they are due to a weaker Euro relative to the US dollar. In the first case, income is almost stable while in the second case it increases by 8% relative to the baseline because prices are higher. By contrast, in the context of a stronger Euro, income is 12% below the baseline in 2022 because the lower prices offset the decrease in production costs. And when the oil price is higher, higher production costs lead to a decrease in income.

10. Impact of higher input prices in EU regions

In recent years, farm input costs have been rising due to greater competition for production resources in both the EU and the global economy. Recent studies[22] show that these cost increases particularly concern energy, labour, fertilisers, machinery, seeds and crop protection expenses. According to Eurostat data, real purchase prices of key agricultural inputs like fuel and fertilisers increased between 20% and 60% over the period 2000-2010, with most of the increase occurring in the last four years. The movements in feed costs closely follow the upward and downward movements of cereal and oilseed prices.

Farm level analysis indicates similar upward trends in EU farm production costs: a slow but steady increase over the last decade that escalates from 2005 onwards.[23]

10.1. Methodology and scenario setting

The partial equilibrium model CAPRI is used for this analysis. Attention is focused on the impact of an increase in operating costs: higher feed costs at world level (from a demand shock) and an assumed increase in other costs only for the EU. According to the FADN definition (Farm Accountancy Data Network), operating costs cover all cash expenditure necessary to operate the farm, including feed costs, but excluding wages, rent and interest paid[24]. In order to model an increase in input prices in EU regions, a dual approach has been adopted to combine increases in prices of both endogenous and exogenous variables.

Since feed costs are endogenous in the CAPRI model, an exogenous change has to be introduced in order to provoke an increase in these costs. To simulate such an increase, it was assumed that the demand for meats (beef, pig and poultry) in China would increase by 20 to 30%. This would generate an increase in feed demand at global level while keeping China's meat trade balance close to the baseline values.

The other exogenous operating costs were increased based on econometric estimates of the observed volatility of input prices by EU Member State, using the coefficient of variation as a measure of volatility[25]. In this scenario, we only consider the upward change in variability as we want to see the impact of ***higher*** operating costs. As well as the direct impact of price increases on production costs, indirect effects may be observed through the price feedback coming from crop markets to feed costs and young animal costs.

Graph 10.1 shows that the variability of plant protection costs across EU Member States is relatively high, ranging from 3% to 32%. Subsequently, the change in

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[22] USDA (2011). Agricultural Prices. National Agricultural Statistics Service (NASS), Agricultural Statistics Board, United States Department of Agriculture (USDA). http://usda.mannlib.cornell.edu/usda/current/AgriPric/AgriPric-09-29-2011.pdf

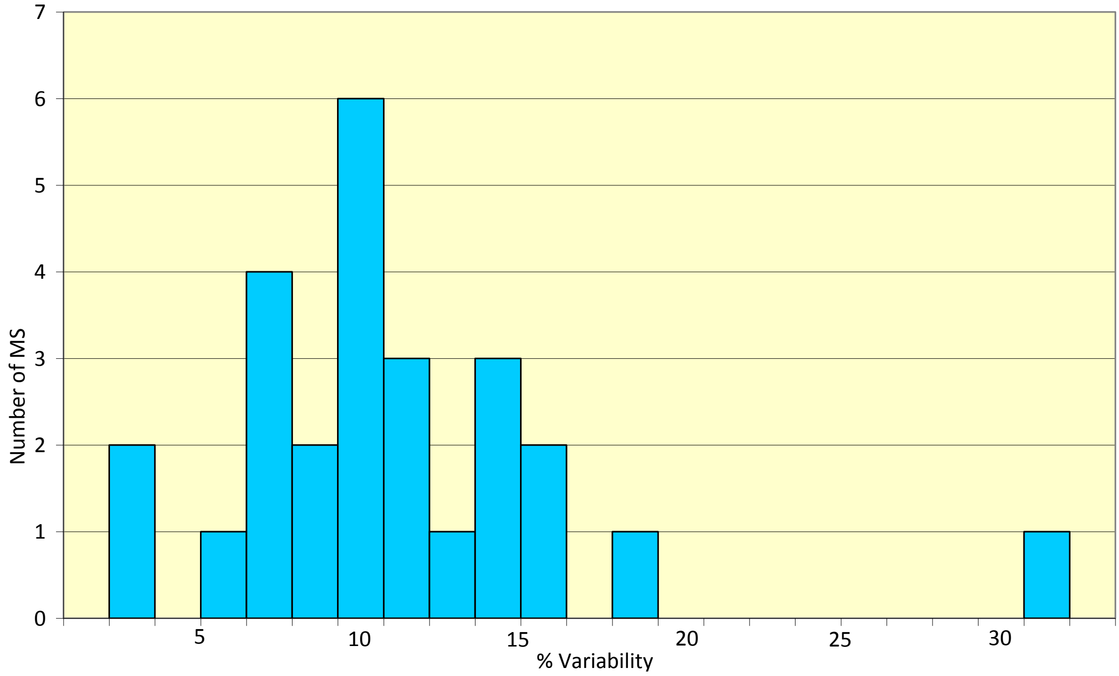
[23] European Commission (2011). Farm Economics brief, N°2 EU production costs overview, DG Agriculture and Rural Development, Microeconomic Analyses of EU Agricultural Holdings. http://ec.europa.eu/agriculture/rica/pdf/Brief201102.pdf

[24] Operating costs cover mineral fertiliser, fuel and energy costs, maintenance, pesticides, seeds, services, veterinary costs, feed costs and purchase of young animals (calves, piglets, …).

[25] Himics, M., Van Doorslaer B., Ciaian P., Shrestha S. (2012): 'Increasing volatility of input costs in the EU agriculture', Presentation to the 123rd EAAE Seminar on Price Volatility and Farm Income Stabilisation, Dublin.

operating costs is Member State-specific and depends as well on the share of each cost item in total operating cost. It is assumed that cost increases in Member States are correlated.

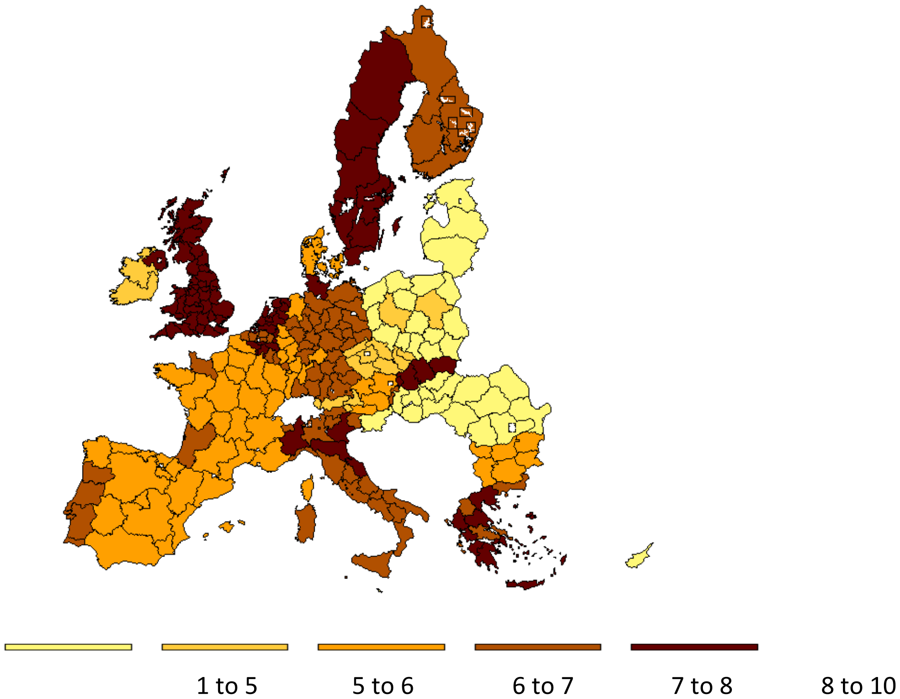
Graph 10.1 Variability (coefficient of variation) in plant protection costs among EU Member States



Operating costs increases in the crop sector vary between 12% and 20% at EU level. Differences between Member States are considerable, and are in line with the degree of variability in operating costs observed in the past. The United Kingdom, Spain and Lithuania are at the higher end, with operating cost increases up to 32%, while Austria and Germany show less variability, which is reflected in more moderate increases in operating costs (up to 15%).

In the livestock sector, operating costs are dominated by feed costs and purchase costs of young animals. The increases in animal sector operating costs at Member State level are more moderate than in the crop sector, averaging between 5% and 12%. The actual increase in operating costs depends greatly on the particular livestock production system and its cost structure. It follows that regional differences in cost increases are considerable and explanations for them are region-specific. For example, the strong cost increase per head in the pig fattening sector in Belgium and Germany, as shown in Map 10.1, is due to the high share of protein-based feed in the production system of these countries, which are most affected by the feed price increase. On the other hand, the large increases in the UK, Finland and Sweden can be explained by the high share of maintenance and energy costs in total cost per head.

