

Soy use in Belgium

A research paper prepared for
WWF-Belgium



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Contents

Summary	1
Introduction	3
Chapter 1 Methodology	5
1.1 Scope	5
1.2 Definitions	5
1.3 Data used in this study	6
1.3.1 Soy on the Belgian market	6
1.3.2 Soy processed in animal feed and food products	7
1.3.3 Calculation of average yield and soybean equivalents	8
1.3.4 Certified soy streams	8
Chapter 2 Global soy production and trade	10
Chapter 3 Soy trade and consumption in Belgium	14
3.1 Soy imports by country of origin	14
3.2 Soy exports by country of destination	14
3.3 Direct use of soy in Belgium	15
3.4 Use of soy in livestock feed in Belgium	16
3.5 Consumption of animal products in Belgium	18
3.6 Embedded soy in livestock products	20
3.7 Consumption of embedded soy in Belgium	21
3.8 Embedded soy consumption per iconic product	23
3.9 Exports of embedded soy from Belgium	24
Chapter 4 Certified soy in the Belgian supply chain	26
4.1.1 Overview	26
4.2 Supply chain of certified soy in Belgium	26
4.2.1 Animal feed industry.....	26
4.2.2 Dairy, meat and eggs	28
4.2.3 Other food products	28
4.2.4 Technical applications.....	29
4.3 Total certified soy used in Belgian supply chains	29
Chapter 5 Conclusions and recommendations	31
Appendix 1 Key sectors and companies in Belgium using soy	33
Appendix 2 Yield per hectare	37
Appendix 3 Calculation of soybean equivalents	38
References	40

Summary

The global soybean harvest reached 319 million tonnes in the 2015/2016 harvest season. This corresponds with a total area of 121 million hectares. Over 80 per cent of all soy produced globally originates from the United States, Brazil and Argentina combined. Global exports of soybeans, soybean meal and soybean oil amounted to 208 million tonnes in 2015/2016. Brazil, the United States and Argentina were the largest exporting countries. Global imports of soybeans, soybean meal and soybean oil amounted to 202 million tonnes in 2015/2016, with China and the European Union the largest importers. The largest soy consumers are China, the United States and the European Union.

The estimated Belgian imports of soybeans, soybean meal and soybean oil amounted to 1,578,000 tonnes in 2014. After exporting, 957,000 tonnes were available for further processing in Belgium. This was composed of 193,000 tonnes of soybeans, 689,000 tonnes of soybean meal and 75,000 tonnes of soybean oil. Soybean meal is processed into livestock feed, while soybean oil is used as edible oil, in various food products, cosmetics, feed and technical applications. Soybeans are used in food and animal feed.

Mapping the supply chain of soy is challenging as a lot of unknowns remain. Based on the estimates applied in this analysis, 541,000 tonnes of soy were used directly or indirectly for products that were consumed in Belgium: in meat, eggs, milk, cheese and other dairy, margarine and other foodstuffs, and in technical products. For the production of this amount of soy, an estimated area of 179,000 hectares was required. A further 416,000 tonnes of soy were used for the production of feed and foodstuffs that were eventually exported and consumed in other countries.

Based on publicly available information as well as feedback from some stakeholders in the industry, it can be concluded that at least 444,000 tonnes out of the total 957,000 tonnes of soy products processed in Belgium (46 per cent) were certified under one of the considered schemes in 2014/15. When only considering the soy required for domestic consumption, the share reached 82 per cent. This includes predominantly virtual certification based on a mass balance system and smaller amounts of traceable physical imports.

The Belgian animal feed association's (Bemefa) own certification criteria for 'socially responsible' soy ('maatschappelijk verantwoord' (MV) soy) was the most important certification in 2015. It follows the criteria of the Round Table on Responsible Soy (RTRS) but still relies on a reduced set of indicators. According to these conservative estimates, MV soy accounted for around 78 per cent of the total certified volume. This was followed by RTRS with 17 per cent; around 3 per cent of ProTerra certified soy; and shares of around 1 per cent or less of non-GM, organic and EcoSocial certified soy.

ProTerra and RTRS are the most important certification schemes for soy globally, with ProTerra requiring full traceability and exclusive use of non-GM soy. Belgian players are thus focusing on taking steps to increase purchases based on Bemefa's MV criteria or RTRS soy. Demand for full traceability and non-GM certification is weaker on the Belgian market than in some neighbouring European markets. However, the presence of schemes including non-GM certification (ProTerra, EcoSocial, Organic, non-GM RTRS, non-GM ISCC Plus) for processing in food products is likely underestimated in this report as labelling of GM-content above 0.9 per cent in food products is required under EU rules.

Detailed reporting and data provision by traders and processing companies would help to avoid data insecurities and create a more complete picture of the situation. As an immediate step in achieving a more responsible soy supply chain, Belgian stakeholders should rapidly increase the uptake of soy certified under an established scheme requiring the most stringent demands for social and environmental conduct, covering all soy volumes passing through the country. This could be encouraged by relevant national or regional legislation.

However, the significant environmental and social impacts of large-scale expansion of soy production documented in key production areas have not been solved by the introduction of certification schemes aiming to make soy production responsible. A more fundamental change may therefore be required in the medium term. Possible solutions include breaking the dependency on imports of protein-rich crops for animal feed by increasing the supply of locally produced protein-rich crops and an overall reduction in the consumption of animal protein.

Introduction

Soy or soybean is a leguminous crop that grows in tropical, subtropical and temperate climates. The largest part of the soybean harvest is crushed, resulting in around 79 per cent meal and 19 per cent oil.¹ Soybean meal is used in animal feed; soybean oil is used in food, for technical applications, and as biofuel. A small share of soybeans is directly processed for human consumption.

Global soy production has undergone a massive increase in recent decades, predominantly in South and North America. It is expected that global soy production will further increase in the coming years due to a globally growing demand for livestock products and biofuels. This can have important economic benefits for the producing countries, as the export of soybeans and value-added products in the form of meal and oil is an important source of foreign currency. However, the rapid expansion of the soybean cultivation area involves a range of social and environmental consequences.

The massive increase in soy production surface, the directly connected economic activities as well as indirect consequences of displacing other food crops and cattle are important drivers of deforestation and conversion of natural ecosystems. This has, for example, been observed in the highly biodiverse ecosystems of the South American Amazon rainforest, the wooded grasslands of the Cerrado and the Gran Chaco woodlands, as well as the biodiverse temperate grasslands of the Northern Great Plains in North America.² Destruction and degradation of these ecosystems contributes to greenhouse-gas emissions, further driving climate change.³ The removal of the natural vegetation in deciduous and tropical forests in South America can also have a significant impact on precipitation.⁴

The expansion of the soy frontier is not merely a change of land use, but goes along with the introduction of new technologies, new power relations (increasing dependency on a small number of large agribusiness companies that provide seeds and agrochemicals) and large-scale land concentration.⁵

The introduction of genetically modified (GM) soy and other GM crops, which now account for the majority of soybeans grown in North and South America, has led to heated debates between supporters and opponents. Agribusiness claims that these crops allow more efficient farm operations, produce higher yields and reduce pesticide use. Civil society organizations and other opponents, on the other hand, doubt these benefits or see them connected to problematic environmental and social trade-offs, while the promised yield increases have not materialized.⁶

The environmental and social issues connected to the production of soy have led to the development of various certification schemes and sourcing criteria. These voluntary standards are applying environmental, social, ethical and governance principles and are usually assessed by third parties. While all standards ultimately have the objective to make soy production more responsible, there are differences in the strictness of the applied criteria, the rigour and credibility of control and assurance of compliance with the standards, and the level of traceability and segregation.⁷

Most consumers and even some companies are not aware of how much soy is embedded in products they sell and consume. WWF-Belgium wishes to raise awareness of the soy issue with both companies and consumers in Belgium. This research aims to provide the necessary underlying data. It includes basic data on soy production and trade worldwide, and specifically maps of direct and indirect soy consumption in Belgium and the share of soy certified under established schemes and sourcing criteria. This includes not only soy processed for domestic consumption, but also considers soy which is re-exported to other countries, either directly or indirectly (e.g. in the form of livestock products).

