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Another look at agricultural trade of the European Union:

Virtual land trade and self-sufficiency

HFFA Research Paper 01/2014

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Content

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List of figures

List of abbreviations

CAP – Common Agricultural Policy

CETA – Comprehensive Economic and Trade Agreement

EC – European Commission

ECPA – European Crop Protection Association

EU – European Union

FAO – Food and Agriculture Organization

GU – Grain Unit

HFFA – Humboldt Forum for Food and Agriculture

IFPRI – International Food Policy Research Institute

MENA – Middle East and North Africa

SITC – Standard International Trade Classification

TTIP – Transatlantic Trade and Investment Partnership

TLL – Thüringer Landesanstalt für Landwirtschaft

1 Introductory remarks

The agricultural trade of the European Union (EU) has been for years and currently is one of the most frequently discussed issues in public debate and scholarly research. Generations of scientists and policy decision makers have devoted considerable time and efforts to better understand and further liberalise in particular agricultural trade among nations. Most recently, the negotiations of the Transatlantic Trade and Investment Partnership (TTIP) between the EU and the United States and the Comprehensive Economic and Trade Agreement (CETA) between Canada and the EU have often been influenced by public and policy arguments related to agricultural trade.

The authors of this paper have contributed to this discussion by looking at trade issues from various perspectives. New arguments were added by introducing the concept of virtual agricultural trade (von Witzke and Noleppa, 2010), first of all, an approach, which – together with other land use assessment techniques – has gained much attention in scholarly research (see, e.g., Kern et al., 2012; Louwagie, 2013; Qiang et al., 2013), statistical analysis (see, e.g., Destatis, 2013a; b) and public policy debate (see, e.g., van den Bergh and Grazi, 2013; WWF Germany, 2012). By some, the approach developed in von Witzke and Noleppa (2010) and slightly amended in von Witzke et al. (2011) is even used as the reference system for arguing in peer-reviewed scientific papers (see Meier et al., 2014).

In addition, the authors aimed at developing and applying a methodology to continuously, i.e. annually measure agricultural self-sufficiency of the EU, because the discussion of various arguments surrounding the renewal of the old, post-war-driven agricultural self-sufficiency debate (see, e.g., Bouet and Laborde, 2008; de Schutter, 2011) has led to the conclusion that reliable data on self-sufficiency are lacking to build respective arguments upon verifiable information. For instance, statements such as those of Häusling (2011) arguing that the EU suffers from an important protein deficit amounting to approximately 70 percent are not supported by any meaningful evidence. Therefore, a research project has been launched in 2013 to provide a meaningful set of self-sufficiency indicators, which offer detailed but also highly aggregated and easily understandable information. The initial findings of this project have been published in Noleppa and Cartsburg (2013).

The most important data base, i.e. Eurostat (2014b) – building the fundament of the entire approach to calculate the virtual agricultural land trade and the agricultural self-sufficiency of the EU –, has meanwhile undergone a complete information update and structural re-launch in spring 2014. Moreover, some new and more reliable other data sources have become available since the introduction of the approach. This led to the necessity and plea to completely revise previous versions of the calculation of virtual agricultural land trade and self-sufficiency figures for the EU.

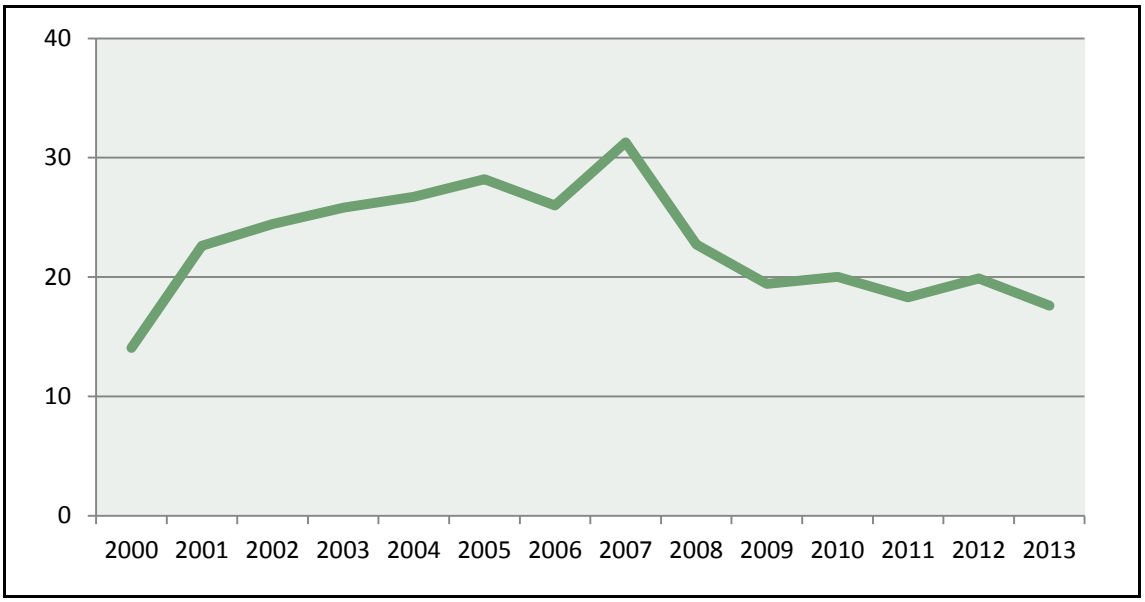
In the following, the major revisions and the results of the adjustments are discussed. First, the revisited trends of the EU's virtual agricultural land trade since the turn of the millennium will be highlighted (chapter 2). It follows a visualisation and interpretation of most recent agricultural self-sufficiency figures for the EU (chapter 3). Some conclusions will be drawn, finally (chapter 4). A comprehensive annex consisting of altogether 27 supplements gives additional and more detailed information on selected issues constituting the methodological and data base of the research findings displayed in the following.

2 Trends of the EU's virtual agricultural land trade

The following results are based on the methodology outline in annex A01 of this report. Accordingly trends of the EU's virtual agricultural land trade are analysed for every single year of the above mentioned time period, i.e. from 2000 until 2013, and for each agricultural commodity.

Before analysing the development of the EU's virtual agricultural land trade in some detail, i.e. by single crop and/or livestock, it is worth putting emphasis first on the development of the EU's entire virtual agricultural land trade. Figure 1 visualises the outcome.

Figure 1: Total virtual agricultural land net imports of the European Union, 2000-2013 (in million ha)



Source: Own figure based on own calculations.

First, it becomes apparent that land trade figures – based on the completely revisited methodology and data set described and the reasons listed in annex A01 – are somewhat lower than previously calculated figures. Nevertheless, the situation has not changed a lot: The EU was and still is a major net importer of virtual agricultural land. It was at no point over the past decade a net exporter of virtual agricultural land. However, looking backwards, two remarkable trends become obvious:

- After the turn of the millennium imports of virtual agricultural land were lower than 15 million ha but rose steadily until it peaked in 2006/2007 with slightly over 30 million ha virtually imported. During this time, the EU lost competitiveness in major agricultural markets due to a loss of former protection, i.e. a further liberalisation of the Common Agricultural Policy (CAP).

- Since then, a rather steep decline was witnessed leading to levelling off approximately 20 million ha virtually imported in past years. This is still more than half the territory of Germany. Obviously, EU farmers have been able in most recent years to increase production in times of additional agricultural demands and re-gained competitiveness in at least some markets.

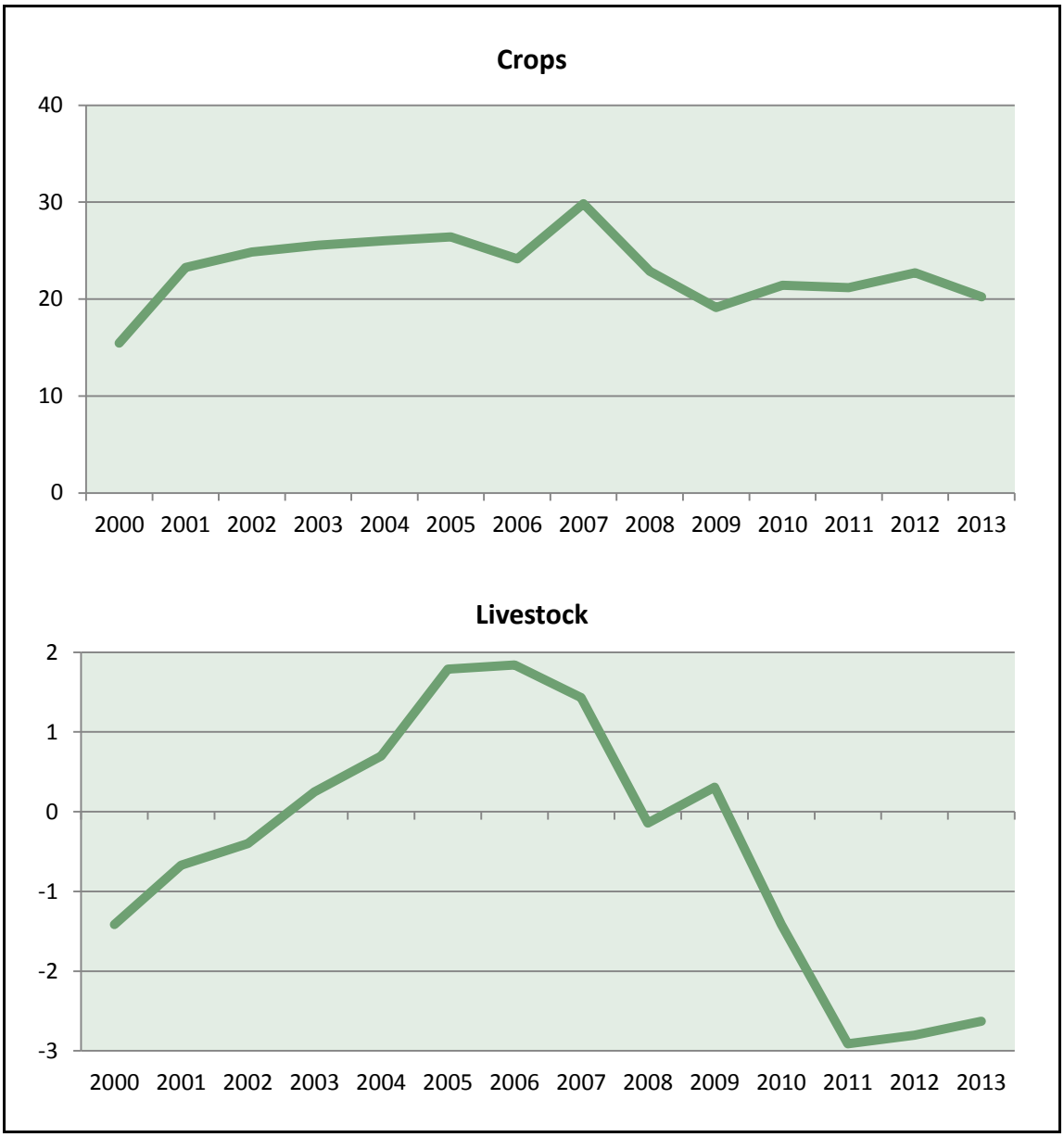
Only by going more into detail it is possible to look behind this dual development. First insights can be provided by splitting the graph depictured in figure 1 into charts displaying the development of virtual agricultural land trade based on the trade of crops and the trade of livestock products. The result is visualised in figure 2.

Accordingly, the EU is continuously a large net importer of virtual agricultural land that can be attributed to crops. The calculated values have ranged between 20 and 30 million ha since the year 2000. The highest net virtual import values were reached in 2006 and 2007, and during recent three years (2011-2013) agricultural land has been net imported at roughly 21.4 million ha. This is slightly more than the initial virtual land trade value at the turn of the millennium.

Behind this development are various drivers. Looking at the annexes A02 to A15, it becomes apparent that not only liberalisation effects of the CAP reform, but also other determinants are noteworthy. Many of them influence the depicted outcome in parallel and not all of them can be discussed here in detail, but some are as follows:

- Taking the example of wheat (see annex A02), e.g., it becomes obvious that the EU took responsibility during the food price crisis in 2007/08, when major wheat exporting nations banned further exports, and considerably enlarged own wheat exports to maintain global food security.

Figure 2: Virtual agricultural land trade of the European Union for crops and livestock products, 2000-2013, net imports (+), net exports (–), (in million ha)



Source: Own figure based on own calculations.

- In addition to that and neglecting the initial liberalisation effect in the first years after the millennium, a (rather volatile) trend towards increasing virtual wheat land exports becomes apparent, too. This probably has a lot to do with increasing wheat production in the EU due to increasing land productiv-

ity. Indeed, between 2000 and 2013, the average yield in EU wheat production rose by 1.0 percent annually (based on own calculations using FAO, 2014b) while virtual wheat land exports rose at a rate of three percent per annum during the same time period.

- However, it has to be noted that the virtual land trade in cereals is indeed rather volatile. Volatility, here, seems to be chiefly influenced by EU harvest amounts. Apparently, comparably good harvests in the EU tend to lower net land imports respectively to increase net land exports in the year of the harvest and/or the year after. Poorer harvests tend to cause an opposite effect.

- Yield improvements (and harvest increases) certainly have contributed to the overall decrease of the EU's virtual agricultural land imports that can be associated to crop production. These yield increases occur inside the EU (for corn and oilseed rape, e.g., the annual rate was plus 0.8 percent), but also in other world regions. Improvements in global land productivity might have influenced, e.g., the EU's lower virtual soya land imports (see annex A06). In fact, while the EU's net soya land imports shrunk by 1.4 percent annually, global soya yields increased by 0.8 percent (again based on FAO, 2014b). I.e., the EU's virtual agricultural land trade balance profits from technological improvements not only within its own territory but throughout the globe.

- In opposite to that, the agricultural land trade balance of the EU became worse for some commodities. Palm (see annex A07) is just one example: Between 2000 and 2013, the EU doubled the amount of palm land that was virtually net imported. This is most probably due to the large increase in palm oil imports for bioenergy generation, hence due to an emerging new demand. Such an additional demand might also be the reason of the worsening of the land trade balance for oilseed rape (see annex A08).

- Other crops show less obvious changes over time when it comes to assess virtual land trade of the EU. The situation is rather stable in the cases of coffee and cocoa (see annex A10) and other stimulants such as tea and tobacco (see annex A11).

- Interesting is also the case of pulses (see annex A14). Despite often politically announced protein deficits and needs for increasing quantities of supplied pulses (see, e.g. Häusling, 2011), the EU market actors obviously refused to take action.

- Sugar crops (see annex A15), on the opposite, tend to become more and more important with respect to its contribution to the EU's virtual net land im-

ports, most likely as an effect of policy activities in most recent years towards more liberalised sugar markets.