Map 10.1 Change in operating costs per head in the pig fattening sector by NUTS2 region (% relative to the baseline)

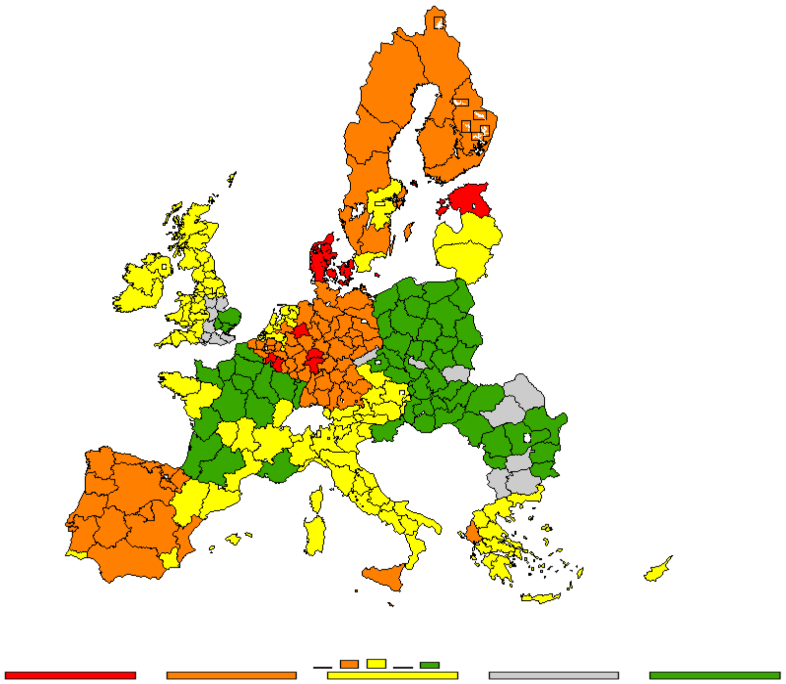


10.2. Scenario results

EU market balances deteriorate

Due to the profit margin squeeze, total production of all agricultural products at EU-27 level decreases by up to 2.4%. The largest production changes at regional level are found in the poultry sector, with falls of up to 17%. Cereals, pig meat and beef production changes vary between -8% and 2%, whereas milk production shows much more resilience to cost price changes. The regional differences can be explained mainly by three factors: difference in competitiveness (profitability), level and share of input use and the feed composition.

Map 10.2 Regional changes in beef production, 2020 (% relative to baseline)

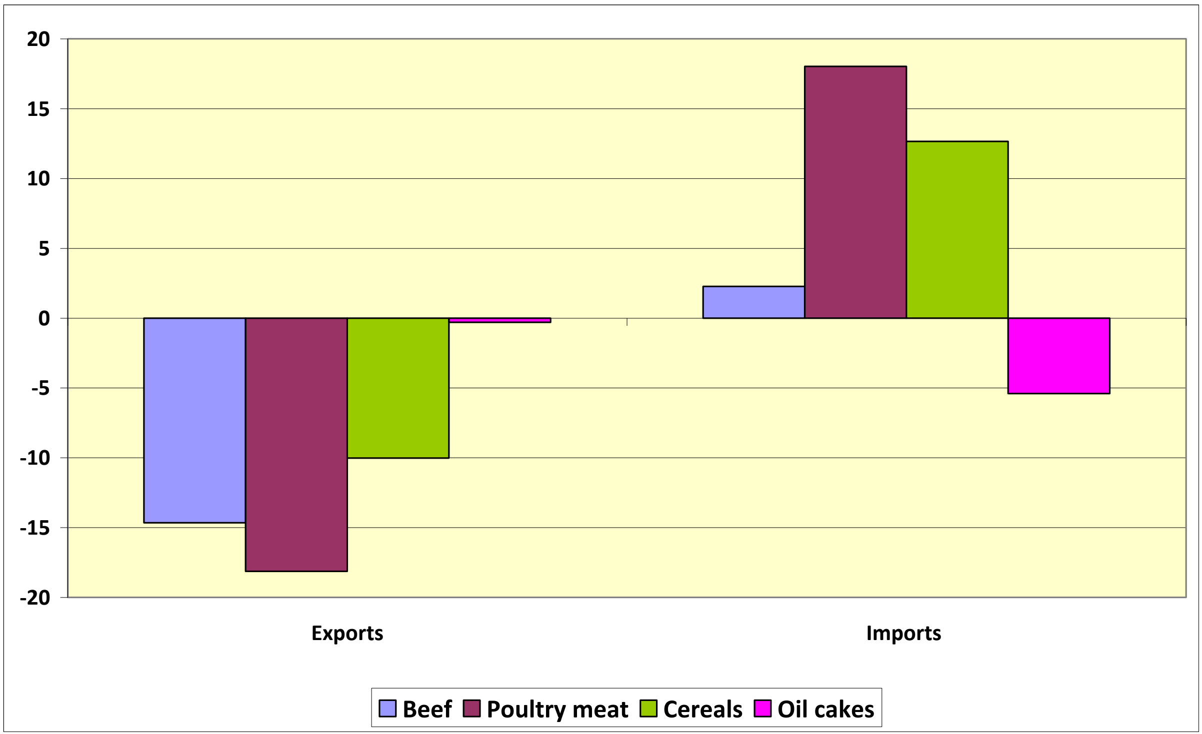


As a consequence of the overall EU production decline, internal commodity prices rise relative to non-EU regions and give space for increasing imports (see Graph 10.2). Common wheat (+32%) and grain maize (+18%) react to the higher demand for cheaper feed cereals, while imports of poultry meat (+18%) replace EU production. The increase in beef imports remains limited at 2.3%. The different reaction of imports partially reflects the EU border protection.

China's increased feed demand drives up the price of oil cakes to such an extent that EU consumption and imports even decline. Consumption of other commodities goes down by less than 1%, except for cereals (+ 0.6%).

Although the feed demand from China increases considerably and the prices of these products rise as a result, the EU cannot take advantage of this situation. This is because of the decrease in its competiveness due to higher internal prices driven by higher operating costs (other than for feed) that are assumed to increase only in the EU. The same loss in competitiveness on the world markets is at the origin of the decline in all exports. Beef exports go down by 14.7% and those of pig meat by 7.3%. Cereals see a similar drop of 10%, in particular wheat and barley. This results in a substantial deterioration in the EU net trade position for agricultural products.

Graph 10.2 Changes in EU imports and exports, 2020 (% change relative to baseline)



Shift from high-cost protein feed to cheaper cereals

As a consequence of the higher world feed demand and increasing operating costs in the EU, internal prices for animal feed rise but at different rates (see Table 10.1). Although the changes are relatively small, they have significant consequences for the composition of feed. Costly protein-rich feed is replaced by relatively cheaper imported cereals, within the limits of dietary requirements. A move towards more grass-based or cheaper fodder-based production systems is observed for ruminants.

Table 10.1 EU-27 Feed price and use, 2020 (% change relative to baseline)

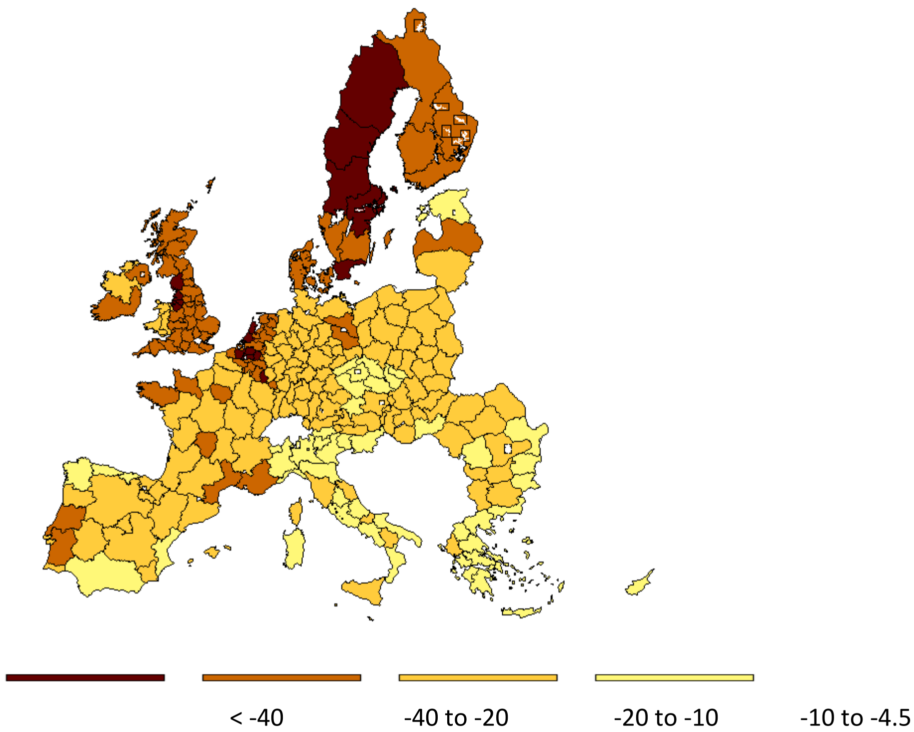
Animal feed	Price	Feed use
Common wheat	3.2	4.8
Maize	3.8	0.6
Barley	3.7	1.0
Rapeseed cake	4.6	-5.2
Soybeans cake	4.2	-2.9

Crop income is squeezed between increasing costs and world competition

Map 10.3 and Map 10.4 show total income changes by region, which captures both the price/cost effect and the quantity effect on the income of a particular commodity at regional level.