Chapter 1 describes the methodology applied and data used in the analysis. A brief overview of global soy production is provided in Chapter 2, while Chapter 3 looks in more detail at the situation in Belgium, including the use of embedded soy to produce livestock. Chapter 4 aims to give an indication on the share of certified soy used in Belgium in the last year. Conclusions from the findings of this analysis are summarized in Chapter 5.

Chapter 1 Methodology

1.1 Scope

This publication provides a brief overview of how much soy is purchased and processed annually by the feed and food industry in Belgium, and what share of it can be referred to as 'certified' under an accredited standard. It allows a check on how far industry, authorities and civil society organizations are succeeding in their aim to make global soy production more responsible.

1.2 Definitions

The following terms and definitions are used in the report:

- Throughout the report, soy is used as a general term for soybeans and the products resulting from their processing, namely soybean meal and soybean oil.
- Soybeans are processed into two main products – soybean meal and soybean oil. This process is referred to as 'crushing'. The crush ratio refers to the weight ratio between meal and oil resulting from the processing of the beans. Different protein contents are achieved depending on whether the hulls are included in the resulting meal (44 per cent protein meal) or kept separate (48 per cent protein meal ('hi-pro')). The protein content of soybean meal also varies depending on the geographical origin as oil yields are influenced by growing conditions. For example, Argentinian soybean meal has a lower protein percentage than meal originating from its top competitors, Brazil and the United States. This fall in protein content is believed to be irreversible, caused by the focus of Argentinian producers on one single crop variety and a lack of crop rotation.⁸

Generally, the crushing ratio varies between 73 per cent – when high-protein meal (de-hulled) is produced – and 80 per cent for low-protein meal.⁹ In this report, the crushing figures of key producing countries over a period of three years are used to calculate an average crushing ratio, resulting in 78.5 per cent meal and 18.5 per cent oil (see Appendix 3 Appendix 3 for a detailed explanation).

- All volumes are given in metric tonnes (1,000kg), abbreviated as 'mt' in tables.
- European Union (EU) refers to the current 28 member states of the European Union (EU-28).
- 'Europe' refers to the geographical definition of Europe. This includes both the EU-28, and non-EU countries such as Switzerland, Bosnia-Herzegovina, Russia, Ukraine and Norway.
- In soy trade, a differentiation is made between calendar years and marketing years. Often data for soy production and trade is reported in marketing years. This refers to the period from the beginning of a new harvest, usually the 12 months from the beginning of October to end of September of the following year.

- ‘Certified’ soy refers to a range of certification standards and sourcing criteria (Roundtable on Responsible Soy (RTRS), ProTerra, Bemefa MV soy, EcoSocial, International Sustainability & Carbon Certification (ISCC Plus), non-GM soy, organic soy). While they all aim to make production of soy more ‘responsible’, there are considerable differences in the environmental, social and governance criteria applied by these different standards, with some only relying on a limited number of criteria. An inclusion in the analysis is not intended as, nor does it constitute, an endorsement of a standard as responsible by the authors.
- Figures for the import or processing of certified soy do not always imply the physical presence of certified soy in the product. Some certification standards require full traceability of the certified product throughout the supply chain but provide certificates irrespective of a physical delivery.

1.3 Data used in this study

1.3.1 Soy on the Belgian market

This study aims to map the whole soy market including trade streams and production of relevant products directly or indirectly containing soy. This approach should enable a better understanding of the overall volume of soy traded, processed and consumed in Belgium.

Important parts of this study thus rely on trade statistics, both in terms of trade between EU member states and third countries (extra-EU trade) as well as trade among EU member states (intra-EU trade). Statistical data on the development of the global soy harvest, prices of soy traded on the international market and key supply streams was collected from sources including the US Department of Agriculture (USDA), oilseed market research publications and EU statistical authorities.

The provision of consistent and reliable trade statistics remains a widely-discussed issue as their accuracy is influenced by various factors. These include the coverage of data collection and methods to adjust for non-collected data, different measurement units and differences in categorization systems, data revisions and confidentiality of data. While certain data shortcomings cannot be excluded, the reliance on customs procedures generally entails a high quality and good coverage of data on trade with non-EU countries.¹⁰

Due to the EU Customs Union, intra-EU trade cannot be documented via customs documents, but is based on the Intrastat system. To reduce the burden on small and medium-sized companies, member states apply thresholds for Intrastat reporting based on the annual value of a company’s EU trade for both arrivals and dispatches. While businesses below these thresholds are exempt from reporting, data is collected relating to at least 97 per cent of all dispatches and at least 95 per cent of all arrivals of intra-EU trade operators. Data analysis must compensate for the gap caused by the exemption threshold with adjustments, which in most countries is done based on VAT-collection data.¹¹ While this avoids significant gaps, it carries a certain risk of error, as conversion from value-based data to volume-based data is influenced by various factors such as volatile market prices for agricultural commodities.

For the purpose of this study, the leading sources for trade statistics have been consulted in order to match figures and identify significant discrepancies.ⁱ As 2015 data is not yet fully available at the time of writing, the trade statistics refer to 2014 data.

ⁱ European Statistical Office (EuroStat), USDA Foreign Agriculture Service, ISTA Mielke.

This research aims to map the whole soy chain for food production, considering not only animal feed but also other products into which soy is processed. In addition, it is considered important that Belgium takes responsibility not only for the soy that is consumed domestically, but also for the soy that is re-exported to other, mostly neighbouring, countries. This happens directly, without further processing, but also indirectly after processing into animal feed and products of the livestock industry, like meat, eggs and dairy ('embedded soy').

Not enough detailed and reliable data can be drawn from industry disclosure on their soy processing, consumption and trade. At several points of the analysis, assumptions have to be made due to data gaps or insecurities. The data used in this report has to be considered as the best available to bring the distribution and consumption of soy in Belgium in focus. This research cannot solve the problem of a lack of transparency in commodity markets.

1.3.2 Soy processed in animal feed and food products

Data on the standard composition of animal feeds was obtained from LEI Wageningen UR, a social-economic research institute connected to the University of Wageningen in the Netherlands. These composition figures are based on a survey conducted in May/June 2014 among a selection of key Dutch animal feed producers in regard to their average use of soy and soy products in compound feeds in the three-year period from 2011 to 2013. Averaging across several years and producers corrects for short-term fluctuations due to market availability and pricing of different oilseeds. These figures consider the use of soybeans, meal and oil in compound feeds, as well as a certain amount of soybean meal used as a single foodstuff, namely for pigs, dairy cows and laying hens.¹²

Certain differences between the agricultural production systems in Belgium and the Netherlands, and thus the exact share of soy in different livestock feeds, have to be expected. However, as the agricultural production systems in Belgium and the Netherlands are not fundamentally different, and as the LEI data relies on data from various large animal feed producers, it was chosen as a realistic approximation to the actual composition of livestock feeds in Belgium.ⁱⁱ

Comparing trade statistics on the one hand and industry reports on the other results in different figures for the consumption of soy products in Belgium. Considering the lack of other, more precise data sources, assumptions have to be made to assign the residual volume. For the unassigned soybeans, the importance of soy for animal feed leads to the assumption that two-thirds are used for livestock feed and one-third is used in food products. Soybean oil has important food uses, which leads to the assumption that two-thirds of the additional oil volume can be assigned to food uses and one-third to feed.

For data on Belgian production and consumption of key products directly or indirectly containing soy – meat, dairy, eggs, margarine and others – the study gathered statistical data published by Statistics Belgium of the Ministry of Economy, either directly through its website or through the statistical data services provided via Eurostat.

ⁱⁱ In June 2016, after the completion of the analysis for this research, the Flemish Department Landbouw & Visserij published an overview of soy consumption in Belgium (see Danckaert, S. (2016), *Geen veevoeder zonder soja? Aandeel van de Vlaamse veehouderij in het sojaverbruik in België*, Brussels, Belgium: Department Landbouw en Visserij). Its calculations are based on soy content figures for animal feed provided by just one producer and highlight data challenges in distributing the available soy among the different sectors. The LEI data thus remains a sufficiently dependable source.

