Production, yields and productivity

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1. Production development

- Production of most EU agricultural commodities increased over the last 15 years, with the exception of ruminant meat (beef and sheep) and sugar.

- Soft wheat is the largest EU crop with an average production of 143 million t in the last few years, grown on 1/3 of the EU’s arable area. Soft wheat production increased by 20% since 2000, mostly due to yield growth. Maize has become the second biggest EU crop, overtaking barley, and maize production increased by 12% over the last 15 years. By contrast, barley production stagnated as a result of a 15% decline in area, offset by moderate yield growth.

- Pigmeat is the most important type of meat produced in the EU with around 23.6 million t, scoring an 8% increase over 15 years. Poultry on the other hand increase by more than 30% during the same period and continues to increase its share in total meat consumption. Beef saw a 9% contraction in production since 2000 due to a range of factors: the consequences of the BSE crisis, the impact of decoupling of direct payments in 2005, and the declining dairy herd (2/3 of the beef meat produced originates from the dairy herd). Sheep meat also recorded a strong decline but its production stabilised over the last few years.

- After many years of stability in EU milk production at around 150 million t due to the presence of production quotas, milk production increased rapidly in the years preceding the end of milk quotas, reaching around 163 million t in 2016, driven by high milk prices in 2013-2014. Milk production stabilised in 2017 as a result of lower prices and policy incentives to limit expansion. The majority of EU milk is channelled into the production of cheese, which increased steadily throughout the last 15 years. Production of skimmed milk powder (SMP) increased by more than 30% since 2000, mostly in the last few years while whole milk powder (WMP) production declined as this product sees strong competition on world markets from Oceania.

**Figure 1:** Development of EU-28 production - 1999-2001 / 2015-2017 – 1000 t

Source: DG Agriculture and Rural Development

**Figure 2:** Development of EU-28 production - % change between 1999-2001 and 2015-2017

Source: DG Agriculture and Rural Development
Sugar production declined substantially with the sugar reform of 2006 which resulted in a massive cut in quotas and production. Sugar production quotas were removed in October 2017 and EU sugar production increased by 25% in 2017 compared to the previous year.

The EU remains one of the largest producers of agricultural commodities worldwide, even though it has lost ground to large emerging economies like Brazil. For wheat and other coarse grains the EU remains the top producer, further consolidating its position over the last 15 years. However, for maize, the EU ranking deteriorated since 2000 as other countries strongly increased their production (e.g. both the US and China by more than 100 million t in 15 years). For meat, the EU remains an important producer but lost ground to Brazil (which in 15 years increased its poultry production by more than 7 million t (+116%), beef +3 million t and pork +1.2 million t). The EU is still the largest milk producer with more than 160 million t (+13 million t in 15 years, most of which in the last few years) but India is growing fast (+66 million t since 2000) and to a lesser extent China (+30 million t, i.e. more than triple) and the US (+20 million t). In terms of dairy products the EU keeps the top ranking for cheese and SMP, for which it still holds a large share of world production (44% and 33% of world cheese and SMP production respectively). For butter and WMP on the other hand, the EU share in world production declined more strongly and the EU lost the first position.

The EU is self-sufficient (i.e. production is higher than consumption) for most agricultural commodities with the exception of sheep meat, sugar and maize and to a lesser extent beef. While the self-sufficiency rate is extremely high for export oriented commodities like SMP and WMP, it remains in the range 100%-125% for most of the other commodities (wheat 123%, barley 120%, pigmeat 112%, poultry 105%, butter 108% and cheese 104%). However for almost all commodities for which the EU is self-sufficient one can observe an increase in the degree of self-sufficiency (with the exception of WMP, where anyhow production is more than twice as high as consumption).

### Table 1: Ranking and share of EU-28 in world production

<table>
<thead>
<tr>
<th></th>
<th>Average 1999-2001</th>
<th>Average 2016-2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rank</td>
<td>EU share</td>
<td>Rank</td>
</tr>
<tr>
<td>Wheat</td>
<td>1</td>
<td>19%</td>
</tr>
<tr>
<td>Maize</td>
<td>3</td>
<td>10%</td>
</tr>
<tr>
<td>Other coarse grains</td>
<td>1</td>
<td>30%</td>
</tr>
<tr>
<td>Sugar</td>
<td>1</td>
<td>23%</td>
</tr>
<tr>
<td>Beef</td>
<td>2</td>
<td>14%</td>
</tr>
<tr>
<td>Pigmeat</td>
<td>2</td>
<td>23%</td>
</tr>
<tr>
<td>Poultry</td>
<td>3</td>
<td>13%</td>
</tr>
<tr>
<td>Sheep meat</td>
<td>2</td>
<td>8%</td>
</tr>
<tr>
<td>Milk</td>
<td>1</td>
<td>24%</td>
</tr>
<tr>
<td>Cheese</td>
<td>1</td>
<td>46%</td>
</tr>
</tbody>
</table>