Although the producer prices of cereals increase by 3% to 4%, this cannot compensate for the increase in operating costs, especially that of fertiliser (25%). Moreover, the cost increase makes it more profitable to import cereals, especially for feed use, and affects the EU's export potential, which results in production decreases and income losses at regional level. The most affected regions are those with a large cost increase and a high share of fertiliser costs, like the United Kingdom, Latvia and the Netherlands, and those with low profit margins or income, like Sweden and Portugal. A similar explanation applies to crops other than cereals.

Map 10.3 Changes in regional income of cereals, 2020 (% relative to baseline)



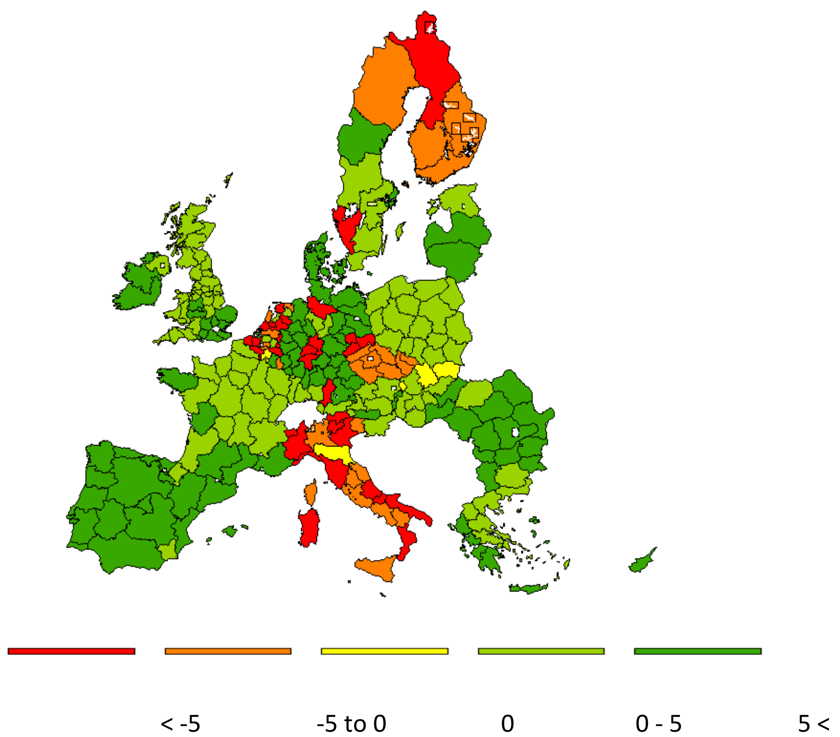
Winners and losers in the livestock sector

Unlike the crop sector, the livestock sector in some EU regions can take advantage of the higher producer prices for some commodities despite the cost increase. The slightly higher price increases compared to the crop sector relate to the lower price elasticity and limited impact of imports in the livestock sector. The high level and high share of non-feed operating costs in the crop sector as mentioned before, add a second explanation to this differential outcome. As a result, the higher revenues, combining price and quantity effects, may offset completely the increase of production costs and enhance the regional farm income of livestock production.

Beef producers in most EU regions gain, thanks to the higher producer price, except in Northern Italy where the large share of protein-based feed increases the operating cost more relative to other EU regions. The regional differences for the pig and poultry meat sectors are explained mainly by the changes in feed cost and the share of non-feed costs (energy, maintenance) in total operating costs. About one-third of the EU regions gain whereas two-thirds suffer income losses.

In the milk sector, income increases except in Italy, Finland, Czech Republic, Slovakia and certain regions in Belgium, the Netherlands and Germany. Whether a region gains or loses depends on a fine balancing between the relative increases in revenues and operating costs together with the initial degree of profitability, which impacts on the potential of substitution by other production activities.

Map 10.4 Changes in regional income of milk production[26], 2020 (% relative to baseline)



[26] In the CAPRI model, most activities (crop or livestock) have two production intensities, an 'intensive/high yield' and an 'extensive/low yield' variant, with distinct input use and production characteristics (see CAPRI model documentation for more details). Results are shown for 'high yield' variant only; 'low yield' variant is similar.

10.3. Conclusion

The results presented here show the potential impact of the uncertainties related to price developments of input costs on commodity balances and agricultural income. Production systems with a high use of inputs are particularly exposed to these price changes. In a scenario of higher input costs as described crop production systems suffer more from a negative impact than livestock systems due to the fact that increased costs are only partially transmitted to a higher producer price. On the other hand, the varied characteristics of the agricultural production systems in the EU make the impact very much regional specific. Following the specified scenario setting, around 13 billions Euro is at stake in the EU agricultural sector, corresponding to 7.2% of total agricultural income.

11. Medium-run economic impact of climate change in EU regions[27]

11.1. Methodology and scenario description

Climate change uncertainties with two adaptation scenarios

This chapter examines uncertainties related to the medium run impact of climate change on EU agriculture.[28] The scenario assumes that average temperatures in Europe increase by 1ºC in 2020 compared to those of the year 2000. The precipitation regime also shows a change, with some regions experiencing increased precipitation (e.g. Scandinavian countries and parts or Northern Europe), whereas others become drier during the growing season (e.g. Iberian Peninsula and South-West Europe).

Two technical adaptation scenarios are considered: 'no adaptation' and 'maximum yield adaptation'. The adaptation is captured through adjustments in the crop growth cycle length, crop sowing date and water availability. The two scenarios reflect two possible extreme situations that climate change may induce. The former scenario does not consider any potential adjustments by farmers (in terms of cycle length, crop sowing date and water availability) under climate change. This is unrealistic since one would expect farmers to react in an attempt to realise the maximum yield potential in the new climatic conditions. Thus, the no adaptation scenario provides one theoretical bound of possible climate change effects on yield. The maximum yield adaptation scenario assumes the farmer adapts by optimally adjusting the combination of the crop growth cycle length, crop sowing date and water availability (depending on the crop) in such a way as to generate the highest possible yield for a given crop. This maximum degree of adaptation is also highly unlikely and represents the theoretical opposite bound of climate change effects on yield. In reality, the expected impact of climate change will be in between the two scenarios considered.

Modelling climate change with CAPRI through crop yield changes

CAPRI, an agricultural sector partial equilibrium model, was used to simulate the climate change scenarios. In agricultural production, one of the major impacts of climate change is manifested through a change in crop yields. The supply module of CAPRI is able to examine the effects of these changes in the yields of individual crops and to provide an economic assessment of their consequences for the EU agricultural sector. The model requires input data for different crop yields under climate scenarios for the year 2020 based on assumed changes in temperature and rainfall across the EU. The model then adjusts those yields based on the profitability

[27] The results presented in this chapter draw on the work done within the JRC Climate Impact and Adaptation Assessment (PESETA II) project.

[28] More specifically, it assumes the A1B emissions climatic scenario provided by the ECHAM5 model (IPCC (2012): 'IPCC Special Report on Emissions Scenarios.' Special Report of IPCC Working Group III, Intergovernmental Panel on Climate Change. http://www.ipcc.ch/pdf/special-reports/spm/sres-en.pdf).

of a particular crop under given resource constraints (such as land and nutrient balances).[29]

The CAPRI model relies on the crop yield data provided by BIOMA (Biophysical Models Application)[30] that includes a set of biophysical models for different crops. Changes in crop yields are reported by BIOMA as a direct effect of changing climatic parameters. The BIOMA model provided the yield change data for four crops; wheat, rapeseed, sunflower seed and maize under each of the two assumptions: no adaptation and maximum yield adaptation. However, CAPRI covers more than these four crops. Hence, yield changes for CAPRI crops that are not provided by the BIOMA model are assumed to be the same as the yield change for a similar BIOMA crop; for instance, for barley, the same percentage yield change as for wheat is assumed. For vegetables and fruits, the average change in yield of the four BIOMA crops is assumed. This applies to grass yield as well.