Combining the data on soy content in different livestock feedstuffs with statistics on the production of products containing embedded soy results in figures for the amount of soy used per product unit – for example for 1kg of meat, 1 egg or 1kg of cheese. Due to various influencing factors, these figures should be seen as approximations for the distribution of soy use across different product segments rather than precise figures. The calculations are based on various variables, which themselves are influenced by a set of factors. Just to name a few, the volumes of animal feed reported by the industry in Belgium cannot be verified through other sources; there may be deviations in the soy content in different animal feeds between the Netherlands and Belgium; for dairy products, for example, the volume of milk required for cheese production depends on the distribution between soft and hard cheeses.

1.3.3 Calculation of average yield and soybean equivalents

To calculate the average yield of soy, the average yields in the different producing countries have been weighted according to their share of soy imports to Europe. This accounts for the fact that Europe, including Belgium, sources most of its soy from just a handful of countries.

With Belgium receiving a large share of its soy imports through intra-European trade, especially via the Netherlands, it makes more sense to look at the share of key countries of origin in overall EU-28 imports as a proxy.

The crushing of soybeans results in oil and meal. Both are traded on the world market and world market prices determine the sales for the grower, trader, crusher and other parties further up the chain. Soybean meal cannot be produced without producing oil at the same time, and vice versa. As the income from both products is needed for the cultivation of soybeans to be profitable, a part of the surface on which soybeans are grown needs to be assigned to soybean meal and a part to soybean oil.

As soybeans are annual crops, growers decide each year whether to grow soybeans or another crop. This decision is largely based on the expected financial yield from the soy crop. Therefore, we think the price should be included in the calculation of the agricultural land attributable to soybean meal and soybean oil.

The alternative is to base this calculation solely on the weight of the products, which would mean that 1 tonne soybean meal would equal 1 tonne of soybeans, as would 1 tonne of soybean oil. However, this approach neglects the price differences between the two products. The incentive to produce more soybeans is mostly determined by the financial yield, which argues against a neglect of these price differences. The net value of soy production is thus determined by combining soybean meal and soybean oil according to their relative share in the weight of soybeans. Soybeans for human consumption are unlikely to have an impact on a production decision. Hulls, which account for less than 1 per cent of the value, can be neglected.

1.3.4 Certified soy streams

The relevant certification bodies generally do not publish detailed figures on volumes of certified soy virtually or physically imported into specific countries, in this case Belgium. Obtaining information on actual amounts of certified soy used in Belgium is thus dependent on the willingness of companies to share such information.ⁱⁱⁱ

ⁱⁱⁱ For the sake of readability, throughout the report the 'use' of certified soy also refers to the purchase of credits or mass balance which technically do not lead to a physical use of certified soy in the production process. Mass balance is a material accounting system under which the participant must ensure that no more certified soy is sold than was bought, but does not have to keep certified and non-certified soy physically separate.

Information on the use of certified soy by key companies was researched online. In addition, various key companies from different sectors in the soy supply chain were contacted and asked for input. The results of a survey of leading companies conducted by WWF-Belgium in 2016 as part of the research for the WWF Soy Scorecard were also considered.¹³

Overall, few stakeholders were willing to participate or provide details on amounts and uses of certified soy during 2014/15. The fact that no full overview is available inevitably influences the conclusions drawn in this study.

Chapter 2 Global soy production and trade

The global soybean harvest reached a volume of 319 million tonnes in the season 2015/16 (see Table 1). This corresponds with a total area of 121 million hectares. Over 80 per cent of all soy produced globally originates from the United States, Brazil and Argentina combined.¹⁴

Table 1 Soy production per country/region in 2015/16

Producing country/region	Harvest (1,000 mt)	Area used (1,000 ha)
Brazil	100,000	33,300
United States	106,954	33,123
Argentina	57,000	20,000
Paraguay	8,800	3,400
Canada	6,235	2,200
Bolivia	3,100	1,280
Ukraine	3,800	2,100
Russia	2,850	2,030
EU-28	2,050	733
China	12,000	6,550
India	8,000	11,650
Sub-Saharan Africa	2,034	1,534
Other countries	6,185	2,905
Total	319,008	120,805

Source: USDA Foreign Agriculture Service (n.d.), "Production, supply and distribution online", online: apps.fas.usda.gov/psdonline/psdQuery.aspx, viewed in February 2016.

Table 2 provides an overview of the soy production volume and area used in the 20 years from season 1995/96 until season 2015/16. During this period, a production increase of 156 per cent can be observed, while the planted area increased by 98 per cent. In addition to a massive increase in soy production over this period, this also illustrates a significant increase in productivity.¹⁵

Table 2 Development of production volume and area, 1995/96 until 2015/16

	1,000 mt	1,000 ha
1995/96	124,699	61,063
2000/01	175,844	75,590
2005/06	220,860	93,108
2010/11	264,345	103,364
2015/16	319,008	120,805
Increase 1995/96 until 2015/16	156%	98%

Source: USDA Foreign Agriculture Service (n.d.), "Production, supply and distribution online", online: apps.fas.usda.gov/psdonline/psdQuery.aspx, viewed in February 2016.

Global exports of soybeans, soybean meal and soybean oil amounted to 208 million tonnes in 2015/16 (Table 3). Consistent with their role as the largest producers, the largest exporting countries are Brazil, the United States and Argentina, together accounting for around 87 per cent of exports.¹⁶

Table 3 Soy exports per country/region in 2015/2016

Exporting country/region	Export (1,000 mt)			
	Soybeans	Soybean meal	Soybean oil	Total
Brazil	57,000	15,600	1,390	73,990
United States	45,994	10,614	1,043	57,651
Argentina	11,800	31,250	5,680	48,730
Paraguay	4,600	2,980	735	8,315
Canada	4,200	275	150	4,625
Bolivia	150	1,650	370	2,170
Ukraine	2,100	250	160	2,510
Russia	350	450	445	1,245
EU-28	100	400	1,000	1,500
China	200	1,850	80	2,130
India	200	250	0	450
Sub-Saharan Africa	9	50	100	159
Other countries	3,082	649	644	4,375
Total	129,785	66,268	11,797	207,850

Source: USDA Foreign Agriculture Service (n.d.), "Production, supply and distribution online", online: apps.fas.usda.gov/psdonline/psdQuery.aspx, viewed in February 2016.

Global imports of soybeans, soybean meal and soybean oil amounted to 202 million tonnes in 2015/2016 (Table 4).^{iv} The largest importing countries/regions are China and the EU, together accounting for around 57 per cent of global imports of soy.¹⁷

^{iv} The difference between total global exports and imports of about 6 million tonnes is attributable to slight differences between the volumes reported by importing countries and the volumes reported by exporting countries.

Table 4 Soy imports per country/region in 2015/2016

Importing country / region	Import (1,000 mt)			
	Soybeans	Soybean meal	Soybean oil	Total
Brazil	300	20	10	330
United States	816	295	120	1,231
Argentina	2	0	15	17
Paraguay	7	2	5	14
Canada	320	950	30	1,300
Bolivia	5	0	5	10
Ukraine	0	0	0	0
Russia	2,050	530	1	2,581
EU-28	13,700	20,300	150	34,150
China	80,500	20	850	81,370
India	20	7	3,550	3,577
Sub-Saharan Africa	275	760	448	1,483
Other countries	29,163	40,955	5,755	75,873
Total	127,158	63,839	10,939	201,936

Source: USDA Foreign Agriculture Service (n.d.), "Production, supply and distribution online", online: apps.fas.usda.gov/psdonline/psdQuery.aspx, viewed in February 2016.

Table 5 shows the net soy consumption resulting from adding production and import figures from the tables above and subtracting the export figures. Total global soy consumption amounted to 313 million tonnes in the harvest season 2015/2016.^v The largest soy consumers are China, the United States and the European Union.

Table 5 Net soy consumption per country/region in 2015/2016^a

Country/region	Consumption (1,000 mt)
Brazil	26,340
United States	50,534
Argentina	8,287
Paraguay	499
Canada	2,910
Bolivia	940
Ukraine	1,290
Russia	4,186
EU-28	34,700

^v The difference to the global production can be explained by soy in stocks.