The virtual land trade of livestock products is as diverse as the crops-related land trade of the EU. This becomes obvious by looking at the annexes A16 to A21. In the beginning of the 21st century, the EU was a net exporter of virtual agricultural land devoted to livestock products (see the negative prefix in figure 2). However, between the years 2003 and 2007 the EU turned into a net importer of livestock-related land. Close to 2 million ha were net imported as a virtual input in livestock products. However, the situation changed again leaving the EU a net exporter of virtual agricultural land for livestock products ever since 2009. The 2011-2013 mean represents virtual land exports of almost 2.8 million ha.

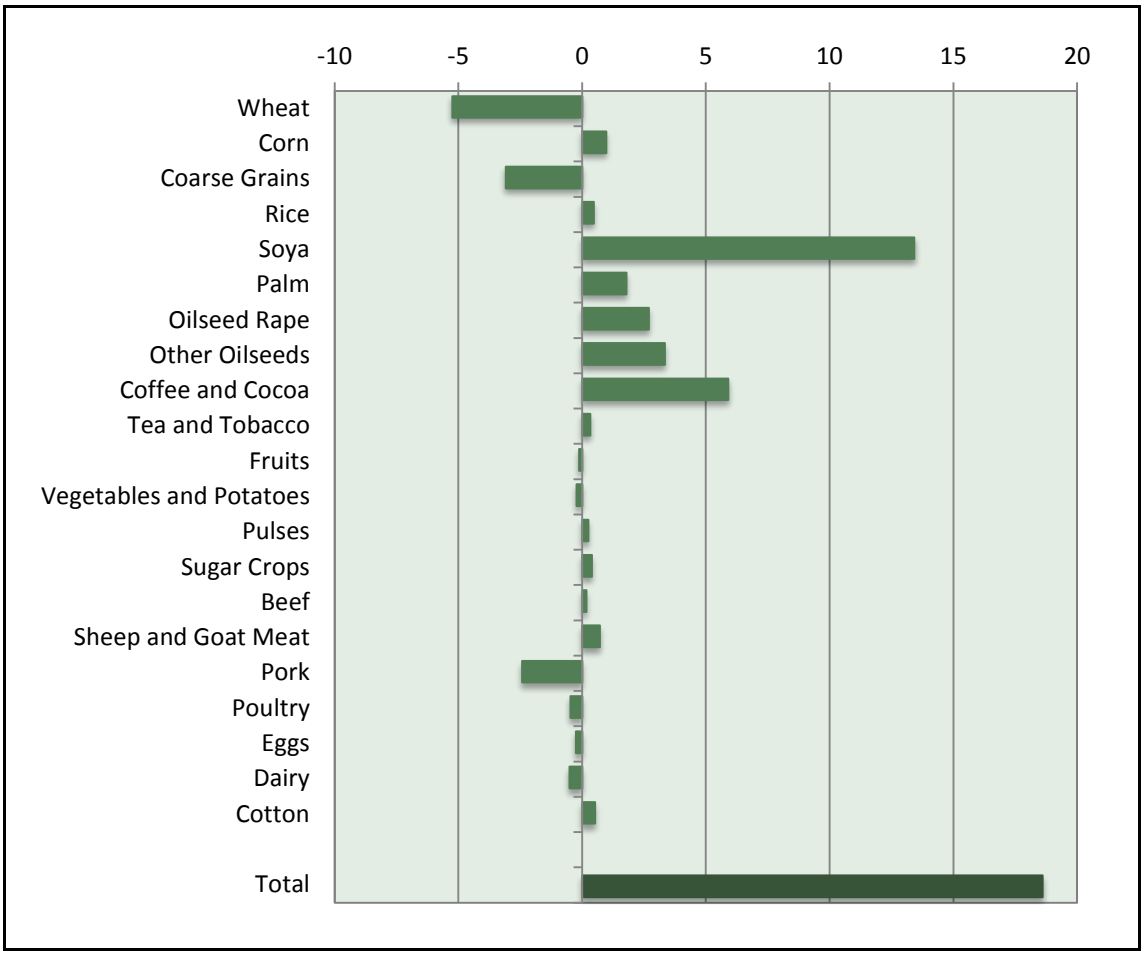
Obviously, the EU was altogether able to re-gain at least some competitiveness that was most probably lost around the turn of the millennium when the EU agricultural markets were confronted with a more liberalised CAP of the EU leading to a considerable loss of some protection, especially in the beef sector (see annex A16), but not in the at all times rather unprotected pork sector (see annex A17).

Looking not only at the trends, but analysing the net imports and exports of virtual agricultural land by crop and livestock category more particularly for most recent years, i.e. 2011-2013 (or what we consider: the status quo), leads to some more insights into particularities of the EU's virtual agricultural land trade. As becomes clear by looking at figure 3, the current situation is rather complex. While the EU in total net imports roughly 18.6 million ha virtually, there are big differences in the trade balance for individual crops and livestock groups:

- Oilseed crops as well as coffee and cocoa products facilitate the overwhelming majority of net virtual land imports into the EU. The, by far, most important driver of virtual land imports is soya with 13.4 million ha, followed by coffee and cocoa (5.9 million ha), oilseed rape (2.7 million ha), palm (1.8 million ha) and other oilseeds (3.3 million ha). Net virtual land imports of corn (almost 1.0 million ha) and rice (0.5 million ha) play a minor role.

- Net virtual exports of agricultural land are dominated by wheat (5.2 million ha) and coarse grains (3.1 million ha) as well as livestock products, especially pork (2.4 million ha), dairy products (0.5 million ha) and poultry (0.4 million ha).

Figure 3: Net imports (+) and net exports (–) in virtual agricultural land of the European Union by crop and livestock commodity, on average for 2011-2013 (in million ha)



Source: Own figure based on own calculations.

A closer look at the world regions most affected by the current virtual agricultural land trade of the EU is finally provided with figure 4. The region most affected by virtual net agricultural land imports of the EU is South America. Over 14.3 million ha of agricultural area in that region are being virtually occupied by the EU. The vast majority of this imported area certainly comes from soya (10.7 million ha), followed by coffee and cocoa (1.4 million ha). The most important region in which virtual agricultural land from the EU is net exported is the Middle East and North Africa (MENA) region (6.4 million ha). The majority of virtual land being exported to the MENA region is devoted to wheat (4.2 million ha) and coarse grains (1.5 million ha). Such regional- and crop-specific figures are summarised with annex A22.

Figure 4: Regional distribution of net virtual agricultural land trade of the European Union, on average for 2011-2013 (in million ha)

North America	Asia	Africa	CIS
2.789	1.156	2.311	2.573

South America	MENA Countries	Rest of Europe	Rest of the World
15.344	–6.400	–2.092	2.836

Source: Own figure based on own calculations.

3 Current agricultural self-sufficiency ratios of the EU

Methodological particularities leading to the following results can be obtained from annex A23 of this report. Accordingly, figure 5 visualises the self-sufficiency ratio of the EU for major agricultural commodities using three-year-average values for 2011-2013:

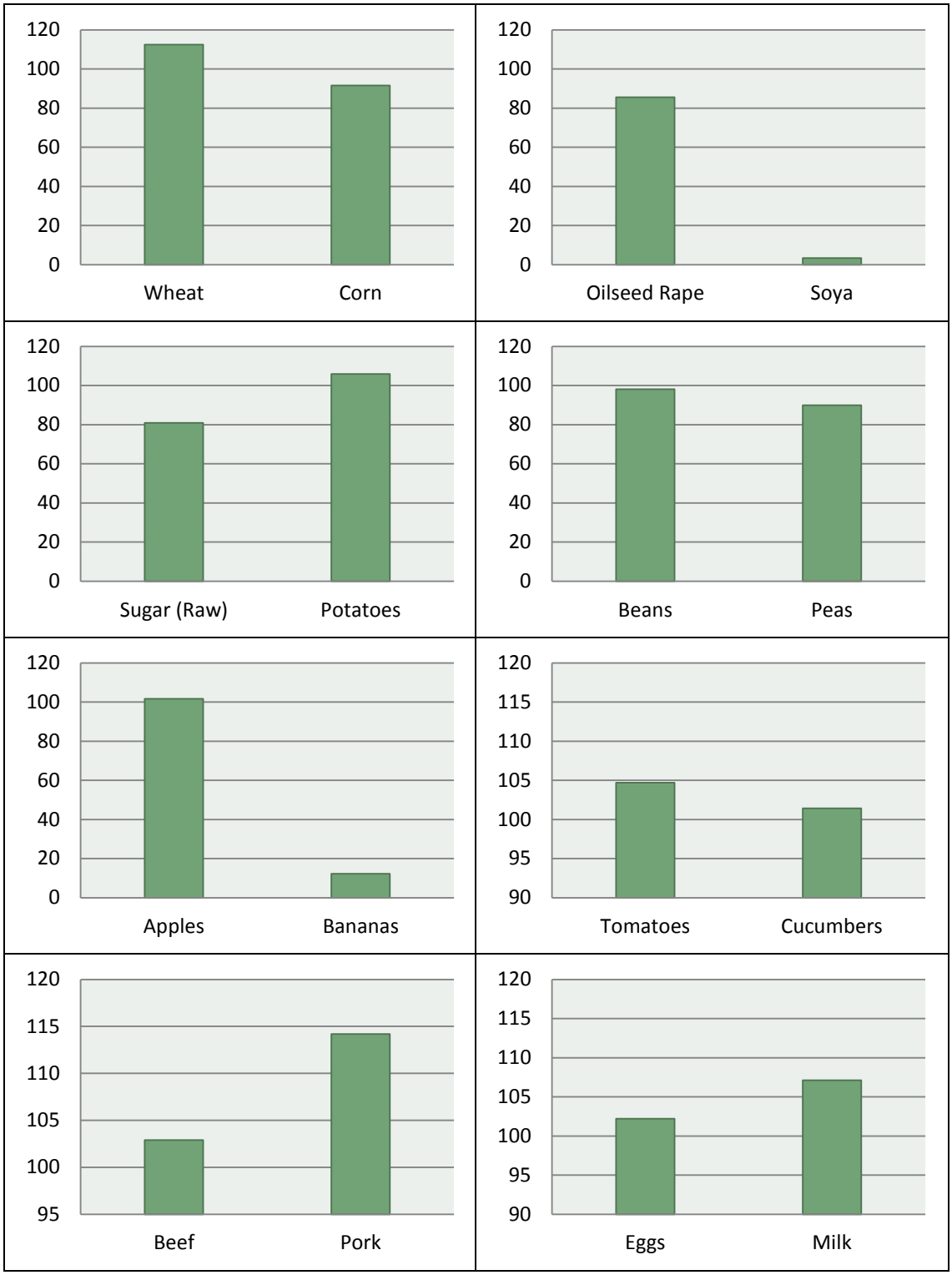
- It becomes apparent that the EU is currently able to produce more agricultural raw materials and marketed products thereof than necessary for domestic consumption of some major crops and livestock. The self-sufficiency surplus, e.g., in wheat and potatoes is 12 percent respectively 6 percent, in pork it is 14 per cent, and in eggs and milk full self-sufficiency is exceeded by 2 respectively 7 percent.

- However, it is obvious, too, that with respect to other crops and livestock products the EU is, partially by far, not self-sufficient. The deficit in self-sufficiency is particularly large in some fruits, such as bananas, but also in some oilseed crops and protein crops.

This becomes even clearer by looking at annex A24 to the report. The annex depicts all the crop-specific and livestock-specific self-sufficiency ratios covered by this analysis not only for the average of the years 2011 to 2013, but annually. By and large, it turns out that latest statistical findings (see again Eurostat, 2011) can be confirmed: Agricultural self-sufficiency in the EU is very diverse indicating that EU member states are well integrated into world markets exporting various commodities in exchange to importing other products.

Using now 'grain units' (GU) (see also annex A23) as a means to sum up product-specific self-sufficiency ratios to a single figure indicating agricultural self-sufficiency for the EU as a whole enables to argue on a different, more general level.

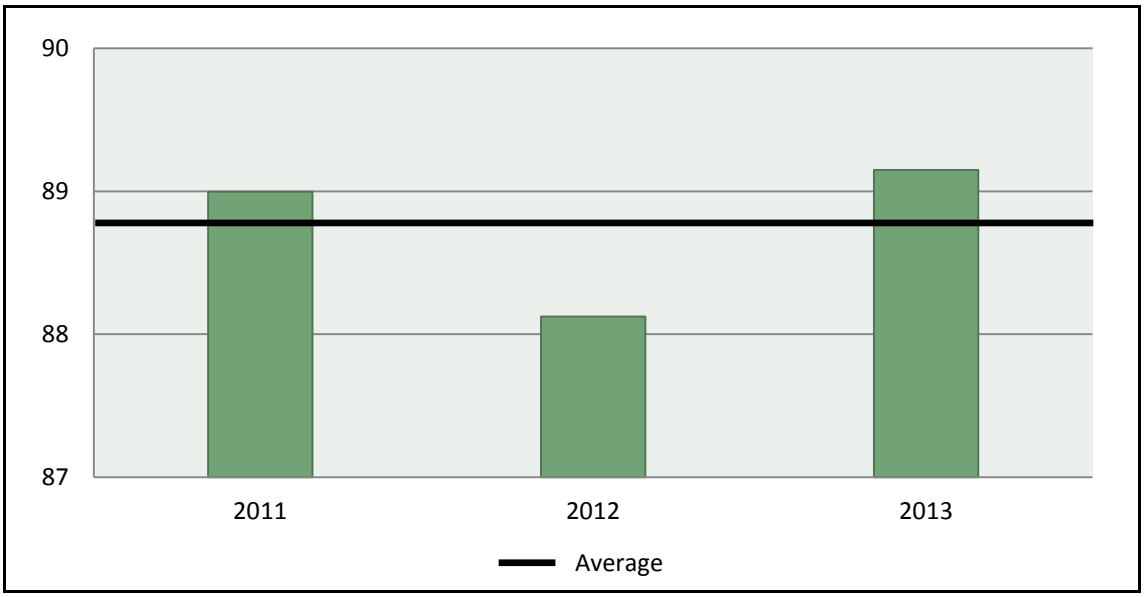
Figure 5: Self-sufficiency ratio of the European Union for some major agricultural commodities, on average for 2011-2013 (in percent)



Source: Own figure based on own calculations.

Against this background, the following figure 6 describes to what extent the EU is self-sufficient from an aggregated nutritional point of view in the past three years and on average from 2011 to 2013.

Figure 6: Aggregated agricultural self-sufficiency of the European Union in terms of grain units, 2011-2013 and on average (in percent)



Source: Own figure based on own calculations.