It should also be mentioned here that BIOMA provided the yield change data for 2020 at the NUTS2 regional level. The NUTS2 regional coverage of CAPRI and the BIOMA dataset are compared and any missing regional data were estimated based on similar neighbouring regions. Since the yield changes due to climate change in BIOMA were available only for European countries, crop yields are assumed to be unchanged elsewhere. When analysing the results, this limitation should be taken into account. In particular, the price effects in our results might be biased downwards or upwards depending on the supply response to climate change in non-EU regions and its impact on global commodity markets.

Once the BIOMA yield data has been completed in order to provide a comprehensive coverage of CAPRI crops and NUTS2 regions, each yield change data set is imported into CAPRI for the corresponding scenario. They then help to determine the context in which CAPRI assumes that producers make their supply decisions so as to maximise profit.

11.2. Scenario results

Yields improve due to climate change

The results show that even in the medium term, climate change may have important impacts on EU agriculture. Table 11.1 reports yield changes for selected cereal and oilseed crops in the two scenarios. These yield changes are a result of two effects: climate change and adjustments in farm practices so as to maximise yield given the new climatic conditions. Climate change effects come from the BIOMA model and represent an exogenous input into CAPRI.

Overall, climate change results in positive yield changes in the EU, except for sunflower seed in the no adaptation scenario. Yields change between -28% and

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[29] It is important to note that we do not take the full range of potential adaptation of EU agriculture to climate change into account. As mentioned above, the adaptations considered concern changes in the length of the growth cycle, sowing date and water availability only, and that these adjustments are occur only via yield adjustments due to changes in variable input use induced by changed profitability (price level). We do not take into account farmer adaptation related to changes in technology availability, innovation and farm structure.

[30] Confalonieri, R., M. Acutis, G. Bellocchi, M. Donatelli (2009): 'Multi-metric Evaluation of the Models WARM, CropSyst, and WOFOST for Rice.' Ecological Modelling, 11: 1395–1410.

Stöckle, C.O., M. Donatelli, R. Nelson (2003): 'CropSyst, a Cropping System Simulation Model.' European Journal of Agronomy, 18, 289-307.

10% in the no adaptation scenario relative to the baseline (see Table 11.1). In addition, technical adaption of cropping practices to climate change may result in a significant upward adjustment in all yields. The yield change for the best adaptation scenario is between 2% and 33%, implying that adaptation may improve crop yields by a factor between 0 and 7 relative to the no adaptation situation. Maize yield is particularly positively affected by climate change due to the more favourable climatic conditions for its growth. This is valid across most of the EU regions where yield increases by more than 20% (see Map 11.1). For other crops, the picture is mixed. Regional impacts for wheat show that there are some regions where exogenously determined yields fall and some where yields rise. Paradoxically, in some regions (e.g. Northern France, Northern Finland) yields are lower in the maximum yield adaptation situation than in the situation without adaptation (see Map 11.2). In these cases, farmers adapt to lower crop prices (induced by more abundant harvests elsewhere, see below) by reducing variable inputs and hence lowering yield.

Map 11.1 EU-27 maize yield changes, 2020 (% change relative to baseline)

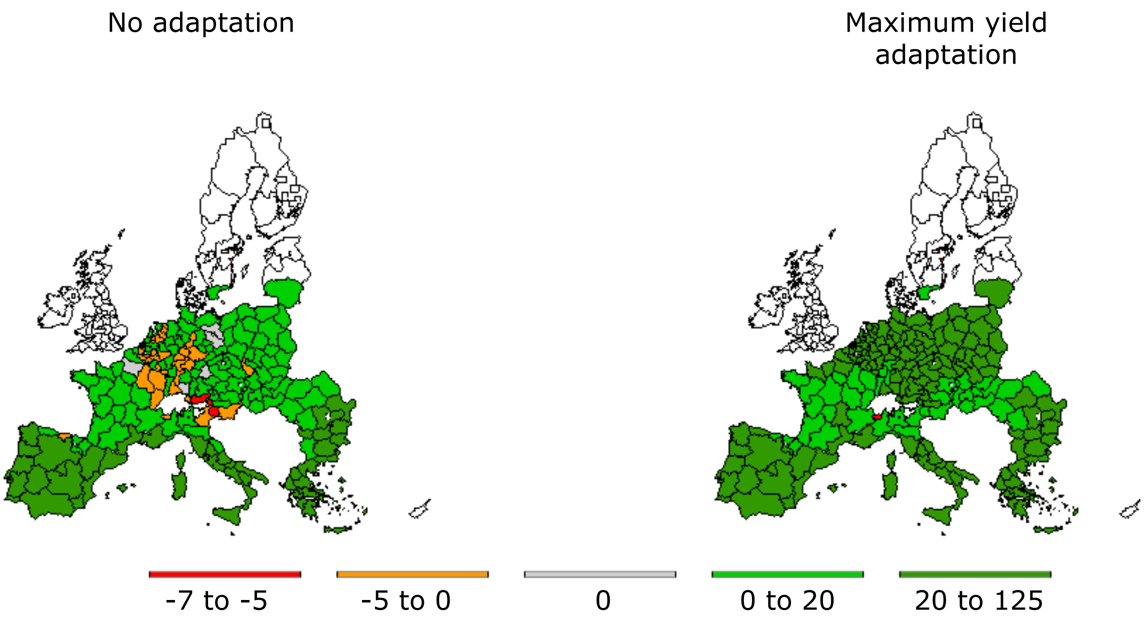
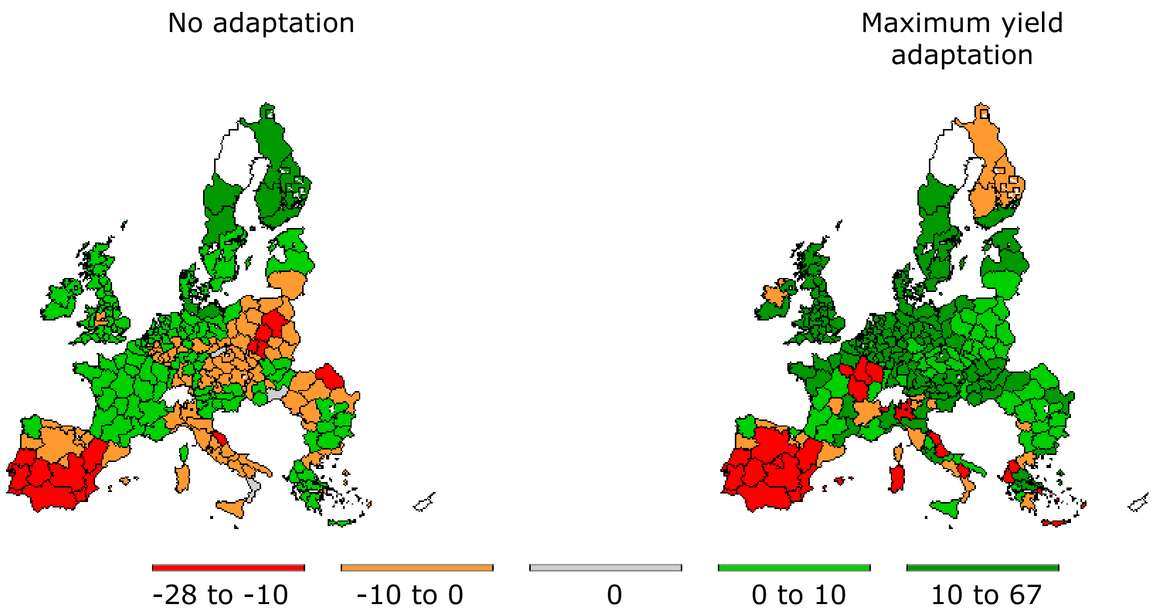


Table 11.1 EU-27 yield changes, 2020 (% change relative to baseline)

	No adaptation	Maximum yield adaptation
Common wheat	2	13
Barley	2	9
Maize	10	33
Rapeseed	4	16
Sunflower seed	-28	2

Map 11.2 EU-27 common wheat yield changes, 2020 (% change relative to baseline)