Country/region	Consumption (1,000 mt)
China	91,240
India	11,127
Sub-Saharan Africa	3,358
Other countries	77,683
Total	313,094

^a Net consumption figures include stocks. This may overstate consumption data of the soy producing countries.

Source: Net consumption = total production - total exports + total imports.

Chapter 3 Soy trade and consumption in Belgium

3.1 Soy imports by country of origin

Table 6 shows the soy imports to Belgium by country of origin in 2014. The total quantity of all types of soy was around 1.6 million tonnes, of which two-thirds (68 per cent) came from the Netherlands. As most Dutch soy imports originated from Brazil, Argentina and the United States, it is safe to assume that most soy imports to Belgium originated from these countries.¹⁸

Table 6 Soy imports to Belgium by country/region of origin in 2014

Country/region of origin	Import (1,000 mt)			
	Soybeans	Soybean meal	Soybean oil	Total
Netherlands	135	849	94	1,078
Canada	129	0	0	129
Argentina	0	124	0	124
India	5	57	0	61
Brazil	16	27	0	43
Germany	1	33	0	34
United States	1	30	0	31
France	5	25	1	31
Paraguay	0	0	14	14
China	6	2	0	8
Other countries	10	10	7	26
Total	308	1,155	115	1,578

Source: Eurostat, "International trade: EU trade since 1988 by HS2,4,6 and CN8", online: <http://ec.europa.eu/eurostat/web/international-trade/data/database>, viewed in April 2016.

3.2 Soy exports by country of destination

Table 7 shows the soy exports from Belgium by country of destination in 2014. Most soy exports from Belgium were destined for France and the Netherlands.¹⁹

Table 7 Soy exports from Belgium by country/region of destination in 2014

Country/region of destination	Export (1,000 mt)			
	Soybeans	Soybean meal	Soybean oil	Total
France	30	394	2	426
Netherlands	50	29	22	101
Germany	8	19	1	28
United Kingdom	12	2	2	15

	Export (1,000 mt)			
Ireland	3	0	3	6
Austria	0	6	0	6
Gabon	3	2	0	4
Poland	3	0	0	4
Hungary	3	0	0	3
Suriname	0	1	2	2
Other countries	3	13	8	24
Total	115	466	40	621

Source: Eurostat, "International trade: EU trade since 1988 by HS2,4,6 and CN8", online: <http://ec.europa.eu/eurostat/web/international-trade/data/database>, viewed in April 2016.

3.3 Direct use of soy in Belgium

In total, an estimated 1.6 million tonnes of soy were imported into Belgium in 2014. As crushing no longer takes place in Belgium, it has to be assumed that the amounts remaining after export of part of the volumes were further processed in Belgium (see Table 8). Part of the resulting products were again exported.

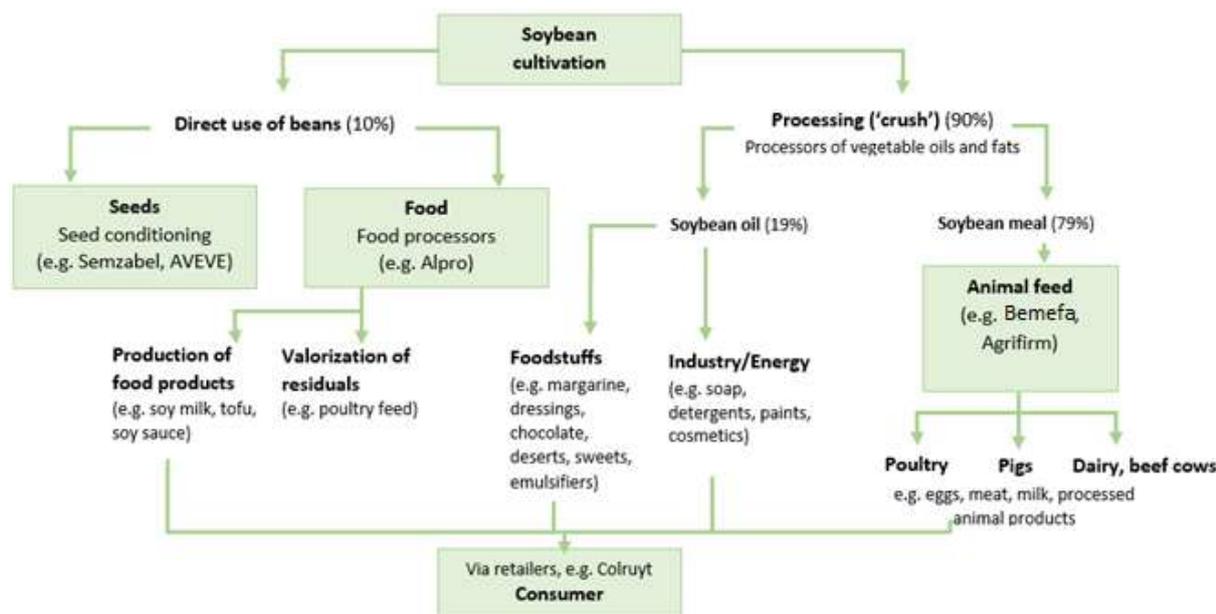
Table 8 Soy available for use in Belgium (2014 estimates, in 1,000 tonnes)

Soy products (1,000 mt)	Import	Export	Available for use in Belgium
Beans	308	115	193
Meal	1,155	466	689
Oil	115	40	75
Total	1,578	621	957

Source: Eurostat, "International trade: EU trade since 1988 by HS2,4,6 and CN8", online: <http://ec.europa.eu/eurostat/web/international-trade/data/database>, viewed in April 2016.

The soy supply chain generally consists of producers, traders, crushers, processors (including animal feed producers and the livestock sector, food producers and industrial users) and retailers. Figure 1 shows a simplified illustration of the Belgian soy supply chain.

Figure 1 The Belgian soy supply chain



Note: The remaining 2% resulting from the crushing process are hulls and waste. Soybean hulls are used as an addition to soybean meal for feeds with low protein content.

Source: Adapted from Van Waes, J., Goormachtigh, S. and J. Pannecoucq (2015, November 25), *La culture de soja en Belgique - Résultats des Résultats des essais à ILVO depuis 4 ans*, Instituut voor Landbouw en Visserijonderzoek, p.13.

3.4 Use of soy in livestock feed in Belgium

According to the European Feed Manufacturers' Federation (FEFAC), livestock feed produced in Belgium reached 6.60 million tonnes in 2014.²⁰ There are no relevant industries other than the animal feed sector consuming soybean meal, the most important soy product on the Belgian market.

To calculate the use of soy in livestock feed, the average shares of soybeans, soybean meal and soybean oil in different livestock feeds are applied to these Belgian feed production volumes (see 1.3.2 for the background on this data and Table 10 for the average soy content in different livestock feeds). This results in an estimated consumption of 825,000 tonnes of soy products in the compound feed industry in Belgium in 2014, with soybean meal accounting for 769,000 tonnes.

Together with the estimates for soy used in food (22,200 tonnes) and technical applications (16,300 tonnes) reported in market analysis, this results in a total annual use of around 863,000 tonnes.²¹ Trade statistics point to a higher total availability of soybeans and a smaller availability of soybean meal in Belgium (Table 8), resulting in a difference of 94,000 tonnes of soy products (Table 9).

According to the Belgian animal feed producers association Bemefa (Beroepsvereniging van de Mengvoederfabrikanten / Association Professionnelle des Fabricants d'Aliments Composés pour Animaux) and European statistics for 2014, Belgium exported around 300,000 tonnes of animal feed.²² Based on an average soy content of 10 per cent, this represents approximately 24,000 tonnes of additional soybean meal exports, and 3,000 tonnes each of soybeans and soybean oil on an annual basis.

It was not possible to find a complete explanation for the remaining difference between the figures for soy consumed in Belgium. The difference can potentially be explained by an underestimate of the soy share in compound feed, of the direct soy use in the food industry or the use for technical purposes. Intra-European trade of beans for crushing and resulting meal may be an explanation for the gap between soybean and soybean meal availability and calculated use of soy in different product groups.