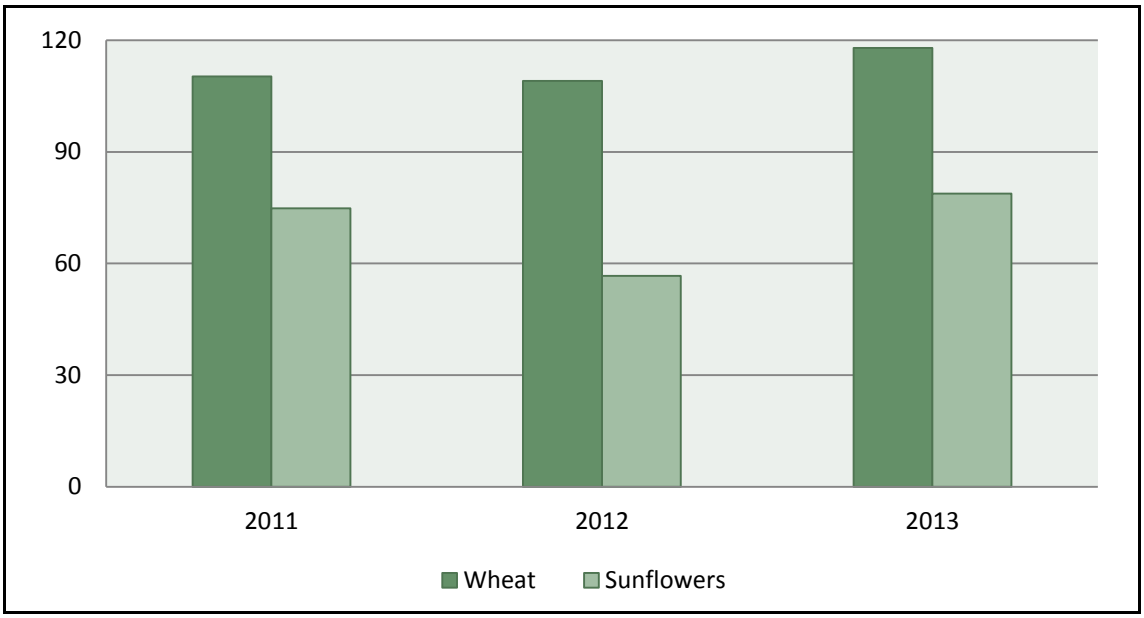
It turns out that – on aggregate – the EU is not self-sufficient in terms of all the nutrients normally locked in agricultural products and principally available for different usages: The respective self-sufficiency ratio is only 88.8 percent on average for the years 2011 to 2013 and has not fluctuated a lot (i.e. within one percentage point) from year to year.

However, crops products have to be distinguished from livestock products. Although in total not self-sufficient, the EU is self-sufficient in livestock products; the average surplus in terms of GU (not visualised in figure 1) is 7 percent and the value of the ratio fluctuated by not more than 0.1 percentage points; on the opposite, the EU's self-sufficiency deficit is quite large in crops products and amounts to 14 percent, i.e. the self-sufficiency ratio is about 86 percent for the average of 2011-2013; the yearly ratios here were 86.0 percent (in 2011) 85.0 percent (in 2012) and 86.3 percent (in 2013).

Fluctuations are obvious in crop production and become even more apparent if looking at single commodities, as figure 7 displays on an exemplified base, first.

Here, the self-sufficiency ratios for the past three years are visualised for wheat and sunflowers, two major agricultural commodities domestically produced at a rather large scale.

Figure 7: Self-sufficiency of the European Union in wheat and sunflowers, 2011-2013 (in percent)



Source: Own figure based on own calculations.

A low harvest in 2012 (compared to 2011) respectively an extraordinarily good harvest in 2013 (compared to 2012) has led to a considerable shrinking (increase) in the EU's crop-specific self-sufficiency ratio for 2012 (2013), a development that still can be observed by looking at the highly aggregated self-sufficiency values shown in figure 6 above. This highlights again the overall importance of crop productivity for agricultural performance and development in the EU.

In opposite to that, self-sufficiency ratios for livestock products are rather stable as figure 8 displays (see also annex A24). Here – giving more or less constant herd sizes and trade patterns – ad-hoc disturbances such as weather conditions influencing harvestable yields play a minor role.

In addition to that it might be interesting to note as well that with respect to pulses a sharp production decline in the EU together with a considerable import increase, in particular beans imports, have led to a meaningful decline in self-sufficiency of pulses in 2013; and, to take a final example: The fruit sector shows remarkable movements in self-sufficiency ratios, too. Here, unusual high volumes

of imports of bananas, oranges and grapes led to a very remarkable decrease of the fruits' self-sufficiency of the EU in 2013.

Figure 8: Agricultural self-sufficiency of the European Union for important commodities in terms of carbohydrates, proteins and fats, average for 2011-2013 (in percent)

Commodity Group	Carbohydrates	Proteins	Fats
Cereals	106	107	104
Oilseeds	81	74	84
Roots	106	106	105
Sugar Crops	81	81	81
Pulses	91	91	87
Vegetables	104	104	105
Fruits	79	79	70
Total, Crops	90	82	85
Meat	111	109	111
Eggs	102	102	102
Milk	107	107	107
Total, Livestock	109	107	109
Total	**91**	**85**	**87**

Source: Own figure based on own calculations.

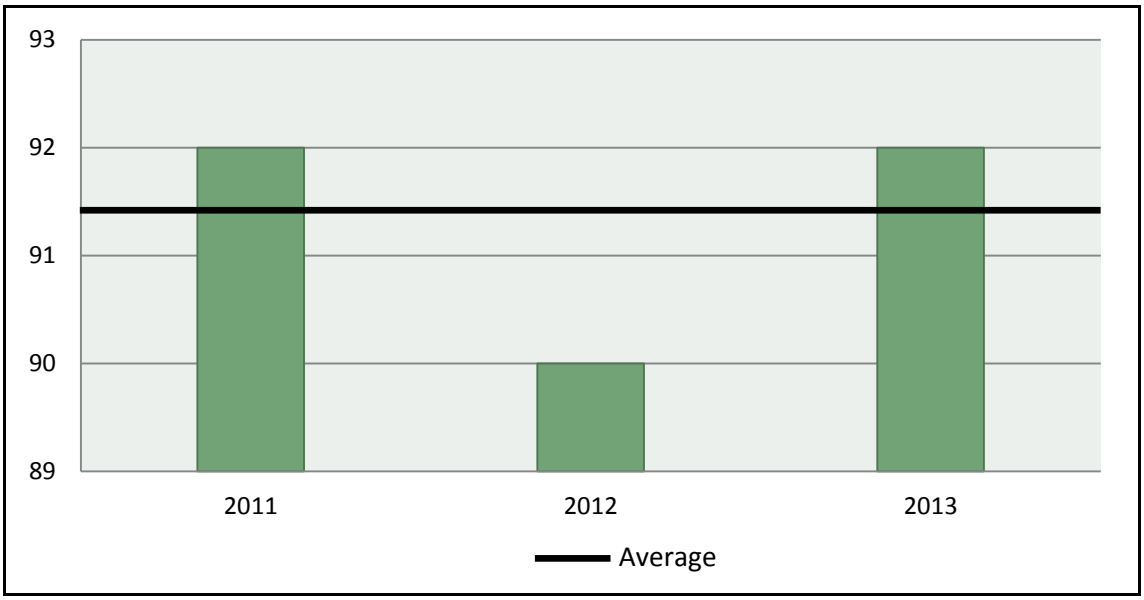
Finally, it shall be noted that – similar to what has been visualised in figure 6 for GU – the following three figures depict the EU's self-sufficiency picture for single nutrients, i.e. for carbohydrates (figure 9), proteins (figure 10) and fats (figure 11). The results can be summarised as follows:

- The agricultural self-sufficiency is the biggest with respect to carbohydrates, but reaching only a bit more than 91 percent.
- It is lowest in proteins and sums up to approximately 85 percent.
- For fats, the agricultural self-sufficiency of the EU is in between and slightly higher than 87 percent.
- In livestock products the EU is self-sufficient across the three basic nutrients – carbohydrates, proteins, and fats – whereas it is not in crop products.

- More particularly, a carbohydrate surplus provided in livestock production of more than 8 percent is overcompensated by a deficiency occurring in crop production of almost 10 percent.
- Even more pronounced is the difference in the EU's agricultural self-sufficiency in terms of protein. Although more animal protein is available from domestic production than actually needed (plus 7 percent), the total protein balance is negative because the EU suffers from a protein deficiency in crop production accumulating to almost 18 percent.
- Looking finally at the fat (i.e. oil) content of crops, it becomes apparent that the EU also envisages a high deficit. It amounts to almost 15 percent. In opposite to that the EU is still self-sufficient in animal fats. The surplus amounts to 9 percent. However, this surplus does not compensate the deficit in available oil from crop production leading to an overall fat-specific self-sufficiency depicted in figure 3.

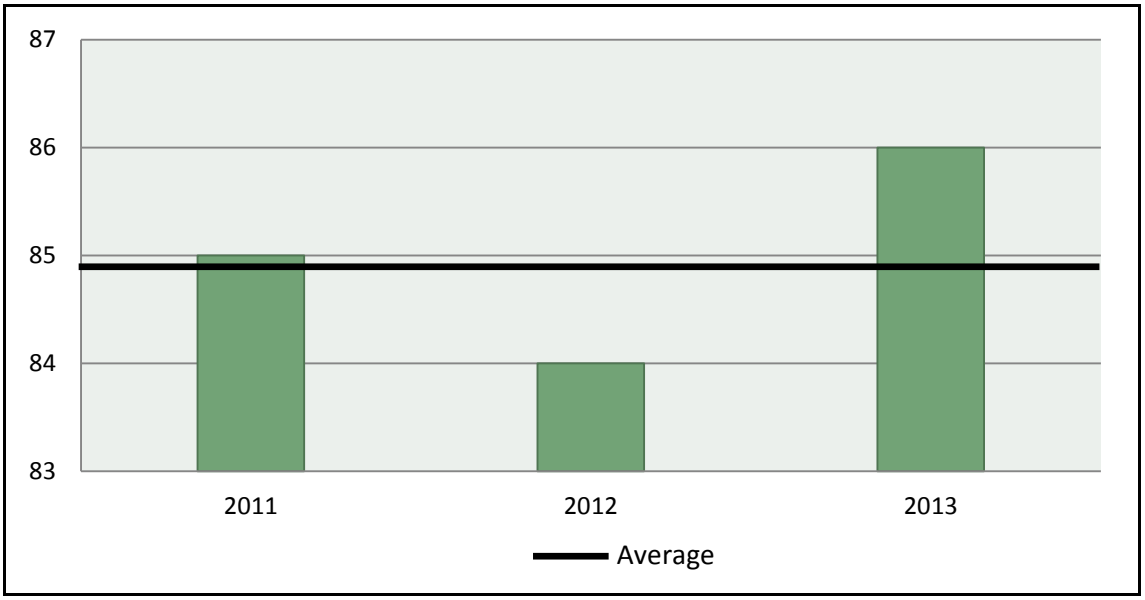
All in all, it turns out that the EU is not self-sufficient in all three basic nutrients.

Figure 9: Aggregated agricultural self-sufficiency of the European Union in terms of carbohydrates, 2011-2013 and on average (in percent)



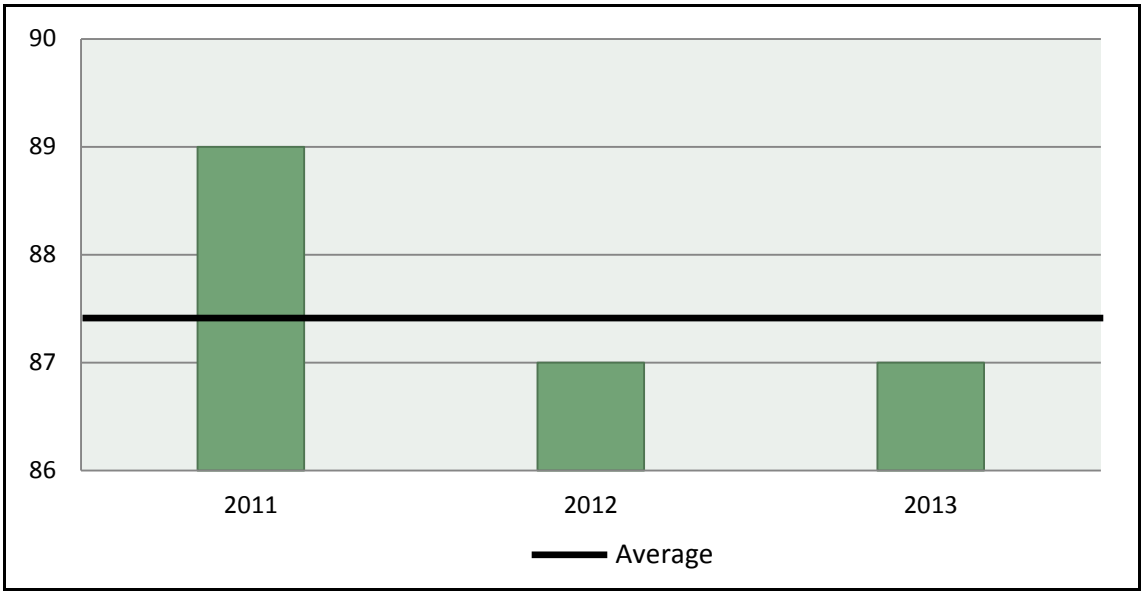
Source: Own figure based on own calculations.

Figure 10: Aggregated agricultural self-sufficiency of the European Union in terms of proteins, 2011-2013 and on average (in percent)



Source: Own figure based on own calculations.

Figure 11: Aggregated agricultural self-sufficiency of the European Union in terms of fats, 2011-2013 and on average (in percent)



Source: Own figure based on own calculations.

4 Concluding remarks

This research paper is considered the initial outcome of a multi-annual project aiming at continuously measuring the virtual agricultural land trade as well as the agricultural self-sufficiency of the EU. It is based on a revisited methodology and most recent trade and other data, thus setting an improved standard of calculating the virtual land trade and various self-sufficiency indicators to be updated regularly.

Accordingly, the EU is currently net importing a still remarkable amount of virtual agricultural land – close to 20 million ha. The status quo, however, is the result of various developments during past years. Around the turn of the millennium, the EU has net imported almost 15 million ha, only. The acreage net occupied outside the EU's territory then doubled until the years 2006/07, obviously as the result of increasing liberalisation, new and increasing demands and decreasing land productivity growth in the EU. Since then, the trend has changed again: The EU was able to lower its virtual net import of agricultural land over time by about 10 million ha. First of all, this is apparently due to good harvests, especially in grain production, rising competitiveness in meat production, but also because trading partners improved in land productivity.

Despite all improvements, the EU remains a large net importer of virtual agricultural land. It occupies resources outside its territory to satisfy its own demand. Some of the world regions net delivering virtual agricultural land to the EU face resource scarcity and/or own problems in satisfying domestic demand for food, feed, fuel and/or fibre. Therefore, it is absolutely necessary to further improve the land trade balance of the EU.