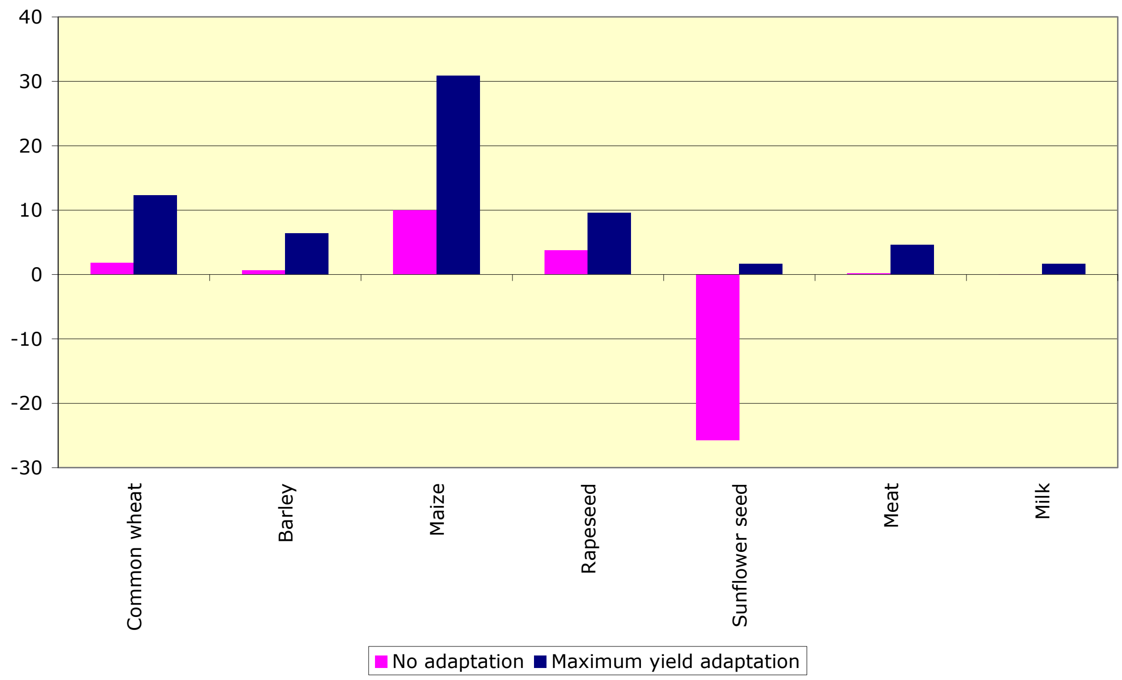


Climate change increases EU agricultural production but prices may drop

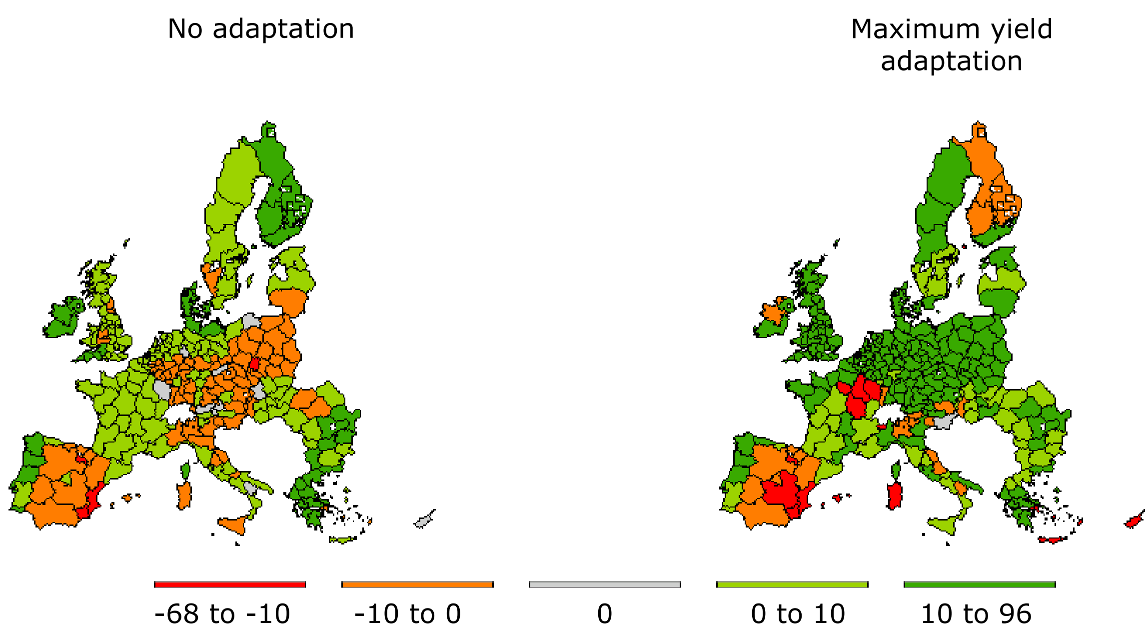
Climate change tends to affect EU agricultural production levels positively due to higher yields, although there are strong differences in adjustment patterns between sectors. Overall, production changes mirror yield changes. Under the no adaptation scenario, cereals output increases by 3% in the EU-27. For individual cereals, the production increase varies from 0.5% to 10% at EU aggregate level (see Graph 11.1). However, there is strong regional variation in cereals production. The impact on cereals production in a large part of Spain and some parts of Central and Eastern Europe under no adaptation is negative due to unfavourable changes in temperature and rainfall patterns, whereas many regions gain by up to 10% (see Map 11.3). For oilseeds, EU-27 production decreases by 6% relative to the baseline in the no adaptation scenario driven by heterogeneous trends in the output of the various oilseed crops (rapeseed versus sunflower seed). The regional results show that negative change in oilseed output prevails, particularly in the Southern and Eastern EU, although output changes are positive in the North-West EU (see Map 11.4). The variation in oilseed production across the EU is due to changes in temperature and rainfall patterns leading to a drier growing season in the Southern EU.

In the maximum yield adaptation scenario, EU-27 production of cereals and oilseeds increases by 18% and 7% respectively. However, there are significant differences between crops. Due to strong yield increases induced by climate change, production of maize increases much more than that of other crops. Sunflower seed output increases the least due to its small yield improvement. At regional level, output improves in most regions in the maximum yield adaptation scenario compared to the no adaptation scenario, thus indicating the role of farmer adjustment in coping with and reducing climate change impacts.

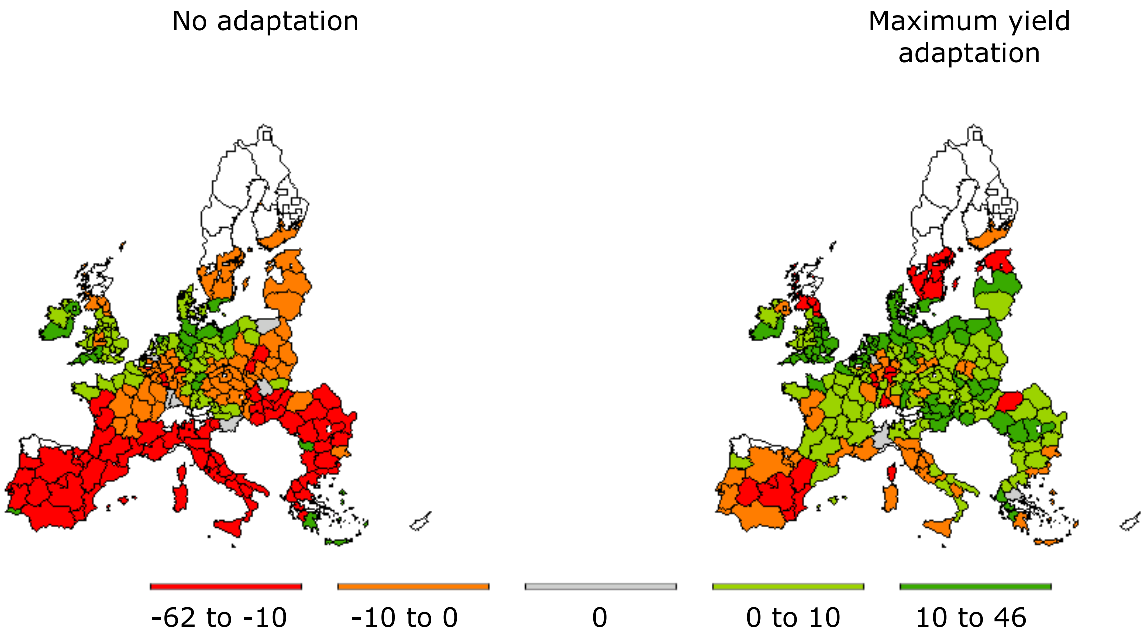
Graph 11.1 EU-27 production change, 2020 (% change relative to baseline)



Map 11.3 EU-27 cereals production change, 2020 (% change relative to baseline)