To synchronize the figures, it is assumed that the volume of soy processed in food products, as well as the animal feed production volumes, were somewhat higher than indicated in market reports. The yet unallocated volumes of soybeans and soybean oil are therefore distributed among livestock feed and food products, while the soybean meal use is lowered (Table 9).

Table 9 Distribution of available soy across product groups (2014)

Soy product (1,000 mt)	Processed in Belgium	Original figures product groups				Remainder	Final figures product groups			
		Feed	Food	Technical			Feed export	Feed use	Technical use	Food use
Beans	193	22	3	-	168	3	131	-	59	
Meal	689	769	-	-	-80	24	665	-	-	
Oil	75	34	19	16	6	3	33	16	23	
Total	957	825	22	16	94	30	829	16	82	

To distribute the unexplained amounts of soy products among different animal feeds, the originally calculated volumes of livestock feed consumed in Belgium in 2014 are multiplied by a factor of 1.01. Hence, the total livestock feed consumption in Belgium in 2014 is estimated at 6.63 million tonnes.

The soy content in feed differs between different livestock, depending on the specific needs of the animals. Generally, the soy content is highest in compound feeds for broilers and laying hens (Table 10). Hulls used in feed are not separately considered, as their role as a commodity is negligible, and they are often crushed with the beans to obtain low-protein soybean meal.²³ In addition to the soy content in compound feeds, the use of soybean meal as a single feedstuff has been considered in the calculations of soy products in feed for pigs, dairy cows and laying hens.

Based on these considerations, Table 11 shows the volume of soy products in different livestock feeds in Belgium in 2014, which forms the basis for the calculations in the following sections. The resulting 829,000 tonnes of soy used in livestock feed production in Belgium is a little lower than the estimate of 850,000 tonnes of processed soy given by Bemefa for 2013.²⁴

Table 10 Soy in different livestock feeds in Belgium (2014)

Livestock feeds	Livestock feed production (1,000 mt)	Soy content (%) ^a			Soy products in livestock feed (1,000 mt) ^b			
		beans	meal	oil	beans	meal	oil	total
Pigs ^c	3,660	0.2	7.6	0.5	3	381	20	404
Dairy cows	652	0.0	9.9	0.2	0	76	1	77
Cattle ^d	722	0.0	7.6	0.1	0	55	1	56
Broilers	798	2.1	22.2	1.2	17	178	10	204
Laying hens	443	0.4	12.9	0.3	2	60	2	64
Other meat	359	0.0	6.2	0.3	0	23	1	24
Total	6,634				22	772	34	829

^a based on average shares for the years 2011 to 2013; ^b including soybean meal as single feedstuff; ^c based on relative soy shares in sow, piglet and fattening pigs feed; ^d including milk replacer.

Source: Calculation by Profundo based on: Hoste, R., *LEI*, August 2014; European Feed Manufacturers' Association (2015, December), *Compound Feed Production (1989-2014)*.

3.5 Consumption of animal products in Belgium

A part of the Belgium production of livestock products is exported. With the export of these products, soy indirectly leaves the country (soy used to produce these products). At the same time, livestock products from other countries are imported to Belgium. Table 11 shows the production, net export (gross export minus imports) and consumption of livestock products in Belgium in 2014 in both slaughter and retail weight.^{vi}

Table 11 Production, net export and consumption of livestock products in Belgium (2014)

Product group	Production	Net export	Consumption (carcass weight)	Consumption (retail weight)
<i>Cattle and meat (1,000 mt slaughter weight)</i>				
Beef & veal	258	86	172	112
Pork	1,118	643	475	323
Poultry	507	261	246	217
Other meat ^a	100	48	51	33
<i>Eggs and egg products (millions)</i>	<i>2,754</i>	<i>236</i>		<i>2,518</i>
<i>Dairy products (1,000 mt)</i>				
Milk	718	-62		780
Milk products	430	101		330
Cheese	85	-100		185
Butter and butter oil	45	-1		45

^{vi} Carcass weight refers to the weight of an animal after partial butchering, meaning after bleeding and removal of intestines, organs, skin, head and inedible parts of tail and legs. Still included are the bones and other body structure. In poultry, skin, stomach, liver, heart and neck are counted in the carcass weight. The carcass weight is thus lower than the life weight, but higher than the retail weight, as trimming and deboning leads to a further weight reduction.

Product group	Production	Net export	Consumption (carcass weight)	Consumption (retail weight)
Condensed milk	73	28		45
Milk powder	200	150		50
Other dairy products ^b	306	-16		322

^a including sheep, goat, horsemeat and other slaughtering; ^b including whey/whey products, lactose/lactose syrup etc.

Source: Statistics Belgium (2016, March 3), *Landbouw - Bevoorradingbalansen (2000-2014): Bevoorradingbalans vlees*; Eurostat database (n.d.), "Milk collection (all milks) and dairy products obtained - annual data", online: <http://ec.europa.eu/eurostat/data/database>, viewed in February 2016; Eurostat database (n.d.), "EU trade since 1995 by HS6", online: <http://ec.europa.eu/eurostat/data/database>, viewed in February 2016; Statistics Belgium (2016, March 3), *Landbouw - Bevoorradingbalansen (2000-2014): Bevoorradingbalans eieren*; own calculations.

Notes to the table:

- The calculations for meat are for the largest part based on carcass weight. The difference between carcass and retail weight is important when calculating the amount of soy necessary to produce a kilo of meat sold in the shop, as the retail weight requires the production of a higher carcass weight. The ratio depends on various factors such as the breed and the related meat percentage, or the age of the animal.

The average coefficients applied to convert the carcass weight into retail weight are 0.65 for beef, 0.68 for pork and 0.75 for poultry cuts (for whole broilers a coefficient of 1 can be applied).²⁵ Retail weight of poultry is based on a coefficient of 0.88, which is the average of the coefficients of 0.75 for poultry cuts and 1 for whole broilers. The retail weight of other meat is based on the coefficient of 0.65 for beef. The consumption of 1kg of meat purchased by a consumer (retail weight) thus requires the amount of soy used for the production (carcass weight) of 1.54kg of beef or veal, 1.47kg of pork or 1.33kg of poultry.

- Milk powder is not reported as a separate product group in the trade figures of the Eurostat database. Estimates for net exports have therefore been based on an estimated consumption of milk powder in Belgium of 4.5kg per person. This suggests a net export of 75 per cent of milk powder produced in Belgium.

Table 12 shows the estimated consumption per capita of animal products in Belgium. On average, a Belgian citizen consumes roughly 61kg of meat (in retail weight), 225 eggs, and 158kg of dairy products per year. This corresponds to a daily consumption of about 168 grams of meat, two-thirds of an egg and 430 grams of dairy products.

Table 12 Per capita consumption of livestock products in Belgium (2014)

	Consumption (kg per capita, in slaughtered weight)	Consumption (kg per capita, in retail weight)
<i>Cattle and meat</i>		
Beef & veal	15	10
Pork	42	29
Poultry	22	19
Other meat	5	3
<i>Eggs & egg products (number of eggs)</i>		225
<i>Dairy products (kg)</i>		
Milk		70
Milk products		29
Cheese		17
Butter & butter oil		4
Condensed milk		4
Milk powder		5
Other dairy products		29

Source: input from Table 11; Eurostat, "Population on 1 January by age and sex", online: <http://ec.europa.eu/eurostat/data/database>, viewed in February 2016.

3.6 Embedded soy in livestock products

Table 13 shows the amount of soy, in grams, used per kilo of livestock product. This provides an estimate of the soy indirectly used for these products. It combines both the soy contents from Table 10 and the product volumes from Table 11.