A promising option to do so is increasing agricultural productivity. This becomes clear by looking at most recent agricultural self-sufficiency data. Summarising the respective findings, it can be stated that EU agriculture is on the one hand able to produce huge volumes of agricultural raw materials and products thereof, especially in times of good harvests (due to comparably high yields). On the other hand, the Community has to import some important agricultural commodities and products thereof to assure a very high level of regional food security.

Different self-sufficiency ratios, against this background, foremost indicate that the EU is very well integrated into world agricultural markets using its comparative advantages for exporting some commodities while relying on trading partners for importing other agricultural goods, which cannot be produced sufficiently in the EU due to unfavourable natural and/or economic conditions.

In particular, it has to be noted that the EU is especially dependent on certain crop nutrients, which must be imported at large scale: proteins and oils. This probably has a lot to do with strong feed and fuel demands:

- Indeed, the particularly high self-sufficiency deficit in vegetable fats (see annex A27) might not only partially be driven by our steadily increasing demand for biofuels and industrial raw products (e.g. palm oil).
- On the other side, it should be noted that our crop protein deficit is not as alarming as some advocates of protein crops cultivation in the EU suggest (see, e.g., Häusling, 2011). It is important to note that not only protein crops but also oilseed crops and cereals contribute to the availability of vegetable proteins.

Indeed, alarmism is not appropriate when speaking about self-sufficiency. Self-sufficiency has nothing at all to do with food security. Bouet and Laborde (2008) state that food security exists if people have access to sufficient food to meet their dietary standards. This is surely the case within the EU. Trade, then, is just a means of balancing domestic supply and demand (Kapma, 2013; Matthews, 2013), and self-sufficiency ratios should then be considered as indicators only pointing at trade dependencies of a region.

Still, there are other factors causing our deficits, in particular negative incentives to invest in agricultural productivity (see also Noleppa et al, 2013). Being a region with innovative people able to create and apply modern, safe technologies and with suitable soil and other natural conditions, it is astonishing that agricultural productivity growth in the EU fell behind a rather modestly growing demand. Indeed, high-productive agriculture in the EU is often confronted with unjustified restrictions and suspensions. They particularly target major arable crops, which provide not only a lot of nutritional energy, but also domestically produced proteins and oils. Using this perspective, low self-sufficiency ratios as discussed above also point at policy-led shortcomings, especially at an inappropriate resource use outside the EU's territory.

To meet regional demand, EU member states definitely need to occupy globally available agricultural produce and inputs (such as land abroad) that might better be used to improve world food security. In such an environment, statements of the European Commission (EC) indicating that "… times where the EU continuously recorded a negative trade balance seem to be over …" (EC, 2013) have to be reflected. Such an argument might hold true with respect to trade from a monetary perspective, but not from the viewpoint of resources needed to generate this pecuniary trade surplus. This might definitely be not "… a good story to tell …", as the EC tries to suggest (see again, EC, 2013), especially not for world regions having enough natural resources to produce agricultural raw materials, but suffering from food security problems.

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Annex

Annex A01: Methodological remarks on the calculation of the virtual agricultural land trade of the EU

The virtual agricultural land trade approach discussed here is based on the concept of virtual inputs initially developed by Allan (1993; 1994) for water. The basic idea is as follows: Essentially, any good being produced requires inputs. The inputs used in the production of a good are then considered a virtual part of this good. Hence, when a good is traded internationally the virtual input is traded simultaneously (see also Hoekstra et al., 2011; Hoekstra, 2003; Hoekstra and Hung, 2002; von Witzke and Noleppa, 2010).

Here, this concept is modified so it can be applied to the input 'land' in agricultural commodity production. By analogy, we define virtual land as the amount of land that is required to produce one unit of a given agricultural good. For instance, if it takes 'X' hectares of land to produce one metric ton of wheat, the 'X' is the number of hectares of virtual land contained in one metric ton of wheat. Exporting (importing) one metric ton of wheat from one country to another is then equivalent to the export (import) of 'X' hectares of virtual land. In essence, the import of agricultural goods adds land to the domestic resource base, while the export acts to reduce it.

An essential to calculate meaningful virtual land trade figures is therefore reliable and up-to-date foreign trade statistics. Looking at the EU, data of Eurostat – the European statistical office – have been proven to be consistent in this respect, but have most recently been completely updated and re-structured. Eurostat (2014b) data have now to be used to analyse the EU's virtual agricultural land trade.

Point of departure for the particular analysis are international agricultural trade volume flows, i.e. export and import tonnages, which are based on an internationally agreed classification of commodities and are available for each trading partner of the EU. In particular, the Standard International Trade Classification (SITC), the most widely used classification system in international trade analysis, is used hereafter. The SITC categories distinguish various degrees of processing, meaning that goods from identical raw materials (e.g. wheat) may end up in different classifications (e.g. wheat flour, feed preparations, pasta, etc.). However, they can also always be attributed to their raw material again.

In this analysis of international agricultural trade not only suitable categories of SITC 0 (Food and live animals) and SITC 1 (Beverages and tobacco) are included but additionally numerous categories of SITC 22 (Oilseeds and oleaginous fruits), SITC 263 (Cotton) and SITC 4 (Animal and vegetable oils, fats and waxes). In total, just a little under 300 different SITC categories of tradable agricultural commodities and products thereof are included in the analysis. This can be considered the largest amount of tradable goods ever incorporated in such kind of data exploration.

Indeed, the data base used here has continuously been expanded since von Witzke and Noleppa (2010). In particular, a lot of processed agricultural products are now included which were still excluded in previous versions of virtual land trade calculations. Important tradable goods most recently included are, e.g., cocoa butter and chocolate, roasted coffee products, some processed fruits and vegetables, and beverages (containing a lot of sugar). For all these almost 300 SITC categories, export and import data in terms of volume (i.e. tons) were generated from Eurostat (2014b) for the EU and for the years 2000 to 2013.

The conversion of agricultural trade data into land trade information is a rather complex methodological issue. Calculating virtual land trade from agricultural trade statistics requires several intermediate steps to be performed for each SITC category:

- First, it is essential to re-convert traded agricultural goods back into their respective raw material using consistent technical parameters and suitable conversion factors. Here, more up-to-date information from FAO (2012) has been obtained substituting to a large extent data used in previous analyses which were mainly based on FAO (2001) and USDA (1992).

- Looking particularly at some technical conversion factors, a more complex challenge has to be met which arises with agricultural raw materials that can be processed into more than one good to be categorised into different SITC numbers. This is, e.g., the case with oilseeds, which are usually processed into oil and cake. Similarly, dairy products, namely butter, cheese and milk, need to be converted into liquid milk equivalents. This problem was dealt with by applying weights for the relative volume of, e.g. oil and cake per ton of crop, fat and proteins per litre of milk, etc. (described in more detail in von Witzke et al., 2011) before conversion factors as provided with FAO (2012) have been applied. Thus, a potential double counting of hectares has been avoided.

- The resulting trade volumes (in terms of agricultural raw products) have then to be related to annual regional yields. The respective information is now taken from FAO (2014b) and allows to compute regional-specified land used for exports or imports.

- Finally, it is necessary to calculate the net imports respectively net exports for every single SITC category, therefore for every internationally traded agricultural commodity, and for each trading partner of the EU.

Using this gradual approach SITC by SITC category, it is possible to sort the traded agricultural goods into 57 different crop and livestock groups of agricultural raw

materials, including wheat, corn, other cereals, rice, soybeans, oilseed rape, palm, other oilseeds, coffee, cocoa, tea, tobacco, various fruits and vegetables and, in addition, eight livestock groups. These 57 groups can pragmatically be concentrated into altogether 21 groups of primary crops and livestock, which will be used here for proper analysis.

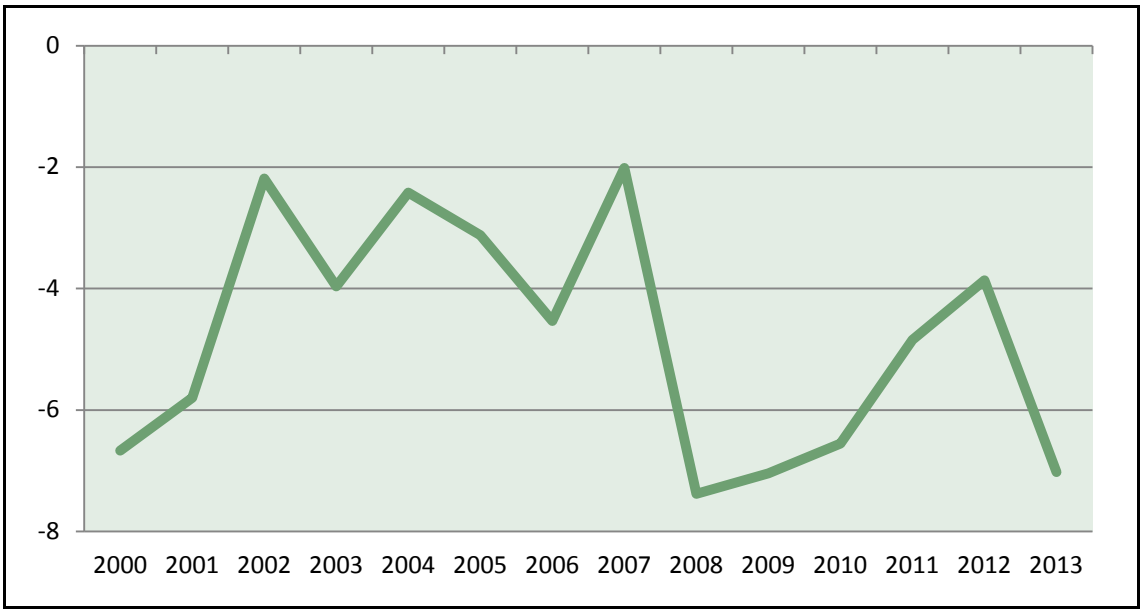
In essence, the methodological adjustment should lead to a new perspective on the EU virtual land trade because, by and large, the amendments tend to lower the amount of hectares to be net imported for a variety of reasons:

- The inclusion of more processed products on balance gives more weight to EU exports. The EU is highly competitive in processing products that cannot be produced in the EU at large scale due to unfavourable natural conditions. To take an example: Cocoa beans are almost entirely imported whereas chocolate products are also a major export product of the EU's agricultural value chains. Coffee beans vs. roasted coffee products is another case.

- The use of more up-to-date conversion factors points at efficiency improvements upstream and downstream the agricultural value chains over time. They include aspects such as higher oil yields in crushing, higher yield plant varieties and more productive livestock.

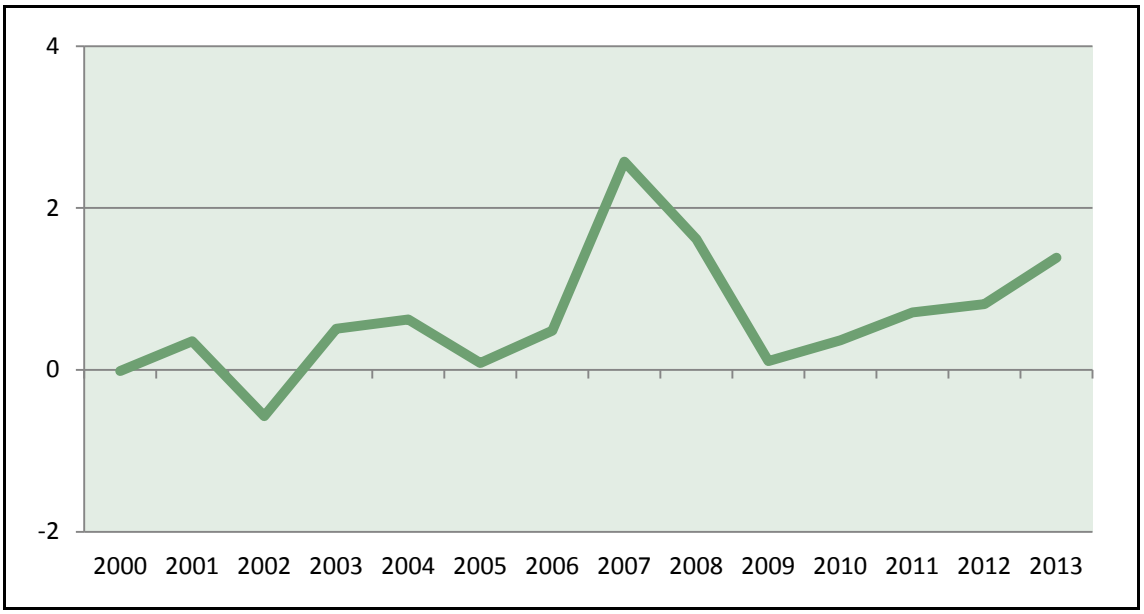
- Using the new Eurostat (2014b) data base, additionally provides a better opportunity to avoid potential double counting and overlaps of trade information, e.g. with respect to distinguish EU-intra and EU-extra trade.

Annex A02: Virtual agricultural land trade of the European Union for wheat and products thereof, 2000-2013, net imports (+), net exports (–), (in million ha)



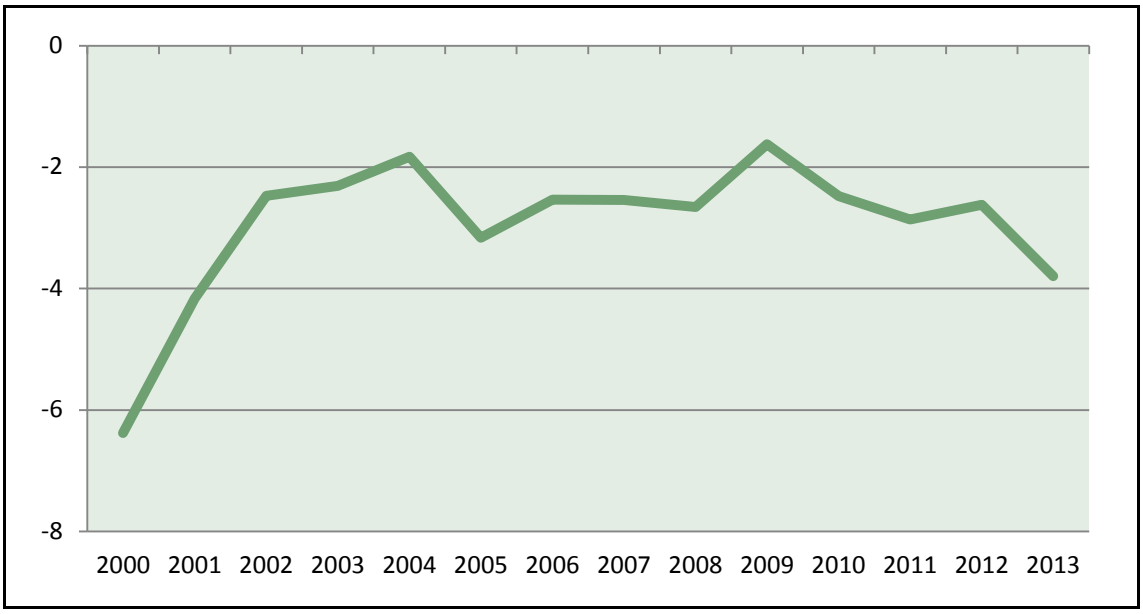
Source: Own figure based on own calculations.