Source: OECD-FAO Agricultural Outlook 2019-2028

### Figure 3: Development of EU self-sufficiency rate - 2004-2006 vs. 2015-2017

![Development of EU self-sufficiency rate](source: DG Agriculture and Rural Development)
Even though the EU remains one of the largest producers of agricultural commodities in the world, with growing self-sufficiency rates and record trade surplus, its share of world trade for most products continues to decline as import demand worldwide grows at a faster pace. This is the case for sugar, beef, poultry and most dairy products (except SMP and whey). However, the EU share in world trade remains high for dairy products, with EU cheese and SMP exports representing more than 30% of world trade and other dairy products between 15 and 20%.

Also for pigmeat the EU has a large share in world trade (32% and still growing compared to 2000) while its export share for poultry has declined over the last 15 years as other big exporters expanded their production and export (e.g. Brazil, whose exports were multiplied by 4 in the last 15 years). The EU has also seen both its exports and its share in world wheat market increase over the last 15 years, reaching 17% of world trade.

Figure 4: Development of the EU-28 share in world trade

Source: OECD-FAO Agricultural Outlook 2016-2025 and DG Agriculture and Rural Development
2. Yield developments

- The EU has the highest wheat yield in the world, both due to favourable natural conditions and to intensive and innovative production systems. For maize, the average EU yield lags behind major producers such as the USA and Canada, where GM varieties are allowed. However, yields in the EU-15 are comparable to those in Canada (9.5 t/ha), while yields in the EU-N13 are increasing but still lag behind. For other coarse grains (mainly barley) EU yields are also the highest in the world.

- EU wheat harvests are rather stable (compared to Australia for example where droughts and heat waves can strongly affect crop production). By contrast, EU maize yields remain more variable, despite the development of irrigation.

- Yields are increasing over time for all crops in the EU. However, among cereal crops, the annual growth rate is slower for common wheat than for maize.

- Concerning crops other than cereals, the average yield growth is also heterogeneous, with higher growth for sugar beet and sunflower than for rapeseed.

- Yield levels in the Member States that joined the EU after 2004 are coming closer to the levels in the other Member States over time. The gap is expected to further decrease in the coming decade, with a slowdown of yield growth particularly in those Member States that joined before 2004.

- In the past, farmers were partially compensating rising production costs (such as energy costs) with higher yields. However, the average EU wheat yield is expected to increase only very slowly in the next 10 years. There are several reasons for this stagnation in yield:
  - Technology and production systems have evolved and become more professional, which resulted in a yield close to the theoretical obtainable yield. Little room for improvement is left unless a new technological breakthrough emerges in the next years.
  - Agricultural policies have shifted towards decoupled payments which led to a lower use of fertilisers.
Climate change is already playing a role in slowing down global yields and will continue to have an effect. In addition to the CAP, several policies related to European citizens’ choices have an effect on future and current yields, e.g. the regulation and limited uptake of genetically modified crops and the limitation of certain active ingredients to be used in plant protection (neonicotinoids ban, Sustainable Use directive).

The EU average milk yield close to 7 000 kg per cow is in-between the yields of its main competitors. In New Zealand, where cows are purely grass-fed, yield averages 4 000 kg per cow. In the US, where the use of compound feed is more systematic, yield is close to 10 000 kg per cow. By contrast, the EU is characterised by a diversity of production systems from mainly grass-fed in Ireland to purchased feed based in the North of Italy or Spain. This combination allows for a more regular EU production, depending less on weather conditions than in Oceania, while many farmers are more resilient to feed price variations than in the US.

Dairy milk yields increase steadily due to genetic progress, improved herd management and change in feed. In 2016, the milk yield reached 7 400 kg/cow in the EU-15 and 5 230 in the EU-N13. In the EU-15, the yield increased annually by 1.1% over the past decade and yields are expected to grow at the same pace in the next 10 years. Due to a strong restructuring of the sector, yields increased by 3% per year in the last decade in the EU-N13 and yields are expected to continue to grow faster in this part of Europe in the next decade.