Table 13 Soy content in livestock products in Belgium (2014)

Livestock product	Production volume	Milk kg per kg product	Soy product per unit				
			beans	meal	oil	Total (in carcass weight)	total (in retail weight)
			1,000 mt	kg	gr/kg	gr/kg	gr/kg
Beef & veal	258		1	213	2	216	332
Pork	1,118		3	341	18	361	531
Poultry	507		34	350	19	403	457
Other meat	100		0	227	10	237	365
<i>Eggs and egg products^a</i>	<i>2,754</i>		<i>1</i>	<i>22</i>	<i>1</i>	<i>23</i>	<i>23</i>
<i>Produced and processed milk</i>							
Milk	718	1	0	19	0	19	19

Livestock product	Production volume	Milk kg per kg product	Soy product per unit				
			beans	meal	oil	Total (in carcass weight)	total (in retail weight)
	1,000 mt	kg	gr/kg	gr/kg	gr/kg	gr/kg	gr/kg
Milk products	430	1	0	16	0	17	17
Cheese	85	7	1	135	3	138	138
Butter	45	1	0	26	0	27	27
Condensed milk	73	3	0	61	1	63	63
Milk powder	200	9	1	161	3	165	165
Other dairy products	306	1	0	19	0	19	19

Note: figures are rounded.

^a Eggs: production volume is expressed in million eggs, soy product per unit is expressed in grams per egg.

Source: see Table 10 and Table 11; own calculations.

The soy content per kilogram of livestock product (in retail weight) is highest for pork (531 grams per kg), broilers (457 grams per kg), and beef (332 grams per kg).

3.7 Consumption of embedded soy in Belgium

Table 14 presents an overview of the estimated amount of soy needed for the Belgian domestic consumption of livestock products and other food products, and an indication of the area of agricultural land needed to produce this. It combines both the soy product per unit from Table 13 and the consumption volumes from Table 11.

Appendix 1 and Appendix 3 give a more detailed explanation for the calculation of the average yield per hectare and the conversion to soybean equivalent.

Table 14 Total embedded soy consumption in Belgium and the required land (2014)

Product (group)	Consumption (1,000 mt)	Soy volume (1,000 mt)				Soybean equivalent (1,000 mt)	Land (1,000 hectares)
		beans	meal	oil	total		
<i>Cattle and Meat</i>					320	277	99
Beef & veal	172	0	37	0	37	31	11
Pork	475	1	162	8	172	149	53
Poultry	246	8	86	5	99	87	31
Other meat	51	0	12	1	12	10	4
<i>Eggs and egg products^a</i>	2,518	2	55	1	58	49	18
<i>Dairy products</i>					64	54	19
Milk	780	0	15	0	15	13	4
Milk products	330	0	5	0	6	5	2

Product (group)	Consumption (1,000 mt)	Soy volume (1,000 mt)				Soybean equivalent (1,000 mt)	Land (1,000 hectares)
Cheese	185	0	25	0	25	21	8
Butter	45	0	1	0	1	1	0
Condensed milk	45	0	3	0	3	2	1
Milk powder	50	0	8	0	8	7	2
Other dairy products	322	0	6	0	6	5	2
<i>Sub-total livestock products</i>		11	415	17	443	380	136
<i>Other products</i>					98	121	43
Food products from soybeans		59			59	59	21
Food products from soybean oil				23	23	37	13
Technical applications				16	16	26	9
Total consumption		71	415	56	541	502	179

Note: figures are rounded.

^a Eggs: consumption volume is expressed in million eggs.

Source: input from Table 11 and Table 13, Appendix 2 and Appendix 3 ; own calculations.

For the Belgian consumption of livestock feed, food and other products in 2014, in total 541,000 tonnes of soy products were required. This is equivalent to 502,000 tonnes of soybeans and required approximately 179,000 hectares of farmland, an equivalent to nearly 6% of Belgium's land area.

Table 15 shows the per capita consumption of embedded soy in Belgium. The total soy use per capita amounts to 48.3kg of soy products. This is equivalent to 45kg of soybeans and required on average 160m² of farmland.²⁶

Table 15 Per capita embedded soy consumption in Belgium and the required land (2014)

Product (group)	Total soy products (kg per capita)	Soybean equivalent (kg per capita)	Land (m ² per capita)
<i>Cattle and Meat (retail weight)</i>	29	25	88
Beef & veal	3	3	10
Pork	15	13	47
Poultry	9	8	28
Other meat	1	1	3
<i>Eggs and egg products</i>	5	4	16
<i>Dairy products</i>	6	5	17

Product (group)	Total soy products (kg per capita)	Soybean equivalent (kg per capita)	Land (m ² per capita)
Milk	1	1	4
Milk products	0	0	1
Cheese	2	2	7
Butter	0	0	0
Condensed milk	0	0	1
Milk powder	1	1	2
Other dairy products	1	0	2
<i>Sub-total livestock products</i>	<i>40</i>	<i>34</i>	<i>121</i>
<i>Other products</i>	<i>9</i>	<i>11</i>	<i>39</i>
Food products from soybeans	5	5	19
Food products from soybean oil	2	3	12
Technical uses of soybean oil	1	2	8
Total consumption	48	45	160

Note: figures are rounded.

Source: input from Table 14; Eurostat database (n.d.), "Population on 1 January by age and sex", online: <http://ec.europa.eu/eurostat/data/database>, viewed in February 2016.

3.8 Embedded soy consumption per iconic product

Table 16 shows the embedded soy consumption for several iconic livestock products. Embedded soy consumption is largest for pork chops. Other iconic products containing a high amount of embedded soy are chicken breasts and hamburgers. Meat products with a large difference between carcass weight and retail weight have the highest relative soy content, as the amount of soy required to produce the same weight of meat in the supermarket is comparatively higher than for those with a small difference between carcass weight and retail weight.

Table 16 Embedded soy consumption per iconic product in Belgium (2014)

Product	Soy use per unit (in grams)
Hamburger (100 grams)	33
Pork chop (100 grams)	53
Pork sausage (50 grams)	17
Chicken breast (100 grams)	46
Egg (55 grams)	23
Cheese (100 grams)	14

Product	Soy use per unit (in grams)
Glass of milk (200ml)	4
Bowl of yoghurt (200ml)	3

Source: input from Table 13.

^a Assuming a weight of 50 grams for a pork sausage containing 65% pork meat.

3.9 Exports of embedded soy from Belgium

Table 17 shows the embedded soy used in the net export of products from Belgium. In 2014, these products accounted for 416,000 tonnes of soy products, equalling 361,000 tonnes of soybeans. Growing this amount of soy requires on average an area of 129,000 hectares.

Table 17 Embedded soy consumption in products exported from Belgium and the required land (2014)

Product (group)	Export (1,000 mt)	Soy volume (1,000 mt)				Soybean equivalent (1,000 mt)	Land (1,000 hectares)	
		beans	meal	oil	total			
<i>Cattle and Meat</i>						367	318	114
Beef & veal	86	0	18	0	19	15	6	
Pork	643	2	219	11	232	201	72	
Poultry	261	9	91	5	105	92	33	
Other meat	48	0	11	0	11	10	4	
<i>Eggs and egg products^a</i>	236	0	5	0	5	5	2	
<i>Dairy products</i>						13	11	4
Consumption milk	-62	-0	-1	-0	-1	-1	-0	
Consumption milk products	101	0	2	0	2	1	1	
Cheese	-100	-0	-13	-0	-14	-12	-4	
Butter	-1	-0	-0	-0	-0	-0	-0	
Condensed milk	28	0	2	0	2	1	1	
Milk powder	150	0	24	0	25	21	7	
Other dairy	-16	-0	-0	-0	-0	-0	-0	
<i>Sub-total livestock products</i>		11	358	17	386	334	119	
<i>Other products</i>						30	28	10
Food products from soybeans								

Product (group)	Export (1,000 mt)	Soy volume (1,000 mt)				Soybean equivalent (1,000 mt)	Land (1,000 hectares)
Food products from soybean oil							
Feed for export	300	3	24	3	30	28	10
Technical uses of soybean oil							
Total consumption		14	382	20	416	361	129

Note: figures are rounded.

^aEggs: export volume is expressed in million eggs.

Source: input from Table 11 and Table 13, Appendix 1 and Appendix 3 ; own calculations.

Adding up domestic consumption and net export, the total Belgian soy use equalled a soybean equivalent of 863,000 tonnes, for which an average area of 308,000 hectares was required. This equals around 430,000 football pitches, or 10% of Belgium's land area.^{vii}

^{vii} Based on a standard football pitch measuring 68m x 105m.