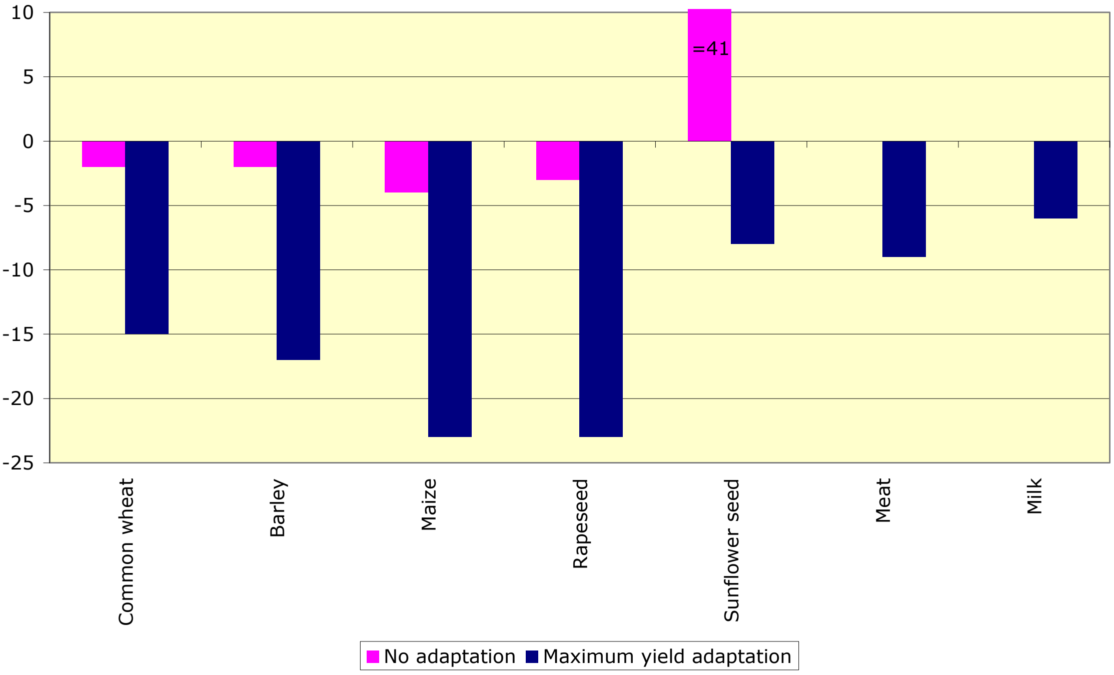


Map 11.4 EU-27 oilseeds production change, 2020 (% change relative to baseline)



The simulation results indicate that climate change will reduce the prices of agricultural commodities because of the higher output levels. The price decrease under the no adaptation scenario is lower than in the maximum yield adaptation scenario except in the case of sunflower seed, the price of which actually increases when on-farm adaption does not take place. Similarly for the other crops, the decrease in price corresponds to an increase in production. EU producer prices decrease by a maximum of -23% relative to the baseline (see Graph 11.2).

Graph 11.2 EU producer price changes, 2020 (% change relative to baseline)



The livestock sector will also be affected by climate change. Adjustment of animal production to climate change is positive but relatively small because climate change effects are transmitted indirectly to the animal sector through the effects on feed. The overall increase in animal production is because of lower crop prices, which reduce animal feed costs, and higher yields of feed crops (e.g. grassland) (see Graph 11.1). Note that the smaller farmer adjustment for animal production compared to crop production could be partly due to our assumption of zero climate change impact on animal yields. This is based on the view that the direct effect of climate change on individual animals will be very small for the next fifty years[31].

Land use adjusts downwards to climate change

The impact of climate change on aggregate EU land use is predominantly negative. Total utilised agricultural area (UAA) in the EU decreases relative to the baseline by 0.2% and 3% in the no adaptation and maximum yield adaptation scenarios respectively. This effect is mainly driven by price decreases that offset yield gain causing a reduction in agricultural profitability and hence leading to lower demand for land. For specific land use categories the picture is mixed when there is no adaptation. Oilseed areas and pastures increase whereas the area of cereals, fodder and total arable land decreases. With optimal adaptation, downward adjustment in land area is more pronounced because of stronger price and income reductions; the area of individual land use categories declines between 1% and 8% (see Table 11.2).

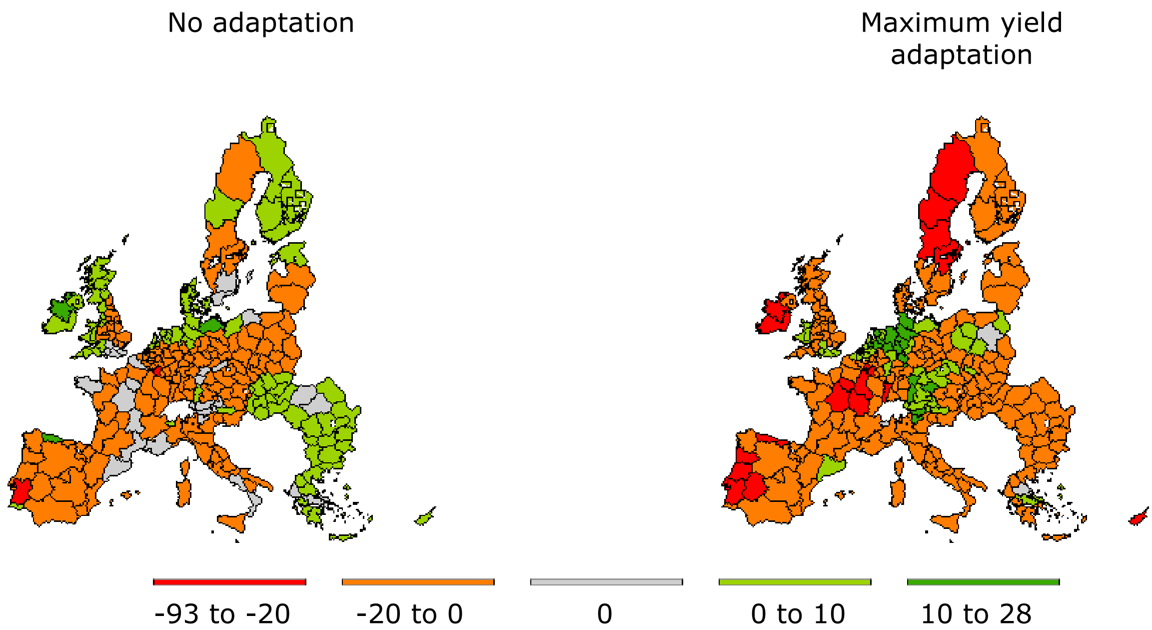
[31] Parsons, D.J., K. Cooper, A.C. Armstrong, A.M. Mathews, J.R. Turnpenny, J.A. Clark (2001): 'Integrated Models of Livestock Systems for Climate Change Studies. 1. Grazing Systems.' Global Change Biology, 7, 93-112.

At regional level, climate change tends to have stronger impacts on utilised agricultural area (UAA) in the Western and Northern EU. In the no adaptation scenario, most regions change their total land use only slightly (between 0% and -1%), whereas in the maximum yield adaptation scenario most regions reduce their UAA by between 1% and 5%, and none expand it.

Table 11.2 EU-27 land use change, 2020 (% change relative to baseline)

	No adaptation	Maximum yield adaptation
Cereals	-0.4	-0.9
Oilseeds	1.1	-2.9
Fodder	-0.2	-7.6
Pasture	0.1	-4.7
Arable land	-0.3	-2.3
UAA	-0.2	-3.0

Map 11.5 EU-27 agricultural income change, 2020 (% change relative to baseline)



Agricultural income drops while total welfare slightly improves

Climate change will lead to a small positive impact on total welfare. Total welfare improves due to consumer gains from lower food prices but the aggregate EU change is very small (close to zero). Agricultural income[32] reacts more strongly, particularly in the maximum yield adaptation scenario. Income affect is a combined impact of changes in production and market prices. Farmers typically see their incomes fall when productivity improves: since most agricultural products have inelastic demands, the price reduction more than offsets the gain from increasing output, causing agricultural income to drop (by 0.3% without adaptation and 9%

[32] Agricultural income is calculated as the difference between farm revenues and variable costs.

for maximum yield adaptation). However, there is considerable variability in agricultural income change at regional level due to variation in yield and price changes across regions. Regions with higher yield changes than the EU average change tend to gain, whereas other regions tend to lose. At the same time, in the maximum yield adaptation scenario more regions experience income loss because of the stronger downward adjustment of prices than in the no adaptation scenario. Around 50% of NUTS2 regions experience no income change or only a small change when there is no adaptation (e.g. the South and Central EU), whereas more than 70% of regions experience an income reduction when adaptation takes place (all except for some regions in the North-West and Central EU) (see Map 11.5). Although from an individual farmer's perspective adaptation may not seem the ideal option, adaptation is always a rational choice because farmers are price takers and cannot individually affect market prices. As adaptation is a rational choice for all farms, aggregate production increases but market prices respond in the opposite direction. In relative terms prices tend to fall more than production expands because consumers' reaction to increased food availability is a significant reduction in the price they are willing to pay due to inelastic demand.