Milk yield levels are very different in Member States and regions, depending on breeds and production systems. Seven Member States have average yields above 8 000 kg/cow: DK, CZ, EE, ES, FI, SE and the UK. Six Member States have average yields below 6 000 kg/cow: IE, LT, SI, HR, BG and RO.
3. Total factor productivity (TFP)

- TFP allows for a comprehensive measure of productivity change over time. It measures the change in output that is not directly originating from a more intensive input use, but from changes in technology, efficiency, managerial skills and organisation of the production. It is an important impact indicator to monitor the CAP objective of viable food production.

- Productivity in the EU has increased over time, albeit at a slower rate in recent years than in the past. While the growth rate surpassed 1% per year between 1995 and 2005, it slowed down to around 0.8% between 2005 and 2015.

- TFP grew by 9% in 2015 compared to 2005. In 2014 and 2015, TFP growth accelerated, given the favourable crop conditions boosting crop and animal production.

- Output growth has been achieved in a context of a shrinking workforce. Since 2005 the volume of agricultural output has increased by about 6%, but this number is quite volatile given the economic, agronomic and climatic uncertainties characterising agriculture. Between 2005 and 2015 the total workforce in agriculture declined by about 25% to around 9.6 million full time equivalents, in line with the restructuring in the direction of fewer, but larger farms with a higher degree of mechanisation.

- Labour has to a large extent been substituted by capital. With capital investments increasing, productivity per unit of capital decreased. Capital productivity shows an overall decreasing trend prior to the financial crisis, indicating that investments in machinery, buildings and alike have played a major role in the realisation of output growth and the substitution of labour. This is also visible from the development of capital, which increased on average by 4% per year prior to the financial crisis and fell back afterwards. As a consequence, after the financial crisis capital productivity growth is recovering, mainly linked to this slowdown in investment growth.
• The growth in intermediate input use has remained largely in line with overall output growth, with the exception of bad harvest year 2012, while land productivity growth also improved, as outputs grew while utilised agricultural area declined by around 5%.

• Both in the EU-15 and the EU-N13, TFP growth has increased compared to 2005. Over a longer time horizon, important differences are however noticeable. Member States which joined the EU after 2004 have given an impetus to overall EU TFP growth. These countries are still undergoing a stronger transition and restructuring compared to the EU-15 Member States. Increased investments in farm technology, logistics, R&D, accompanying services and infrastructure all contributed to this strong growth rate. Given the gap in productivity levels between the EU-N13 and the EU-15, there is indication that efficiency gains (linked to improved management skills), adoption of technologies already used in the EU-15 (such as machinery) and structural change (farms and labour disappearing while farm size grows) are important explanations for these productivity gains.

• TFP growth paths differ considerably between Member States. Some are more hit by the financial and economic crisis than others.

See also EU agricultural markets brief No. 10: Productivity in EU agriculture - slowly but steadily growing
4. Costs of production in the EU

Comparison of costs between the EU and other producing areas

- Comparison of costs of production between different producing areas are not always easy, because of a variety of issues related to definitions, consistency of data, differences in production systems and quality of products (and therefore returns to farmers associated with costs measured). However, there is variety of studies comparing costs of production between the EU and other producing areas, in particular from Agri Benchmark comparing different reference farms throughout the world.

- For meat, for example, most of the production regions outside of the EU benefit from lower costs of production than EU farms. Beef can be produced more cheaply in Ukraine or South America than in any of the EU reference farms (while some EU farms have cost levels similar to those of Australian farms). For sheep meat, most Australian and New Zealand farms show lower costs than EU farms. In addition, the overall EU cost of poultry meat production is higher than in any other region of the world\(^1\).

- For milk, production costs are only slightly higher in Western Europe compared to North America (according to IFCN). Producing milk in New Zealand, where cows are mainly grass-fed, is significantly less costly.

- For crops, certain Member States benefit from lower costs than others and can be very close to some of the main competitors. In wheat, some French or Polish farms show lower costs per tonne of wheat than some US farms. For maize, Brazil benefits from lower costs than all EU Member States. Some Member States like Romania or Hungary have lower costs than others (e.g. France).

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\(^1\) van Horne and Bondt (2014), Competitiveness of the EU poultry sector (LEI)
Figure 13: Broilers - cost of production and slaughter in 2011 (Eurocent/kilo)

Source: van Horne and Bondt (2014), Competitiveness of the EU poultry sector (LEI)

Figure 14: Milk - cost of production in 2016

Note: The lines indicate the min - max range; Source: IFCN, 2016 report

Figure 15: Maize - direct, operating and land cost in the EU and Brazil (USD/t; 2008 - 2015)

Source: Agri Benchmark

Figure 16: Wheat - total cost of production (USD/t)

Source: Agri Benchmark