Chapter 4 Certified soy in the Belgian supply chain

4.1.1 Overview

This chapter combines the findings on the volume of soy processed in Belgium on an annual basis and the different certification standards for soy. The central question guiding this chapter is: what is the share of (physically or virtually) imported and processed soy certified according to one of the established standards and initiatives in the overall volume of soy processed in Belgium in 2015?

Several certification schemes for soy have been established in recent years. These include ProTerra and RTRS as the two most important certification schemes; ISCC (Plus), Organic and EcoSocial. Certification of non-GM soy only requires compliance with the non-GM criteria, but no other environmental or social standards. In addition, the Belgian animal feed industry has introduced its own standard based on RTRS (see below). A discussion and comparison of the strengths and weaknesses of these different schemes is outside the scope of this research. Neither is a discussion of political and governance mechanisms that could guide industry decisions toward more responsible choices part of this research.

Besides aiming to establish the share of certified soy processed in Belgium in 2015, we calculate which types of products this certified soy was processed in. This is partly based on publicly available information. To get a more complete picture, key companies including those identified in Appendix 1 as well as other relevant players and industry associations have been asked for input with the help of a structured questionnaire. No claims to comprehensiveness are made and estimates have to be considered as conservative. Not all relevant stakeholders could be contacted and not all contacted stakeholders were willing or able to provide the required information. Subsequently, assumptions had to be made on the distribution of soy. The lack of detailed feedback from stakeholders did not allow us to create a detailed breakdown between certified soy in different product groups.

As a first step, a selection of initiatives by Belgian stakeholders to source and process certified soy is briefly profiled in section 4.2. This overview by no means claims to be comprehensive. Based on the anonymized feedback received from stakeholders, as well as data gathered from public sources, the stream of certified soy in Belgium is mapped in section 4.3.

4.2 Supply chain of certified soy in Belgium

4.2.1 Animal feed industry

Bemefa is the association of Belgian animal feed producers. According to the organization, the 160 or so members account for 98 per cent of the Belgian compound feed production.²⁷ In 2013, approximately 850,000 tonnes of soybean meal was consumed in Belgian animal feed according to Bemefa.²⁸

The Belgian industry created a platform for sustainable feed in 2006. The step-wise introduction of purchasing certified soy started in 2008. Bemefa participated in the development of the RTRS standard on behalf of the European animal feed association (FEFAC). Bemefa set up a list of criteria described as fulfilling its own definition of being 'socially responsible' ('maatschappelijk verantwoord' (MV)), applying to full-fat soybeans and soybean meal, and fulfilling certain principles, criteria and indicators for social accountability in accordance with the RTRS standard.²⁹ Certification schemes recognized by Bemefa were the criteria set up by 'CEFETRA / Vanden Avenue Izegem' and the 'Amaggi Protocol for the Responsible Production of Soybeans'.³⁰

However, while the RTRS standard is based on more than 30 criteria and 98 indicators, a progressive approach was chosen for the Bemefa MV soy, starting from only a limited number of indicators: in 2009, a start was made with around 20 indicators; by 2014, 64 indicators were reached.³¹ The ‘Standards Map’ website of the International Trade Centre (ITC) provides a comparison of the MV soy criteria with the environmental, social and implementation criteria applied by other standards like ProTerra or RTRS.³²

Since 2012/13, Bemefa has opted for sourcing soy based on a mix of its own MV standards and the purchase of RTRS credits.³³ According to the Belgian animal feed association, the 347,000 tonnes of Bemefa MV soy in 2014/15 covered the total soybean meal required for Belgian feed production for livestock destined for domestic consumption. Bemefa calculated this based on 6 million tonnes of compound feeds produced, of which 1.5 million tonnes is destined for pig feed for pork exports and 900,000 tonnes for poultry feed for poultry product export. This leaves 3.6 million tonnes of compound feed, of which 300,000 tonnes are exported. Bemefa concludes based on these figures that 3.3 million tonnes of compound feed are consumed to satisfy the needs of the domestic Belgian market. Based on an average soybean meal content of 10 per cent this results in a need of 350,000 tonnes of soybean meal.³⁴

Table 18 Bemefa’s collective purchase of certified soy, 2009/10 until 2014/15

Harvesting year	Volume Bemefa MV soy (1,000 mt)	Volume RTRS-certified soy (1,000 mt)
2009/10	100	
2010/11	150	
2011/12	240	
2012/13	310	10
2013/14	369	23
2014/15	347	42

Bemefa (2015), *MV-Soja Factsheet Q&A*, p.9.

In 2016, the objective is to purchase 600,000 tonnes of ‘RTRS equivalent’ certified soy (a mix of RTRS and MV).³⁵ This would bring it closer to covering also the soy products used in production for export.

The Belgian dairy industry and the retail sector support the initiative. At the same time, Bemefa is also cooperating with its Dutch industry partners.³⁶ In February 2016, Bemefa received the certificate for the GMP+-Module MI103 for ‘Sustainable dairy cow feed’, allowing Bemefa-members to export feed to Dutch dairy farmers which qualifies as ‘responsible feed’ under their criteria.^{viii,37}

In terms of non-GM soy, Bemefa has signed an agreement with a retailer to purchase segregated non-GM RTRS soy. In 2013, both parties bought 3,000 tonnes of non-GM soy; in 2014, 8,000 tonnes were purchased.³⁸ For 2015, 5,000 tonnes of non-GM RTRS soy were bought, accounting for less than 1 per cent of total soy use for animal feed in Belgium.³⁹

^{viii} The GMP+ Feed Certification scheme was initiated and developed in 1992 by the Dutch feed industry. Initially set up as a national scheme in response to incidents with contaminated feed, it has developed into an international scheme managed by GMP+ International in collaboration with international stakeholders. The two modules are ‘GMP+ Feed Safety Assurance’ (focused on feed safety) and ‘GMP+ Feed Responsibility Assurance’ (see www.gmpplus.org for more information). The GMP+ module MI103 for ‘Sustainable Cow Feed’ validates the collective purchase programme of Bemefa and means that the individual Bemefa members have set the first steps in the Dutch procedure for equivalence for exporting ‘responsible’ feed to Dutch dairy farmers. Since 1 January 2015, the Dutch dairy industry has purchased exclusively RTRS or ‘RTRS-equivalent’ soy.

4.2.2 Dairy, meat and eggs

Belgian retailer Colruyt Group (see Appendix 1) joined the RTRS in December 2015.⁴⁰ The retailer invests in a project to encourage and help smallholder farmers in Brazil to receive RTRS certification. It also purchases RTRS credits to cover its soy footprint for meat and dairy products.⁴¹ In 2015, Colruyt purchased 6,326 RTRS-credits.⁴² Since the beginning of 2016, Colruyt reports that it has bought enough RTRS certificates to cover all the soy used in its own-brand production chains, equalling 30,000 tonnes per year.⁴³ Colruyt is supporting research projects on local soy production and alternative protein sources.⁴⁴

Retailer Delhaize Group (see Appendix 1) is a member of the Consumer Goods Forum.^{ix} This international industry body has committed to achieve zero net deforestation by 2020, through the responsible sourcing of soy, palm oil, pulp and paper, and beef.⁴⁵ Delhaize Group is also a member of the Consumer Goods Forum's 'Retailers' Soy Group', comprising ten retailers that are members of the RTRS.⁴⁶

Delhaize Group uses soy and its derivatives in the production of some of its private brand products and feed for its livestock. Delhaize acquired 10,000 RTRS credits in 2015, equivalent to 10,000 tonnes, to cover the use in its own-brand products. This was the first year that Delhaize purchased RTRS credits.⁴⁷

Danish dairy cooperative Arla Foods, which is partly owned by Belgian farmers, purchased enough RTRS credits to account for its total soy use in dairy feed in 2015.⁴⁸