Annex A03: Virtual agricultural land trade of the European Union for corn and products thereof, 2000-2013, net imports (+), net exports (–), (in million ha)



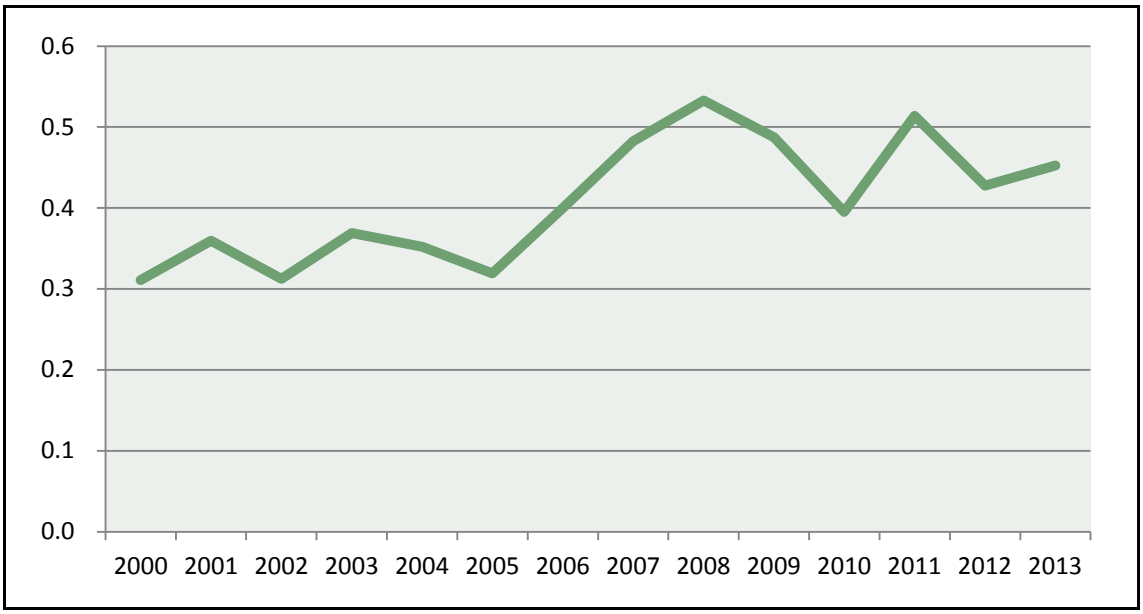
Source: Own figure based on own calculations.

Annex A04: Virtual agricultural land trade of the European Union for coarse grains and products thereof, 2000-2013, net imports (+), net exports (–), (in million ha)



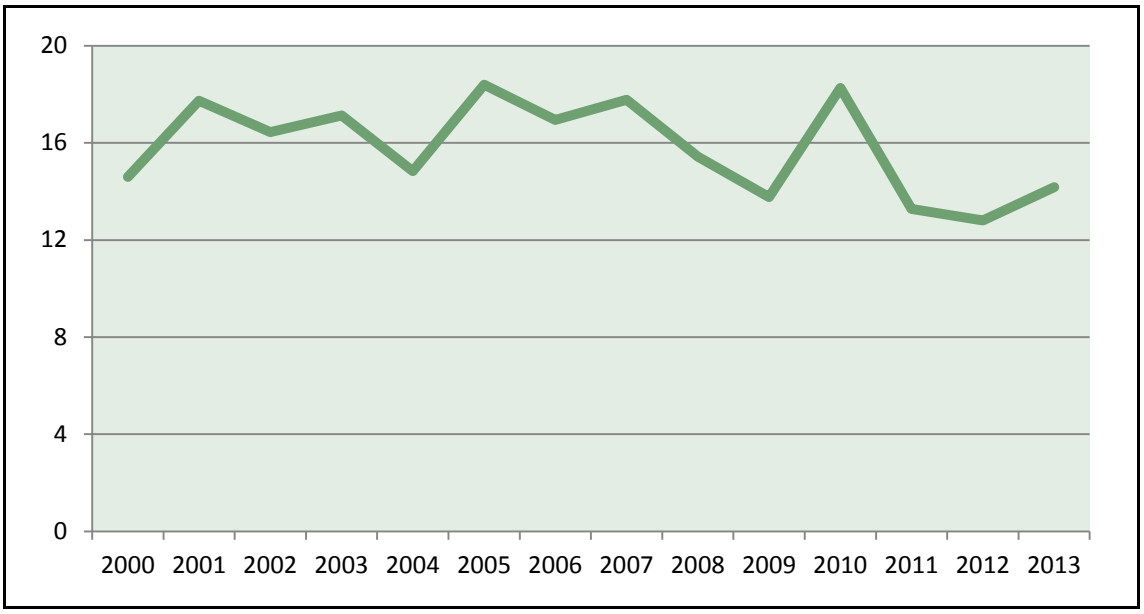
Source: Own figure based on own calculations.

Annex A05: Virtual agricultural land trade of the European Union for rice and products thereof, 2000-2013, net imports (+), net exports (–), (in million ha)



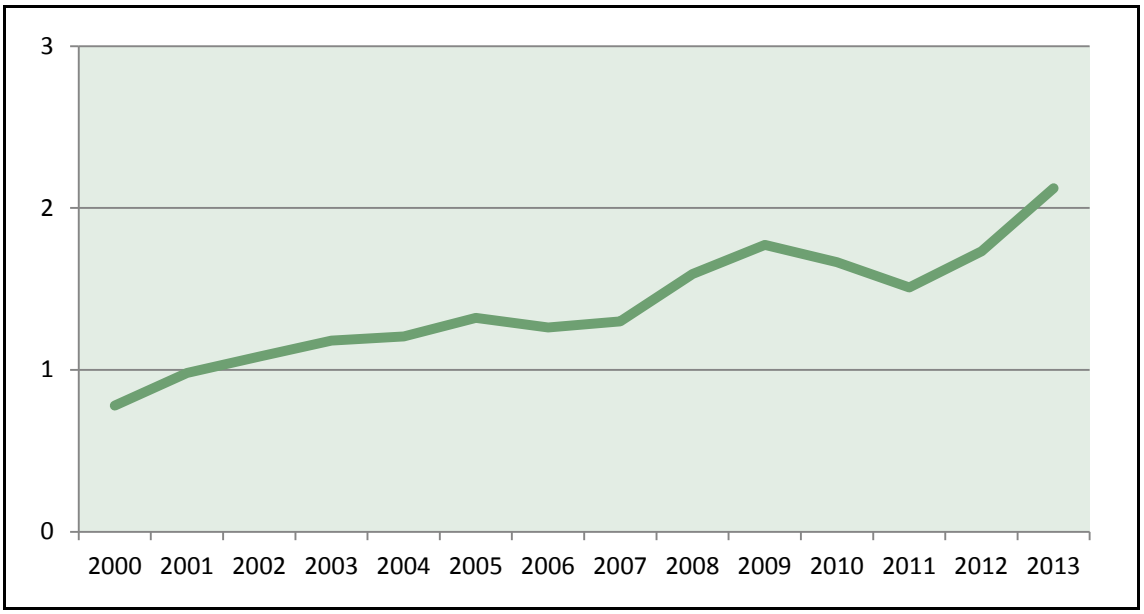
Source: Own figure based on own calculations.

Annex A06: Virtual agricultural land trade of the European Union for soya and products thereof, 2000-2013, net imports (+), net exports (–), (in million ha)



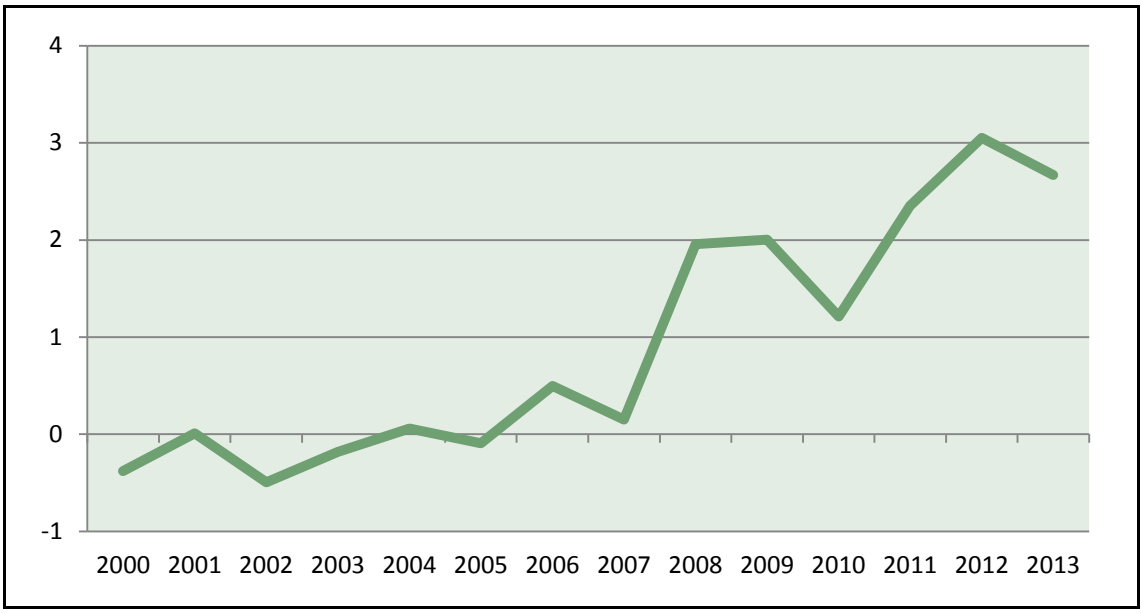
Source: Own figure based on own calculations.

Annex A07: Virtual agricultural land trade of the European Union for palm and products thereof, 2000-2013, net imports (+), net exports (–), (in million ha)



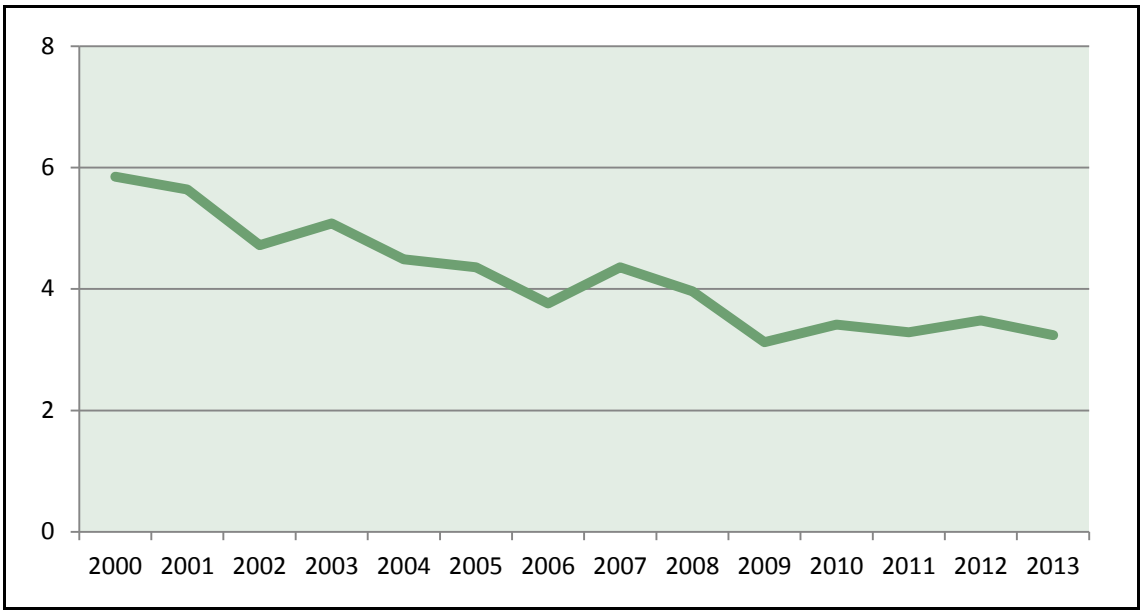
Source: Own figure based on own calculations.

Annex A08: Virtual agricultural land trade of the European Union for oilseed rape and products thereof, 2000-2013, net imports (+), net exports (–), (in million ha)



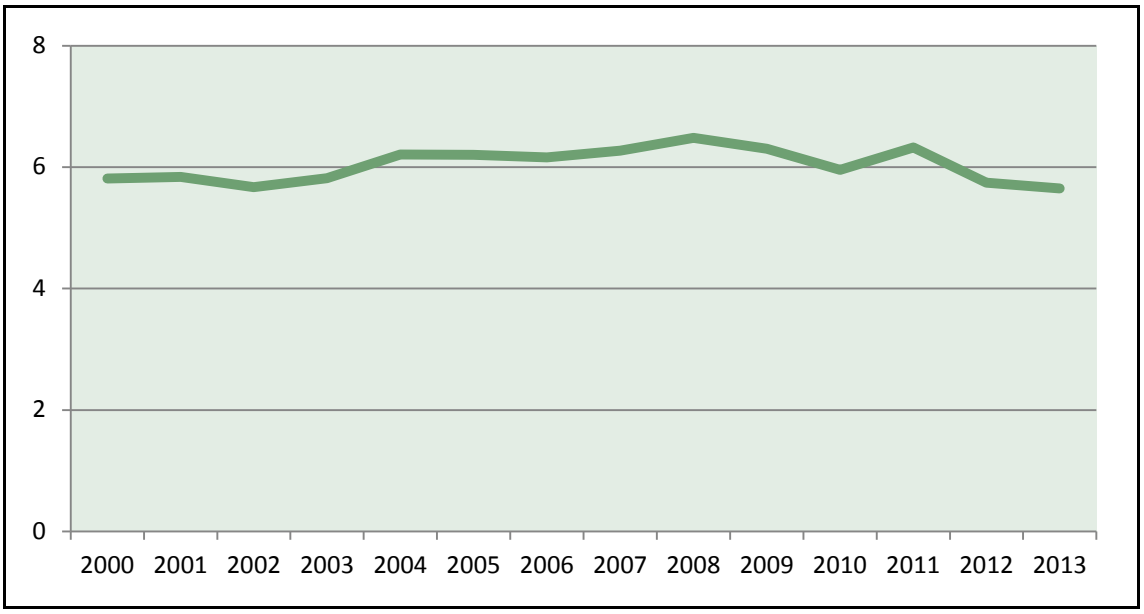
Source: Own figure based on own calculations.