11.3. Conclusions

Results presented in this chapter indicate that the baseline is sensitive to the uncertainties related to climate change. Overall yields and agricultural production increase in the EU due to climate change. However, there will be both winners and losers among regions, with some regions (e.g. the North-West and Central EU) benefitting from agricultural production adjustment as a result of climate change, while other regions (e.g. the Southern EU) suffer losses in production and income. An important implication of the analysis is that market adjustment to climate change induced by higher aggregate production is a price drop. However, as climate change effects in non-European countries are not considered, the negative impact of a price drop on income might be overstated and thus the actual income decrease might be lower. In general, the effects at the EU aggregate level are relatively small. For example, the land use and welfare change by between approximately -0.2% and 9%. However, there is a greater impact at regional level with some stronger effects prevailing particularly in Southern Europe while smaller impacts are observed in the Central and Northern EU. Regional impacts of climate change increase by a factor higher than 10 relative to the aggregate EU impacts.

Furthermore, the simulation results indicate that the technical adaptation of crops to climate change may result in a significant adjustment in yield, production and land use. For example, maximum adaptation in yields may result in a change in the EU aggregate crop production increase by a factor between 0 and 7 relative to the no adaptation situation. However, a negative side effect of improved yields due to adaptation is a drop in market prices causing a more significant reduction of agricultural income relative to the no adaptation situation. Although farmers have an incentive to adapt to climate change at farm level by improving yields, market price adjustments are beyond their control and prices will develop in the opposite direction relative to output changes and cause income losses. Market prices drop due to inelastic food demands which more than offset the gain from increasing output.

12. Uncertainties in EU biofuel policy

The baseline assumes that EU Member States will not reach the 10% renewable energy in transport target[33] by 2020, but later as a result of delays in the initial phases of expansion in biofuel use and production. To assess the uncertainty linked to the potential influence of different factors on the degree to which mandate will be met, two scenarios were examined.

The first scenario examined in this chapter, hereinafter called the '10% target', analyses the impact on EU agricultural markets in the events of the mandated 10% target being fully met. The second scenario, the 'EC proposal', provides a first assessment of the impact of the European Commission's current proposal amending the 'Renewable Energy Directive' (RED) published on 17 October 2012 (COM(2012)595), which aims in particular to reduce the production of biofuels from food crops. Scenarios were run using the AGLINK-COSIMO model.

12.1. The 10% target is reached

Higher ethanol use to reach the 10% target

In order for Member States to succeed in reaching the 10% target by 2020 and in the ensuing years, the use of first-generation biofuels has to be higher than in the baseline and needs to reach a consumption share of 8.2%, assuming that the production of second-generation biofuels remains at the same level as in the baseline. This rise would come mostly from increased ethanol use (see Table 12.1) because the price advantage of ethanol relative to petrol is greater than that of biodiesel versus diesel, and also because ethanol is more readily available on the world market. It needs to be underlined that the 12.6% energy share of ethanol in petrol use in 2022, simulated in this scenario, corresponds to an 18.8% share in volume, i.e. 5.6 percentage points above the baseline and beyond the blend wall for standard cars. Therefore, if the mandate is to be fully met, the use of an E15[34] blend needs to increase as well as the number of flexible-fuel cars that are able to run with E85. Currently, Sweden has the greatest uptake of flex-fuel vehicles, and the most extensive network of E85 filling stations to service such vehicles.

[33] Directive 2009/28/EC on the promotion of the use of energy from renewable sources, the 'Renewable Energy Directive', established as mandatory targets for 2020 a 20% overall share of renewable energy in EU energy use and a 10% share for renewable energy in transport sector.
[34] E15 is a fuel mixture of 15% ethanol. E85 is a mixture of 85% ethanol.

Table 12.1 EU-27 biofuels energy shares, 2022 (%)

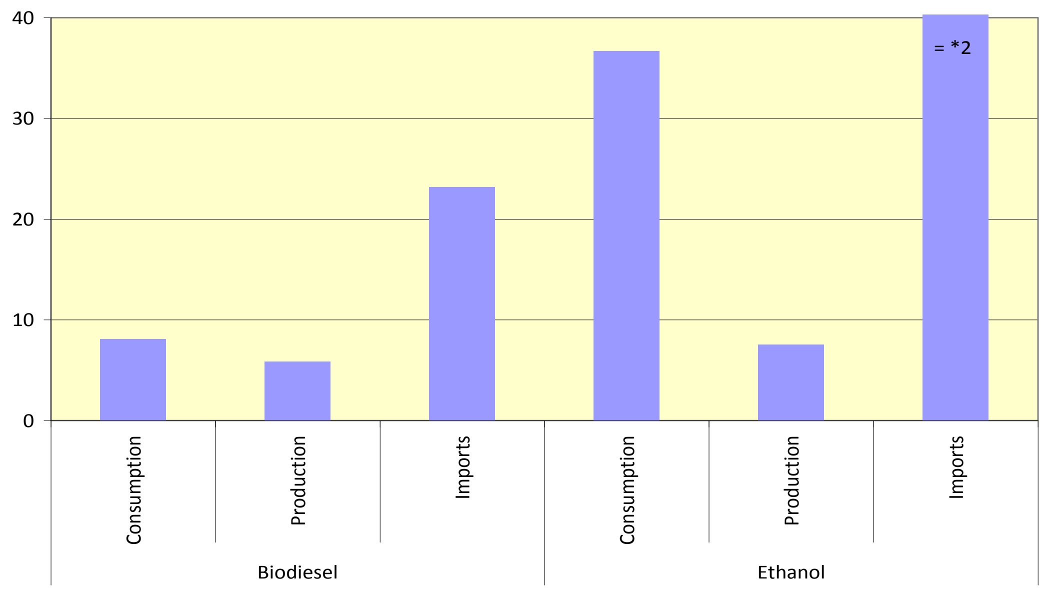
	Baseline	10% target	EC's proposal
Biofuels (in fuel use)	**7.6**	**9.1**	**6.3**
1st-generation	6.7	8.2	5.0
based on waste oils	0.8	0.8	1.1
other 2nd-generation	0.1	0.1	0.3
Ethanol (in petrol use)	**8.8**	**12.6**	**6.0**
Biodiesel (in diesel use)	**7.2**	**7.7**	**6.4**
Biofuels in fuel use (% RED accounting)	**8.6**	**10.0**	**8.1**

Note: According to the current RED accounting methodology, the energy content of biofuels *other than* first-generation biofuels counts twice towards meeting the target. In the Commission's proposal, second-generation biofuels other than those using waste oils will be counted 4 times.

Target is fully met thanks to more biofuel imports

To achieve the expected 37% increase in ethanol use (see Graph 12.1), domestic production has to be higher than in the baseline by 8% and ethanol imports should double. This implies the need for investment to increase ethanol production capacity. Most of all, ethanol availability on the world market would need to increase substantially. Imports come mainly from Brazil in the form of sugar cane-based ethanol. For biodiesel, consumption and production should also increase, by 8% and 6% respectively. In addition, biodiesel imports should be 30% higher.

Graph 12.1 Change in EU-27 biofuel market in comparison to the baseline, 2022 (%)



Although meeting the mandate in full has consequences for feedstock markets, these effects are relatively small given that most of the increase in biofuel demand is satisfied by higher imports. Nevertheless, wheat and coarse grain used for biofuel production increases by 10% in 2012, relative to the baseline. The use of cereals as food, which is rather inelastic, remains unchanged. The use of coarse grains as feed goes down by 0.9 million tonnes because maize prices are 1.3% higher than in the baseline. In addition, there is a 10% increase in the production of dried distillers' grains, a by-product of ethanol production, which can substitute for cereals in feed rations. Overall, total consumption of coarse grains remains unchanged in comparison to the baseline and the EU's trade position deteriorates by only 0.5 million tonnes.

By contrast, the total increase in wheat demand of 1 million tonnes is substantial. As a consequence, the area dedicated to wheat is 0.2% higher than in the baseline, production is higher by 0.5 million tonnes and exports are 2% below the baseline level. The use of sugar beet as an ethanol feedstock remains almost unchanged given the specificity of the production process; the firms who invested in this kind of production cannot leave the sector easily.