Annex A09: Virtual agricultural land trade of the European Union for other oilseeds and products thereof, 2000-2013, net imports (+), net exports (–), (in million ha)



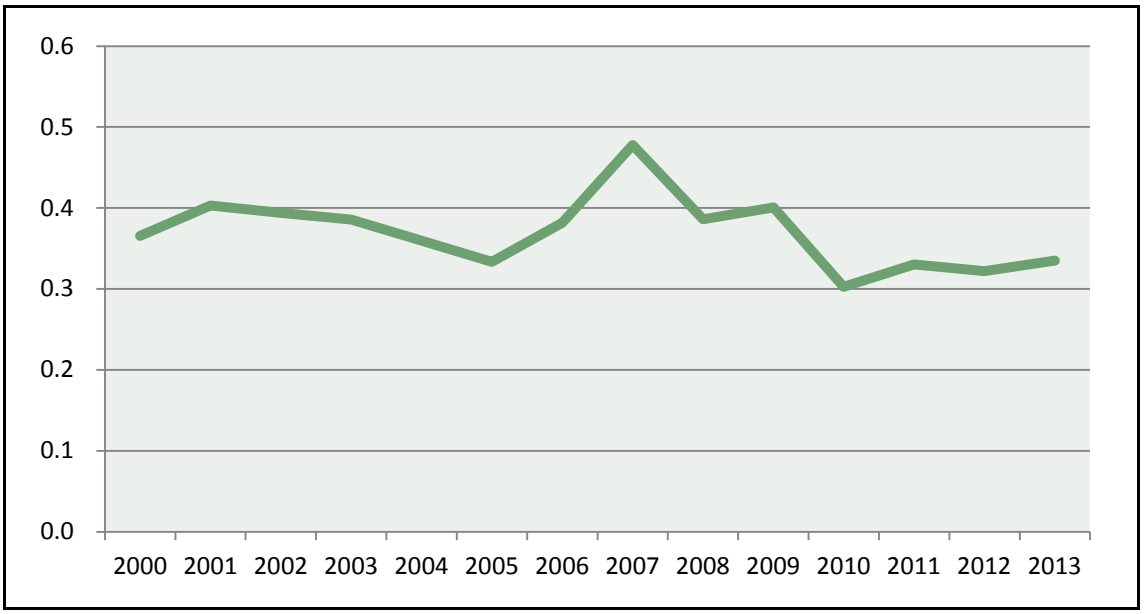
Source: Own figure based on own calculations.

Annex A10: Virtual agricultural land trade of the European Union for coffee and cocoa and products thereof, 2000-2013, net imports (+), net exports (–), (in million ha)



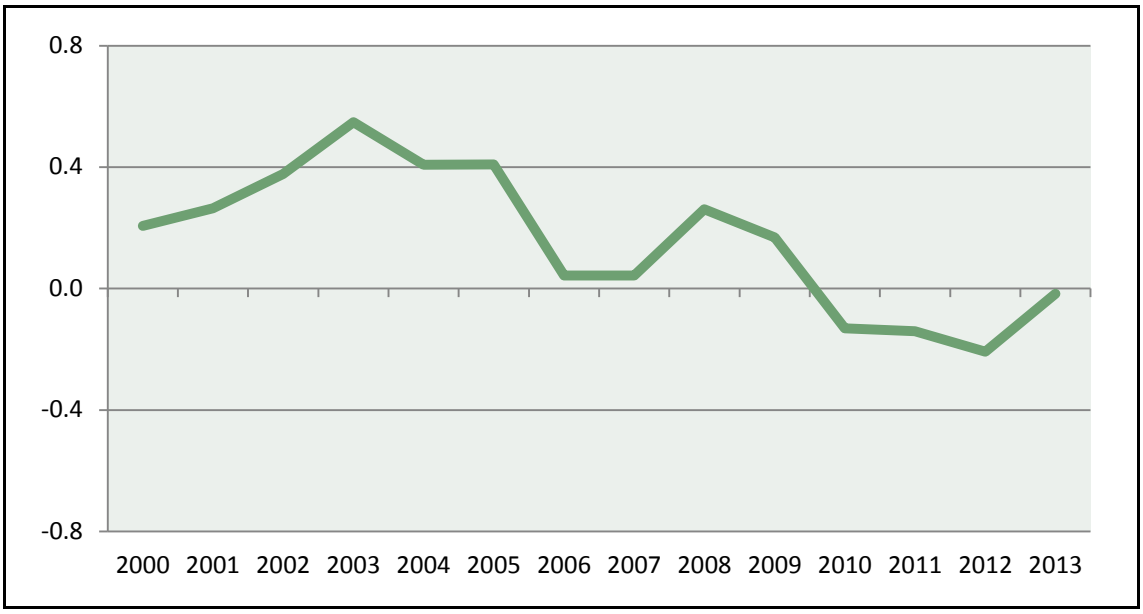
Source: Own figure based on own calculations.

Annex A11: Virtual agricultural land trade of the European Union for tea and tobacco and products thereof, 2000-2013, net imports (+), net exports (–), (in million ha)



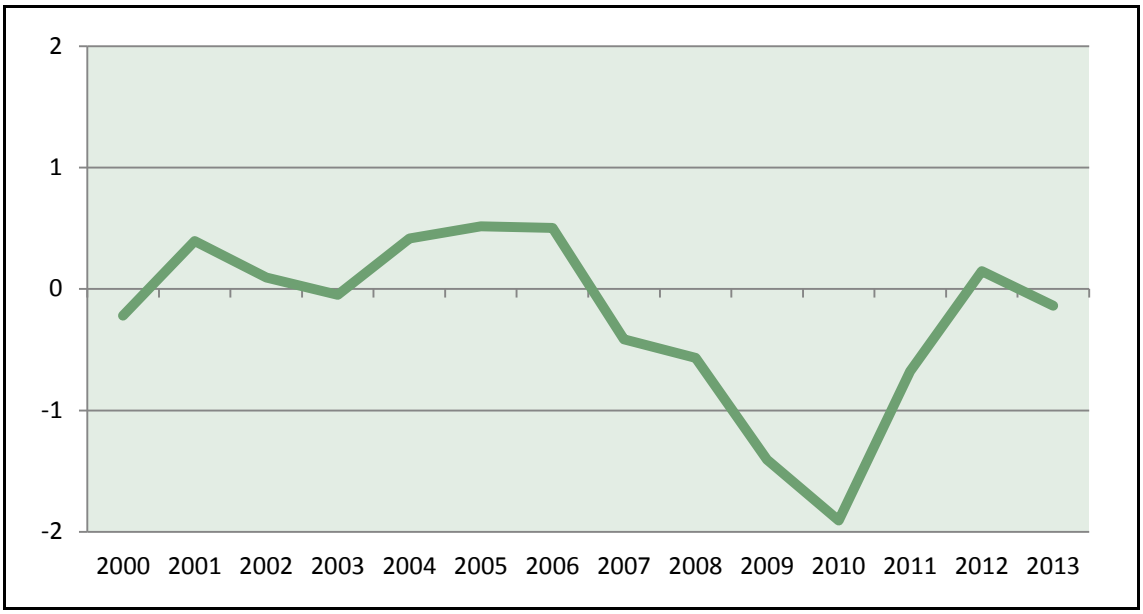
Source: Own figure based on own calculations.

Annex A12: Virtual agricultural land trade of the European Union for fruits and products thereof, 2000-2013, net imports (+), net exports (–), (in million ha)



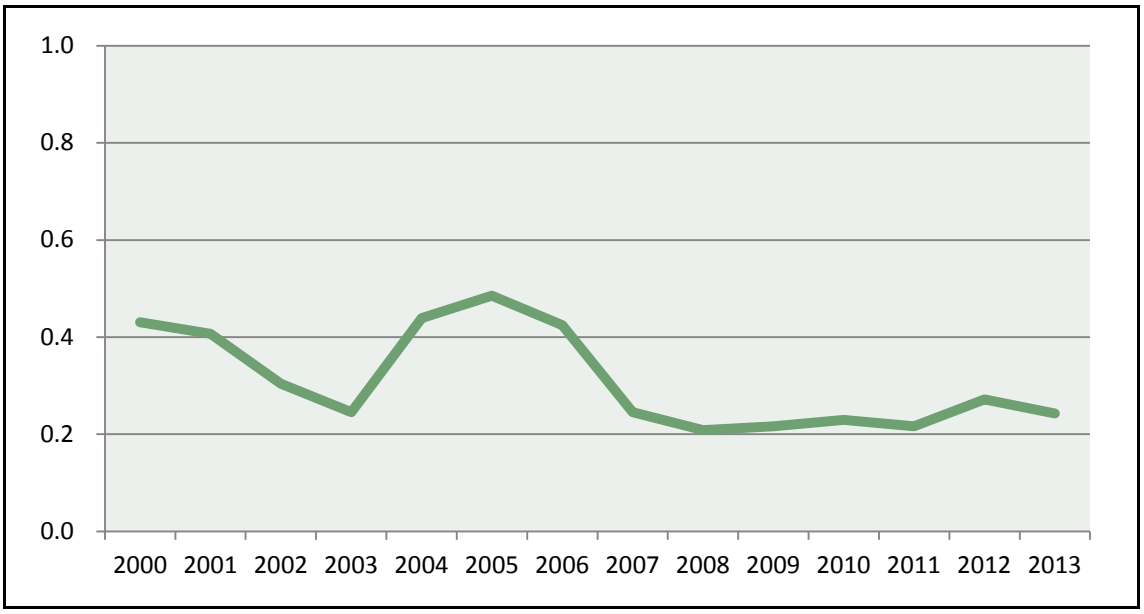
Source: Own figure based on own calculations.

Annex A13: Virtual agricultural land trade of the European Union for vegetables and potatoes and products thereof, 2000-2013, net imports (+), net exports (–), (in million ha)



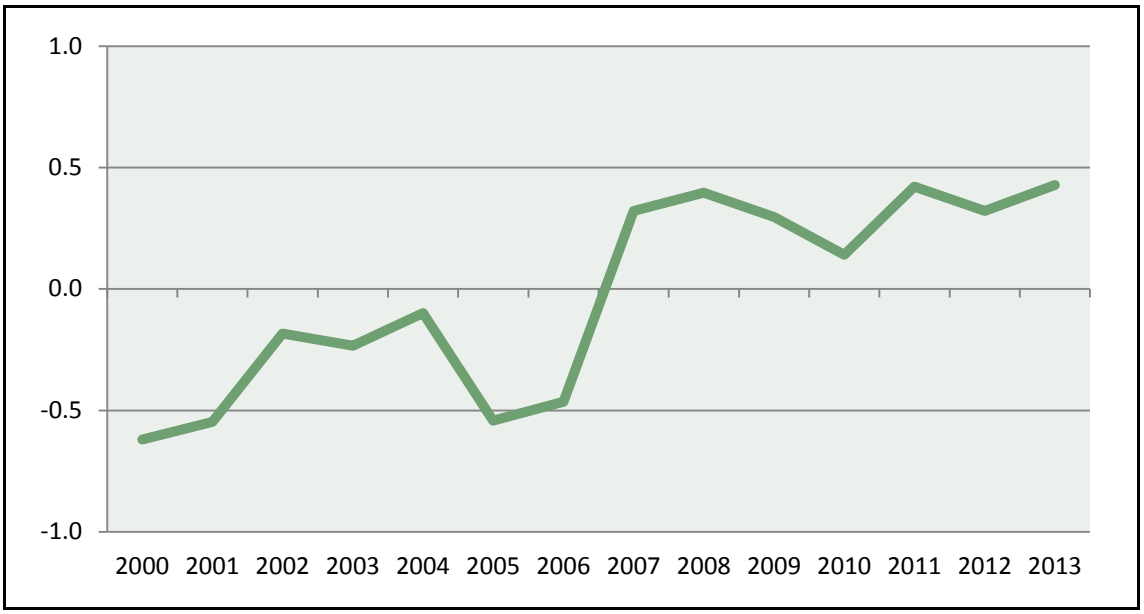
Source: Own figure based on own calculations.

Annex A14: Virtual agricultural land trade of the European Union for pulses and products thereof, 2000-2013, net imports (+), net exports (–), (in million ha)



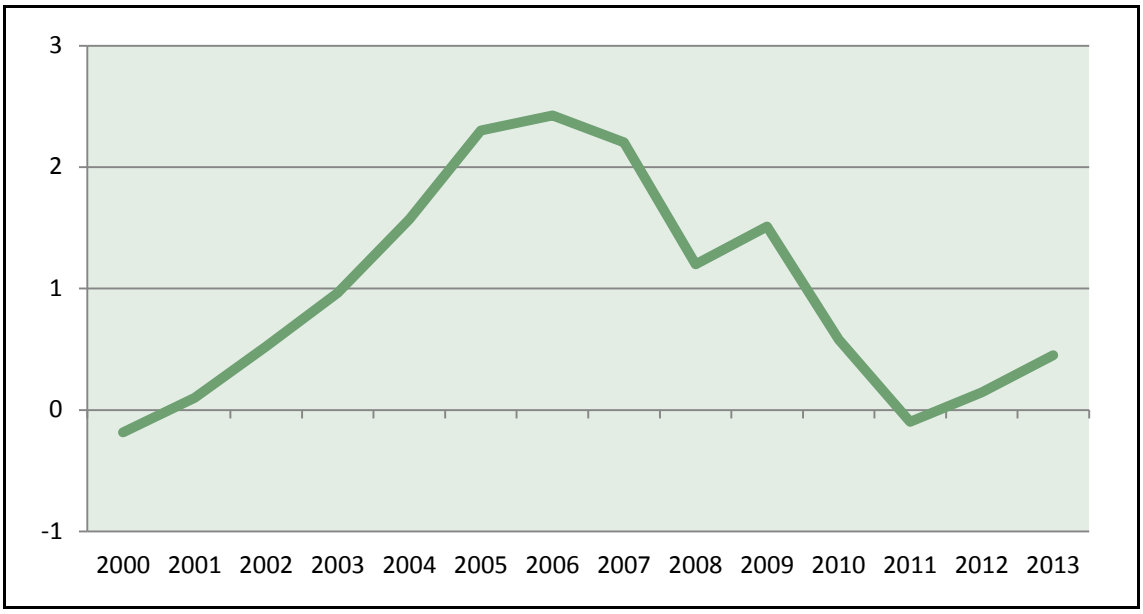
Source: Own figure based on own calculations.

Annex A15: Virtual agricultural land trade of the European Union for sugar crops and products thereof, 2000-2013, net imports (+), net exports (–), (in million ha)



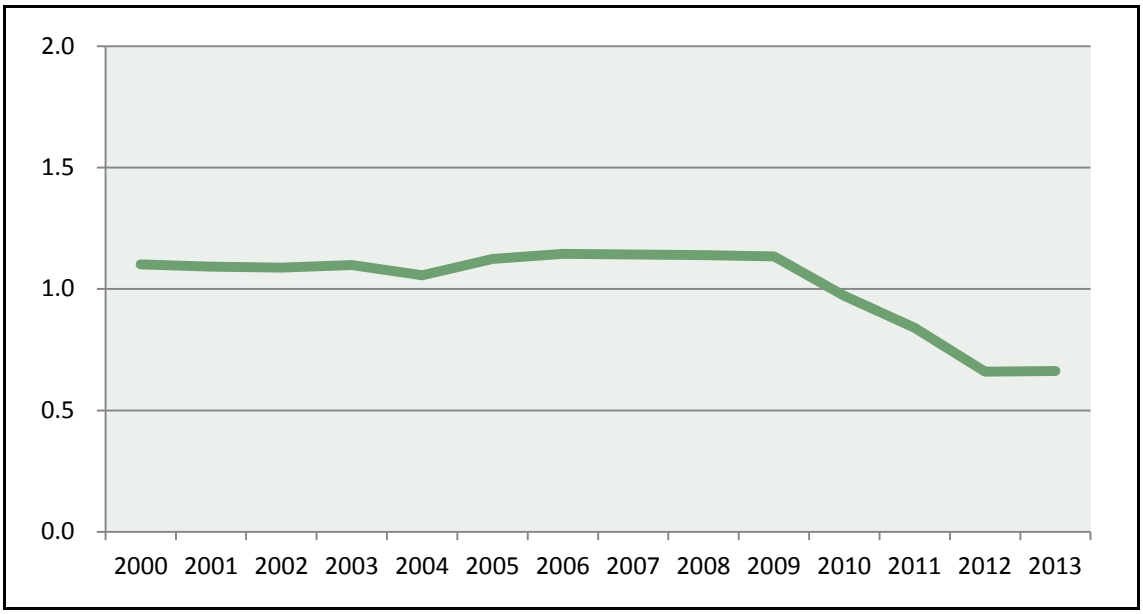
Source: Own figure based on own calculations.

Annex A16: Virtual agricultural land trade of the European Union for beef and products thereof, 2000-2013, net imports (+), net exports (–), (in million ha)



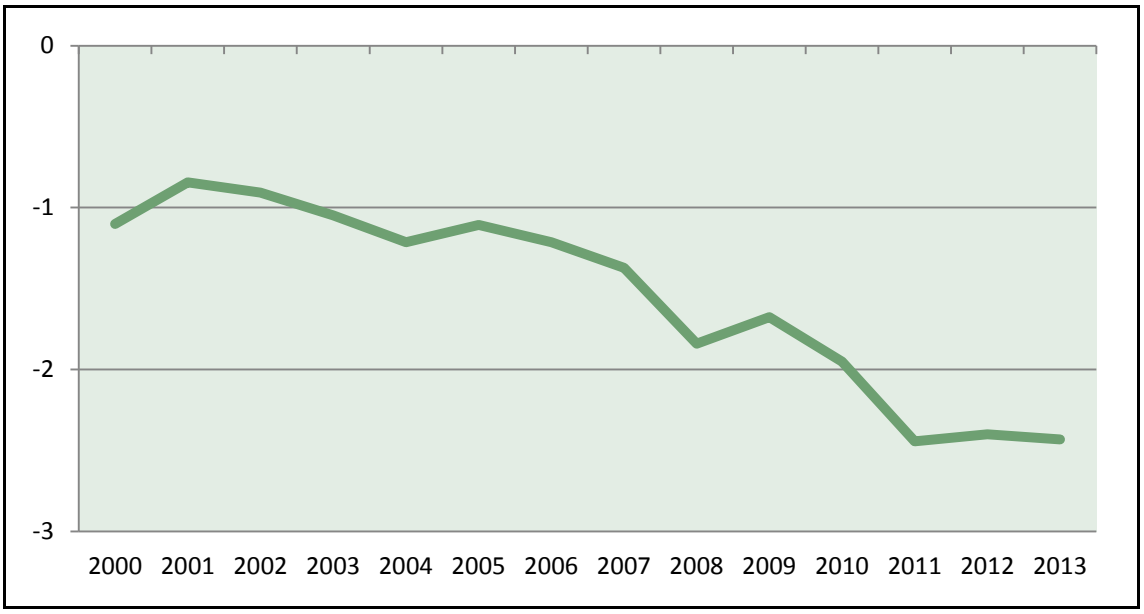
Source: Own figure based on own calculations.

Annex A17: Virtual agricultural land trade of the European Union for sheep and goat meat and products thereof, 2000-2013, net imports (+), net exports (–), (in million ha)



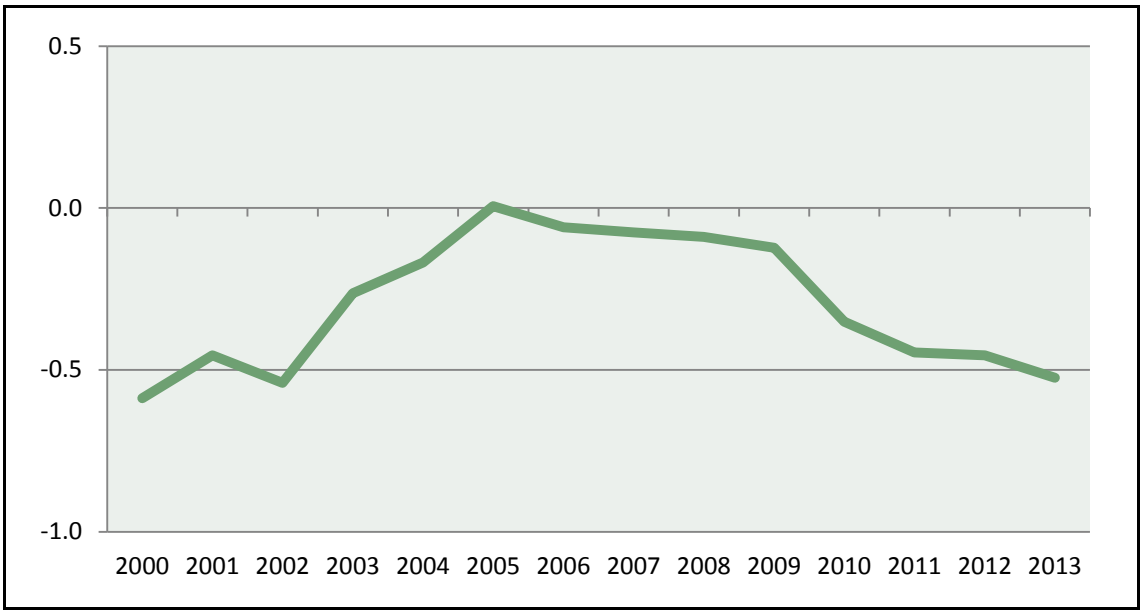
Source: Own figure based on own calculations.

Annex A18: Virtual agricultural land trade of the European Union for pork and products thereof, 2000-2013, net imports (+), net exports (–), (in million ha)



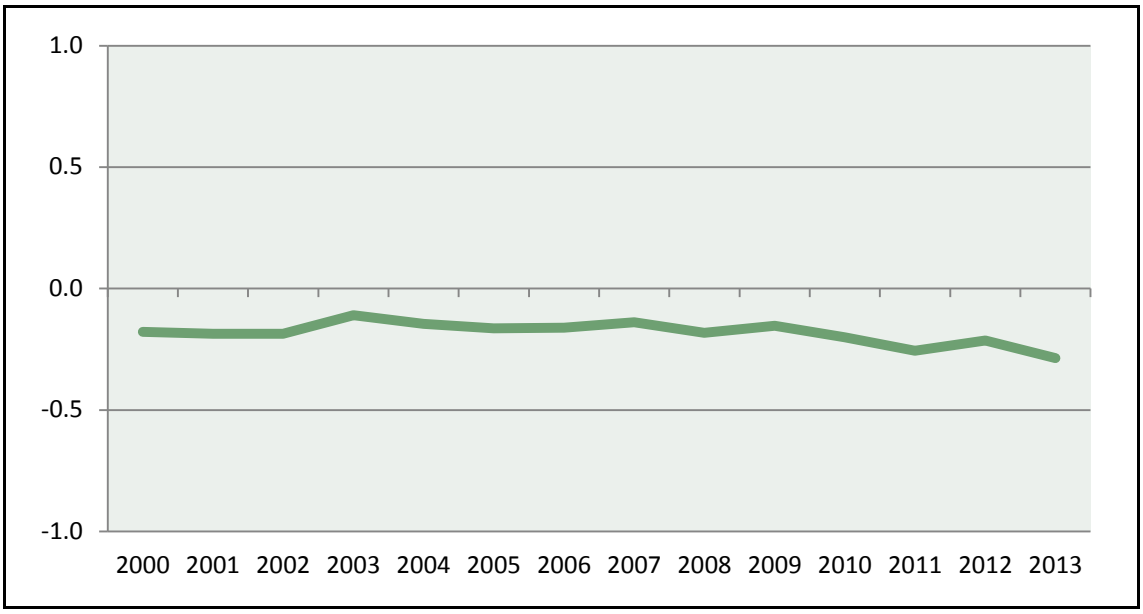
Source: Own figure based on own calculations.

Annex A19: Virtual agricultural land trade of the European Union for poultry and products thereof, 2000-2013, net imports (+), net exports (–), (in million ha)



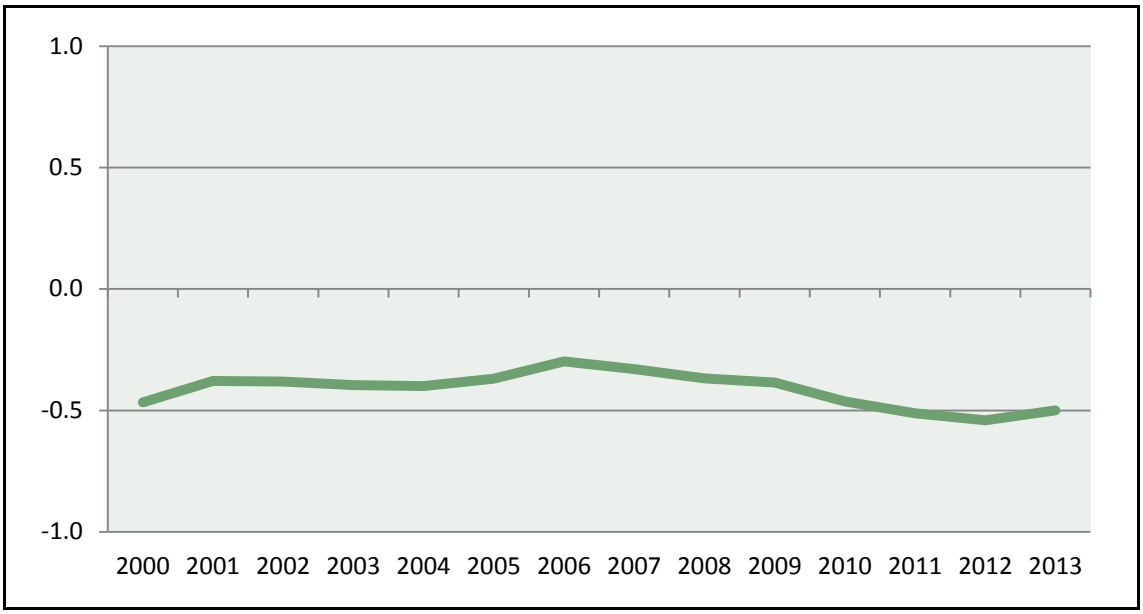
Source: Own figure based on own calculations.

Annex A20: Virtual agricultural land trade of the European Union for eggs and products thereof, 2000-2013, net imports (+), net exports (–), (in million ha)



Source: Own figure based on own calculations.

Annex A21: Virtual agricultural land trade of the European Union for milk and products thereof, 2000-2013, net imports (+), net exports (–), (in million ha)



Source: Own figure based on own calculations.

Annex A22: Virtual agricultural land trade of the European Union, net imports (+), net exports (–), by region and commodity (in million ha)