As mentioned above, the competitiveness of biodiesel relative to diesel is low. Therefore, biodiesel production increases less in 2022 (by 6% compared to the baseline) than ethanol. This translates into a 9% higher use of vegetable oils for biofuel production and thus reduced availability for human consumption (-1%) despite the increase in imports of 1.0 million tonnes. The EU price of vegetable oils increases by 4%.

12.2. The European Commission's proposal

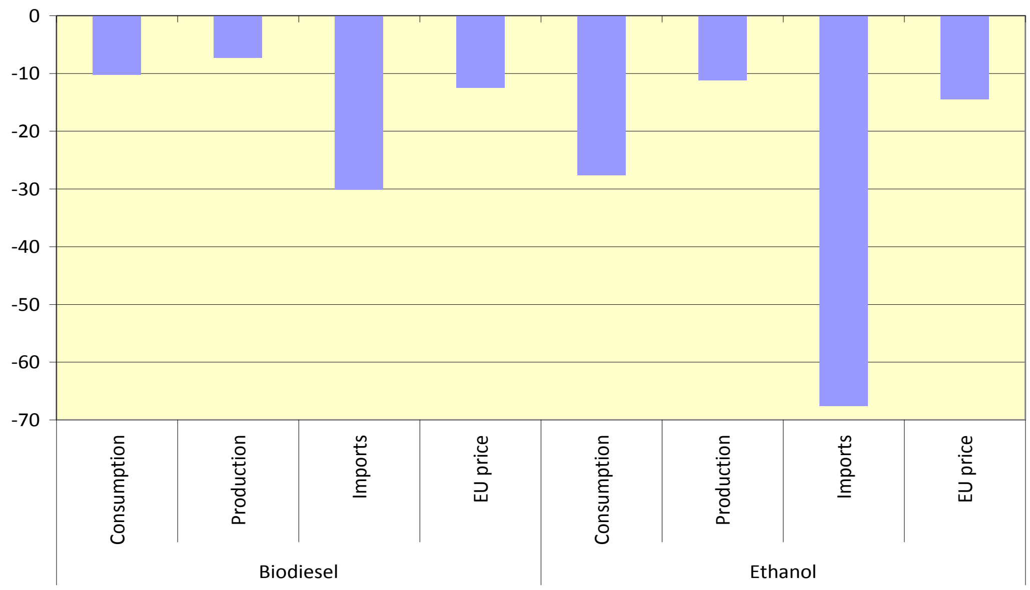
The aim of the EC proposal is to reduce the indirect land use change (ILUC) that may be caused by higher demand for food crops for biofuel by capping at 5% the amount of first-generation biofuels that can be counted towards the 10% renewable energy target. In addition, the use of advanced biofuels, with no or low ILUC emissions, is promoted by weighting their contribution towards fulfilling the target more favourably. In the EU, the significant share of biodiesel produced from waste oil will continue to be accounted for at twice its energy content but other second-generation biofuels will be weighted by a factor of four.

Biofuel use at 8% when first-generation contribution is capped at 5%

In this scenario, the share of first-generation biofuels is set at a maximum of 5% although in reality more *may* be produced without it being counted towards the renewable energy target. Since the proposal promotes second-generation biofuels via the accounting procedure, it is assumed that the share of these biofuels increases (see Table 12.1). This increase is rather small relative to the baseline because its scope is limited by the availability of waste oils and the state of technological progress and industrial development necessary for producing more of these advanced biofuels. Without any double or quadruple accounting, the share of waste oils in fuel use would increase from 0.8% in the baseline in 2022 to 1.1% in this scenario and the share of other second-generation biofuels would triple but be only 0.2 percentage points higher. Therefore, with this proposal, the 10% target is not met, and the renewable energy share in transport is 8.1%, despite the more favourable weighting of the second-generation biofuels. This share is slightly lower than the one assumed in the baseline in 2022.

Biodiesel use is lower than in the baseline (-10%, see Graph 12.2) but still significant, with a share in total diesel use of 6.4%, only 0.8 percentage points below the baseline. The biodiesel production capacity necessary to reach this level of use is indeed already in place.

Graph 12.2 Change in EU-27 biofuels market in comparison to the baseline, 2022, (%)



Ethanol production is 11% below the 2022 baseline level and ethanol production capacity would still need to be further developed relative to the current situation and those developments would depend on long term investment decisions. Simulated ethanol imports are almost 70% lower than in the baseline.

In total, in this scenario, ethanol use in 2022 is significantly lower than in the baseline (-28%) and its energy share in total fuel use (fossil and bio-based) is 6%. In terms of volume, it corresponds to a share of 9%. It should be noted that un-adapted car engines can normally use fuel with up to 10% ethanol.

Table 12.2 Change in EU-27 feedstock balance in comparison to the baseline, 2022 (%)

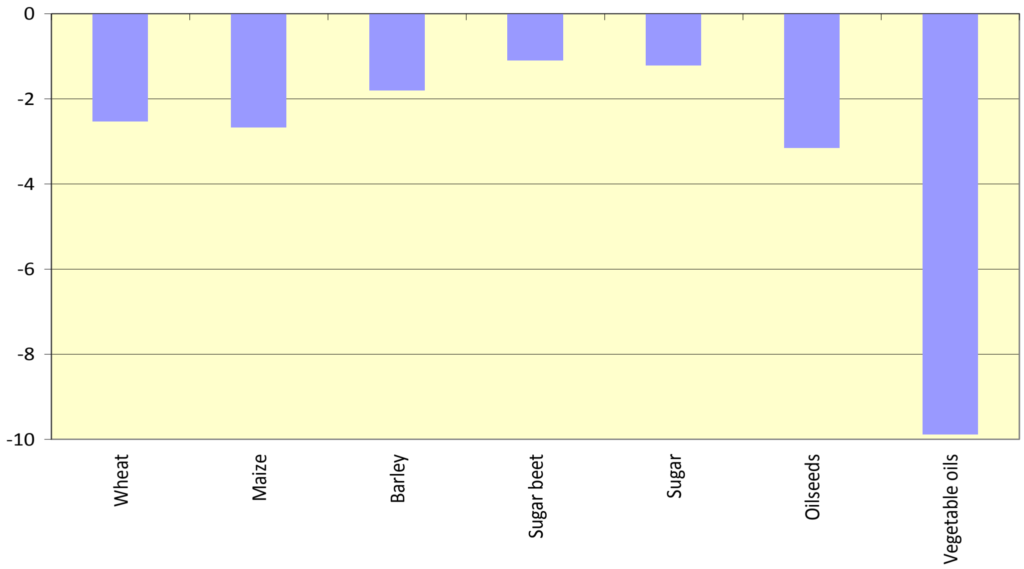
	Wheat	Coarse grains	Sugar beet	Sugar	Vegetable oils
Consumption	**-1**	**-1**		**0**	**-7**
of which biofuels	-20	-20	-2		-17
of which food	0	0		0	2
of which feed	-1	1			
Production	**0**	**0**	**0**	**0**	**-2**
Exports	**6**	**3**		**2**	**10**
Imports	**-5**	**-7**		**-1**	**-14**

A rather small impact on feedstock prices, except for vegetable oils

The diminished need for biofuel production (see Table 12.2) reduces pressure on the grains and oils markets, and feedstock prices are lower than in the baseline (ranging between about 1% lower for sugar beet and nearly 10% lower for vegetable oils) (see Graph 12.3).

The 20% fall in the use of cereals for biofuel production and the corresponding decrease of 20% in the production of dried distillers' grains imply an increase of 1% in the feed use of coarse grains compared to the baseline and a reduction of 7% in imports of coarse grains. Moreover, wheat exports are 6% higher than in the baseline. Because slightly less sugar beet is required for ethanol production, the sugar trade position of the EU improves slightly. The reduction in biodiesel production implies an increase in the food use of vegetable oils together with a significant decrease in their imports. Smaller oilseed imports (-2%) and production (-0.5%) leading to reduction in oilseed crushings by 1% and consequently a similar decline in protein meal production. Combined with an increase in protein meal imports by 1% the EU feed use of protein meal remains unchanged. The imports of protein meal occur more in the form of meal than in oilseeds as the domestic demand for vegetable oil declines.

Graph 12.3 Change in EU-27 producer prices in comparison to the baseline, 2022 (%)



Conclusion

Meeting the renewable energy target could be achieved with an increase in ethanol use. However this would require significant changes in the European car industry, towards more flexible-fuel cars and more vehicles adaptation for the use of fuel mixes with higher ethanol content. The impact on feedstock use would be rather small as most of the increase in demand would be satisfied by higher imports. The adoption of the Commission's recent proposal would lead to some difficulties in reaching the mandate given the state of technological progress and industrial development necessary for producing second-generation biofuels. The required maximum share (5%) of biofuels from food crops would lead mainly to lower ethanol imports, while the resulting impact on feedstock prices would be fairly small.