	Wheat	Corn	Coarse Grains	Rice	Soya	Palm	Oilseed Rape	Other Oilseeds	Coffee and Cocoa	Tea and Tobacco	Fruits	Vegetables and Potatoes	Pulses	Sugar Crops	Beef	Sheep and Goat Meat	Pork	Poultry	Eggs	Dairy	Cotton	Total
North America	0.424	0.058	–0.127	0.010	1.933	0.055	0.121	0.226	0.093	0.036	–0.085	–0.282	0.163	0.109	0.112	0.000	–0.065	–0.004	0.008	–0.031	0.034	2.789
USA	0.212	0.030	–0.048	0.011	1.425	–0.002	0.006	0.065	–0.316	0.033	–0.067	–0.162	0.053	0.010	0.113	0.000	–0.050	–0.001	0.008	–0.008	0.032	1.344
Canada	0.315	0.027	0.014	–0.001	0.507	0.000	0.143	0.143	–0.069	–0.003	–0.116	–0.074	0.101	0.000	0.005	0.000	–0.005	–0.001	0.000	–0.001	0.000	0.985
South America	0.061	0.352	–0.096	0.072	10.734	0.069	0.028	0.407	1.418	0.170	0.516	–0.241	0.047	0.127	1.239	0.043	0.002	0.360	0.004	–0.007	0.040	15.344
Brazil	0.053	0.271	–0.049	0.017	5.686	0.016	0.000	0.026	0.616	0.142	0.160	–0.205	0.000	0.102	0.666	0.000	0.000	0.330	0.000	–0.001	0.036	7.868
Argentina	0.004	0.061	0.036	0.010	3.926	0.000	0.026	0.364	–0.005	0.022	0.059	0.005	0.042	0.002	0.284	0.010	–0.001	0.012	0.004	0.000	0.004	4.864
Asia	–0.637	–0.185	–0.358	0.426	0.454	1.475	0.005	1.035	0.772	0.104	–0.119	–0.279	0.009	0.067	–0.115	–0.039	–1.420	0.033	–0.035	–0.149	0.112	1.156
China	–0.006	–0.001	–0.015	0.000	0.060	0.000	0.000	0.060	0.018	0.063	–0.018	–0.018	0.012	0.000	–0.018	–0.001	–0.514	0.010	0.000	–0.036	–0.013	–0.416
India	0.000	0.001	0.014	0.196	0.376	0.001	0.006	0.379	0.176	0.077	0.011	–0.028	–0.005	0.066	0.000	0.000	0.000	–0.001	0.002	–0.008	0.226	1.490
Japan	–0.004	–0.064	–0.179	0.000	0.001	0.000	0.000	–0.003	–0.054	–0.053	–0.084	–0.122	0.000	0.000	0.000	0.000	–0.216	–0.003	–0.008	–0.006	–0.004	–0.800
MENA region	–4.167	–0.329	–1.457	–0.005	–0.028	–0.003	–0.128	–0.051	–0.211	–0.099	–0.018	0.999	–0.035	–0.104	–0.220	–0.066	–0.006	–0.205	–0.041	–0.182	–0.044	–6.400
Africa	–1.383	–0.106	–0.716	–0.006	–0.006	0.026	0.000	0.097	4.481	0.272	0.066	–0.133	0.010	0.167	–0.178	–0.013	–0.141	–0.400	–0.055	–0.092	0.421	2.311
GUS	0.601	1.098	–0.144	0.000	0.428	–0.039	1.172	1.821	–0.378	–0.092	–0.516	–0.152	0.046	–0.029	–0.359	0.000	–0.637	–0.166	–0.052	–0.042	0.014	2.573
Russia	0.242	0.115	–0.128	0.001	–0.053	–0.037	0.228	0.646	–0.211	–0.061	–0.505	–0.119	0.028	–0.005	–0.298	0.000	–0.449	–0.074	–0.045	–0.034	0.000	–0.759
Developed Pacifics	0.074	0.000	–0.022	–0.001	0.000	0.000	1.597	0.001	–0.073	–0.002	0.178	–0.069	0.004	0.031	0.180	0.811	–0.057	0.000	0.000	0.004	0.000	2.655
Rest of Europe	–0.213	0.083	–0.170	–0.031	–0.094	–0.016	–0.102	–0.230	–0.241	–0.060	–0.144	–0.064	–0.002	–0.017	–0.491	–0.013	–0.096	–0.081	–0.080	–0.020	–0.010	–2.092
Switzerland	–0.038	–0.012	–0.034	–0.009	–0.040	–0.005	–0.018	–0.014	0.013	–0.002	–0.146	–0.038	–0.002	–0.008	–0.033	–0.006	0.016	–0.018	–0.067	0.007	–0.002	–0.456
Norway	–0.060	–0.015	–0.059	–0.003	0.066	–0.002	–0.077	–0.017	–0.061	–0.005	–0.077	–0.012	–0.011	–0.025	–0.028	–0.004	–0.002	–0.001	–0.001	–0.001	0.000	–0.396
Turkey	–0.075	–0.026	–0.021	–0.011	–0.093	0.000	–0.020	–0.191	–0.071	–0.047	0.126	0.029	0.015	–0.001	–0.240	–0.016	–0.001	–0.001	–0.001	–0.001	–0.005	–0.651
Rest of the World	–0.004	0.000	–0.002	0.000	0.000	0.221	0.000	0.031	0.043	0.000	–0.002	–0.002	0.000	0.001	–0.001	0.000	–0.003	0.000	0.000	–0.001	0.000	0.281
Total	–5.244	0.970	–3.091	0.465	13.421	1.788	2.692	3.338	5.904	0.329	–0.122	–0.223	0.244	0.352	0.167	0.721	–2.424	–0.465	–0.252	–0.518	0.567	18.618

Source: Own figure based on own calculations.

Annex A23: Methodological remarks on the calculation of the agricultural self-sufficiency of the EU

Basically, data on the production and/or the consumption of agricultural commodities, i.e. food, feed, fuel, and fibre products, allow for a calculation of the agricultural self-sufficiency, but only if additional information on net foreign trade, i.e. export and import flows, of crop and livestock specific commodities are available. This is necessarily the case, because – using a common definition of the International Food Policy Research Institute (IFPRI) (see, e.g., Peljor and Minot, 2010) – self-sufficiency is defined as being able to meet consumption needs from own production rather than by (net) importing. Hence, agricultural self-sufficiency is defined as a ratio.

For any agricultural commodity (respectively food, feed, fuel or fibre products thereof) equation (1) applies:

(1) $SSR_{EU} = PR_{EU} / (PR_{EU} - NT_{EU})$

with: SSR_{EU} – self-sufficiency ratio of the EU,

PR_{EU} – domestic production of the EU, and

NT_{EU} – net trade of the EU.

Within this rather simple accounting framework, the net trade is defined as the difference of exports and imports. Accordingly, domestic consumption is equal to domestic production minus net trade, and positive values for NT_{EU} indicate a net export situation, whereas negative values for NT_{EU} indicate a net import situation.

According to equation (1), the self-sufficiency ratio is without any dimension (i.e. without any unit); instead it can be measured in terms of percentages: A SSR_{EU} value of 1.10, e.g., indicates a self-sufficiency ratio of 110 percent leading to the conclusion that domestic production in the EU is 10 percent higher than domestic consumption (and the net trade balance is positive, i.e. the EU exports more than it imports). Consequently, a SSR_{EU} value of 0.80, e.g., indicates a self-sufficiency ratio of only 80 percent and points to the fact that domestic production is 20 percent lower than domestic consumption (and the net trade balance is negative, i.e. the EU imports more than it exports).

This straightforward concept is not new. Indeed, it is the basis for the methodology of measuring self-sufficiency in major agricultural products, which has been published most recently in Eurostat (2011) using some exemplified data from 2007 to 2009. However, according to Eurostat (2011), the project from which this data is obtained has phased out and data will not be updated anymore. Besides, the Euro-

stat (2011) data do not allow aggregating crop-specific and country-specific self-sufficiency ratios for the EU as a whole. It becomes apparent that in order to allow for an overall statement on the current agricultural self-sufficiency for the entire EU, proper aggregation as well as new production and trade data must be taken into consideration.

Based on scientifically accepted conversion factors, it is then possible to calculate a meaningful but aggregated agricultural self-sufficiency indicator for the EU, respectively a set of such indicators. Initial basis to do so is the definition of a 'grain unit' (see, e.g., Schulze-Mönking and Klapp, 2010; TLL, 2013). The 'grain unit' (in the following: GU) is an indicator for the aggregated nutritional value of a particular agricultural product. By (historic) definition (see Woermann, 1944), a GU is equivalent to the aggregated nutritional value of 100 kg of barley. The initial values given by Woermann (1944) have been updated on a regular base to meet genetic progresses, technological improvements, etc. Nowadays all agricultural products and commodities thereof are compared against 100 kg of barley using GU data mainly provided by Schulze-Mönking and Klapp (2010) and TLL (2013). Accordingly, 100 kg of wheat, e.g., are set equal to 1.07 GU; 100 kg of soybeans are then defined as 2.60 GU; 100 kg of cow milk can thus be valued at 0.86 GU (being the amount of feed to produce the respective amount of milk); and 100 kg of beef (veal) are considered to be equal to 5.90 (4.10) GU, etc.

Simply weighting EU production and EU net trade volumes of individual agricultural products (see equation (1) above) with respective product-specific GU-values allows for an aggregation and the discussion of an aggregated self-sufficiency ratio (across all – crop and livestock – commodities) for the EU as a whole.

In addition, another indicator (set) shall be introduced to accentuate the discussion of the EU's agricultural self-sufficiency. Technical conversion factors recently provided by FAO (2012) and specific nutritional values delivered with FAO (2014a) allow for the calculation of aggregated self-sufficiency indicators not only in terms of the aggregated nutritional value of the product, but also and even more detailed in terms of specific nutritional components of it, i.e. the carbohydrates, proteins and/or fats an agricultural commodity, be it a crop or livestock product, consists of. Again, using proper algebraic weighting procedures with carbohydrate, protein and fat concentrations as weighting factors allows for an aggregation of crop-specific and livestock-specific production and trade volumes. Hence, the following set of self-sufficiency indicators can be calculated and discussed on the basis of equation (1):

$SSR_{EU, A}$ non-summable EU self-sufficiency ratio for commodity A,

$SSR^{GU}_{EU, A}$ summable EU 'grain units' self-sufficiency ratio for commodity A,

$SSR^{CA}_{EU, A}$ summable EU carbohydrates self-sufficiency ratio for commodity A,

$SSR^{PR}_{EU, A}$ summable EU proteins self-sufficiency ratio for commodity A, and

$SSR^{FA}_{EU, A}$ summable EU fats self-sufficiency ratio for commodity A.

In order to do so, reliable statistical data on EU agricultural production and trade is needed:

- Agricultural production data in tons for almost all crop and livestock commodities are available from Eurostat (2014a). For the purpose of this study, most recent data for the years 2011 to 2013 were obtained. In very few exceptional cases (due to missing information), data for the year 2013 had to be gathered from Schmid and Goldhofer (2014).
- Most recent agricultural trade data, also for the years 2011 to 2013, were taken from Eurostat (2014b). However, trade data are not available on a crop and/or livestock commodity basis. Instead, so-called Standard International Trade Classification (SITC) categories have to be used. SITC categories are usually set for primary agricultural commodities, but in addition also for products thereof. A good example is wheat: Trade data, i.e. export and import volumes in tons, are available for durum and other wheat, but also for wheat flour, (wheat-based) pasta and feed preparations etc. All those SITC categories have to be aggregated to allow for the calculation of an appropriate trade balance. The methodology to be applied is the same which has been used to calculate the virtual land trade of the EU and its change using SITC categories and can be studied in detail in von Witzke and Noleppa (2010) or Noleppa et al. (2013); therefore it shall not be repeated here once again.

In total, the included commodities cover more than 90 percent the volume of agricultural produce (measured in tonnage) domestically marketed in the EU respectively traded internationally by the EU. This allows to draw an almost complete picture of the EU's agricultural self-sufficiency. The following commodities respectively commodity groups are covered within the study (listed are, first, the primary commodity for which production data is available and, second, the corresponding SITC category for which corresponding export and import data could be obtained for the years 2011 to 2013):

- Wheat; SITC categories: 4108, 4110, 4120, 4608, 4610, 4620, and 8126;
- Rice; SITC categories: 4208, 4210, 4220, 4231, 4232, and 8125;
- Corn; SITC categories: 4408, 4410, 4490, 4711, 4719, 4721, 4811, 4813, and 8124;

- Other Cereals; SITC categories: 4300, 4308, 4508, 4510, 4520, 4530, 4591, 4592, 4593, 4599, 4708, 4722, 4723, 4729, 4808, 4812, 4814, 4815, 4820, 4830, 4841, 4842, 4849, 4850, 8111, 8129 and 11230;
- Oilseed Rape; SITC categories: 8136, 22261, 42171, and 42179;
- Soya; SITC categories: 8131, 9841, 22220, 42111, and 42119;
- Sunflowers; SITC categories: 8135, 22240, 42151, and 42159;
- Other Oilseeds: 8138, 22320, 42221, 42229, 42241, 42249, 8132, 22211, 22212, 42131, 42139, 5771, 8137, 22310, 42231, 42239, 22250, 42180, 22350, 42250, 9843, 22262, 22270, 8134, 22340, 42211, 42219, 8133, 22230, 42121, 42129, 42161, 42169, 42121, 42122, and 42129;
- Potatoes; SITC categories: 5410, 5611, 5641, 5642, 5661, and 5676;
- Other Roots; SITC categories: 5481 and 5645;
- Sugar (Raw); SITC categories: 5487, 6112, 6121, 6129, 6159, 5488, 6111, 6151, and 11102;
- Peas; SITC categories: 5421 and 5422;
- Beans; SITC categories: 5423, 5425, and 5429;
- Other Pulses; SITC category: 5424;
- Tomatoes; SITC categories: 5440, 5672, 5673, 5992, and 9842;
- Onions; SITC categories: 5451 and 5612;
- Carrots: SITC category: 5455;
- Cucumbers; SITC category: 5456;
- Garlic; SITC category: 5452;
- Avocados; SITC category: 5797;
- Apples; SITC categories: 5740 and 5994;
- Apricots; SITC categories: 5793 and 5895;
- Bananas; SITC category: 5730;
- Berries; SITC categories: 5794, 5831, 5832, 5839, and 5995;

- Oranges; SITC categories: 5711 and 5910;
- Citrus Fruits; SITC categories: 5712, 5721, 5722, 5729, 5894, 5920, and 5930;
- Figs; SITC category: 5760;
- Melons; SITC category: 5791;
- Pears; SITC category: 5792;
- Pineapples; SITC categories: 5795, 5893, and 5991;
- Grapes; SITC categories: 5751, 5752, 5993, 11211, 11213, 11215, and 11217;
- Beef; SITC categories: 0111, 0119, 1108, 1111, 1112, 1121, 1122, 1251, 1252, 1681, and 1760;
- Pork; SITC categories: 0131, 0139, 1221, 1222, 1253, 1254, 1611, 1612, and 1750;
- Sheep/Goat; SITC categories: 0121, 0122, 1211, 1212, 1213, 1255, and 1256;
- Poultry; SITC categories: 0141, 1231, 1232, 1233, 1234, 1235, and 1740;
- Eggs; SITC categories: 2508, 2510, 2521, 2522, and 2530; and
- Milk; SITC categories: 2211, 2212, 2213, 2221, 2222, 2223, 2224, 2231, 2232, 2233, 2241, 2300, 2308, 2408, 2410, 2420, 2430, 2491, and 2499.

Annex A24: Specific self-sufficiency ratios of agricultural commodities for the European Union in recent years and on average (in percent)

Commodity	2011	2012	2013	Average
Cereals				
Wheat	110	109	118	112
Corn	94	92	89	92
Other Cereals	111	111	114	112
Rice	83	66	65	75
Oilseeds				
Oilseed Rape	86	84	86	86
Soya	3	3	4	3
Sunflowers	75	57	79	70
Other Oilseeds	91	89	88	89
Root Crops				
Potatoes	105	107	105	106
Other Roots	96	96	95	96
Sugar Crops				
Sugar (Raw)	80	83	79	81
Pulses				
Peas	89	84	86	90
Beans	98	98	95	98
Other Pulses	84	51	143	59
Vegetables				
Tomatoes	103	104	106	105
Onions	106	109	109	108
Carrots	101	100	101	101
Cucumbers	101	101	102	101
Garlic	77	82	89	83
Fruits				
Avocados	21	17	14	17
Apples	99	105	101	102
Apricots	276	534	261	322
Bananas	12	13	12	12
Berries	59	64	65	63
Oranges	62	59	53	58
Citrus Fruits	80	83	83	82
Figs	62	59	59	60
Melons	80	80	81	81
Pears	104	107	102	104
Grapes	99	99	97	98
Meat				
Beef	104	103	102	103
Pork	114	114	114	114
Sheep/Goat	84	87	88	86
Poultry	107	106	107	107
Other Livestock				
Eggs	102	102	103	102
Milk	107	107	107	107

Source: Own figure based on own calculations.

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