4.2.3 Other food products

Alpro is based in Belgium, operating as a subsidiary of The WhiteWave Foods Company (United States) since 2009.⁴⁹ Alpro produces plant-based drinks and food products under the brands Alpro and Provamel (organic) at three European facilities, in Belgium (Wevelgem), France and the UK. While soy is still the main ingredient, the assortment has expanded since 2012 to also include products from almonds, hazelnuts, coconut, rice and oats.⁵⁰ According to media reports, the facility in Belgium had a capacity of around 260,000 tonnes in 2015.⁵¹ In soy drinks and desserts, which still account for the majority of Alpro's products, soybeans account for around 6 per cent of the ingredients.⁵²

To guarantee its non-GM policy, Alpro's soybeans are 100 per cent ProTerra certified.⁵³ The soybeans for Provamel products are sourced from organic farmers in France, Italy, Austria and China – 85% of the soy processed in Provamel products originates from Europe. Organic soy sourced from China is EcoSocial certified.⁵⁴

Alpro has reintroduced soybean cultivation in France, with an annual production of 20,000 tonnes in 2015. In Belgium, the company has entered a partnership to develop soy varieties suited to the local climate, while at the same time providing benefit to farmers as a rotation crop.⁵⁵ In the Netherlands, Alpro has entered a partnership with Agrifirm Plant to source locally produced soy. In 2015, Agrifirm Plant supplied the company with 340 tonnes of soybeans.⁵⁶ Alpro would like to increase this amount to 5,000 tonnes by 2020.⁵⁷

Alpro is aiming to use 50 per cent European soy in 2016 (the remainder is sourced from Canada), and to reach 100 per cent European soy for Provamel in 2017.⁵⁸

^{ix} The Consumer Goods Forum is a network of consumer goods manufacturers and retailers that collaborate on issues of sustainability, product safety, health & wellness and supply-chain standards.

Vandemoortele (see Appendix 1), a Belgium supplier of frozen bakery products, margarines and fats, offers its customers the option to purchase soy-based vegetable oils with RTRS certification.⁵⁹ The company purchased 3,000 RTRS credits in 2015. Due to a lack of detailed figures, it is not clear what share of the company's total soy consumption this covered. It is assumed for this study that the whole amount is processed domestically.⁶⁰

4.2.4 Technical applications

No specific information on the use of certified soy to produce products like biofuels, soap and lubricants in Belgium could be identified.

4.3 Total certified soy used in Belgian supply chains

The companies that provided information on the (physical or virtual) import of certified soy to Belgium in 2014/15, or for which information could be identified from other sources, accounted for around 444,000 tonnes of soy products certified under various standards. This equals around 46 per cent of the total soy available in Belgium in that year (957,000 tonnes).

According to the information at hand, it can be concluded that around 425,000 tonnes of soy products certified according to the criteria of one of the schemes present in Belgium were used in the production of animal products in the country in 2014/15. This represents just over half (c.51 per cent) of the 829,000 tonnes of soy processed in animal feed in that year. Belgian food producers processed at least 19,000 tonnes of direct soy products that were certified according to the criteria of one of the schemes in 2015; this represents at least 23 per cent of the soy processed in food products.

When only looking at the production required for domestic consumption in Belgium, the amounts of certified soy cover a larger share: 96 per cent of the need for animal feed and 82 per cent of overall domestic soy consumption.

According to these conservative estimates, the majority of the certified soy volume (78 per cent) was composed of soy certified according to the MV soy criteria set up by Bemefa; around 17 per cent was RTRS-certified soy; around 3 per cent ProTerra certified soy; and shares of around 1 per cent or less of non-GM, organic and EcoSocial certified soy.

However, it is likely that the volume of non-GM soy (including ProTerra, non-GM RTRS, non-GM ISCC Plus) processed in food products is higher than could be confirmed. Presumably, these standards account for most products for human consumption that contain soy as a direct ingredient, as EU-labelling rules state that the presence of GM-ingredients in food products above a threshold of 0.9% has to be mentioned on the label.

Table 19 Use of certified soy in different product groups (2014/15)

Product group	Soy processed in Belgium (1,000 mt)	Use of certified soy (1,000 mt)		
		Processed	Share (%)	Certification standards
<i>Meat, eggs & dairy</i>	829	425	51%	Bemefa MV, (non-GM) RTRS,
Beef	56			
Pork	404			
Poultry meat	204			
Other meat	24			
Eggs	64			
Milk	14			
Milk products	7			
Cheese	12			
Butter	1			
Condensed milk	5			
Milk powder	33			
Other dairy	6			
<i>Other food products</i>	82	19	23%	Proterra, EcoSocial, Organic, (non-GM) RTRS
Food products of soybeans	59	16	27%	
Margarine, baking, frying fats	23	3	13%	
<i>Other products</i>	46			
Feed export	30			
Technical & energy uses	16			
Total	957	444	46%	

Sources: Table 14 and Table 17; Bemefa (2015, September), *MV-soja*, p.8,12; Alpro (n.d.), "Ons assortiment", online: www.alpro.com/nl/producten, viewed in April 2016; Alpro (2016), *Sustainability Report 2015*, p.9; Arla Foods (2016), *Annual Report 2015*, p.21; Company replies to soy consumption questionnaire; RTRS (n.d.), "RTRS credits buyers", online: www.responsiblesoy.org/mercado/compradores-de-creditos/?lang=en, viewed in April 2016; own estimates and calculations.

Chapter 5 Conclusions and recommendations

The aim of this report was to provide a mapping of the global soy supply, as well as a detailed analysis of the direct and indirect uses of soy in Belgium more specifically.

Of the 957,000 tonnes of soy products processed in Belgium in 2014/15, it was found that at least 46 per cent were certified under RTRS, ProTerra, Bemefa MV soy, EcoSocial, International Sustainability & Carbon Certification (ISCC Plus), non-GM soy, or organic soy. When considering only the soy required for domestic consumption, the share reached 82 per cent. According to these conservative estimates, the Bemefa MV criteria was the most commonly used standard in Belgium in 2015, accounting for around 78 per cent of the total certified volume. This was followed by RTRS with 17 per cent; around 3 per cent of ProTerra certified soy; and shares of around 1 per cent or less of non-GM, organic and EcoSocial certified soy. 'Virtual' certification, based on mass balance systems for certified soy without guarantee of actual physical presence in the product, thus dominated (95 per cent).

While Bemefa in recent years slowly increased its purchase of RTRS-certified soy, the largest part of the reported purchases for the Belgian market are still relying on Bemefa's own criteria for MV soy. These criteria are broadly aligned with the RTRS; however, the number of indicators applied for MV soy is still considerably smaller than for RTRS- or ProTerra-certified soy.

Belgian players are thus for the largest part focusing on taking steps to increase purchases of RTRS soy or the MV criteria drawing on RTRS. In some other European countries, for example Germany and Switzerland, retailers and subsequently industry show a stronger demand for ProTerra-certified soy.⁶¹ Demand for full traceability and non-GM certification is weaker on the Belgian market.

It has to be stressed that the results of this research can only give an indication of the share of certified soy at a certain point in time as not all the important players were willing to provide details on actual certified volumes. The findings have to be treated as minimum estimates for the amounts of certified soy. Especially for food products, it is likely that the market share of schemes including non-GM certification (ProTerra, EcoSocial, non-GM RTRS, non-GM ISCC Plus, organic) is underestimated considering the requirements for GM labelling in the EU.

Detailed reporting and data provision by traders and processing companies would help to avoid data insecurities and create a more complete picture of the situation. Creating more transparency should also be in the interest of industry. On the one hand, this would clarify their actual exposure to raw materials that are connected to various environmental and social problems; and on the other hand, it would give a clearer idea on the progress made to use certified oilseeds or efforts to use alternative, locally produced protein sources.

As an immediate step, stakeholders in the Belgian soy supply chain should rapidly increase the uptake of soy certified under an established scheme requiring the most stringent demands for social and environmental conduct. While the Belgian animal feed industry is taking responsibility by purchasing increasing amounts of certified soy, this should also cover the volumes passing through Belgium on the way to other countries, whether directly or 'embedded' after processing into various products. This could be encouraged by relevant national or regional legislation.

However, the significant environmental and social impacts of large-scale expansion of soy production documented in key production areas have not been solved by the introduction of certification schemes aiming to make soy production responsible. A more fundamental change may therefore be required. An important step would be to break the dependency of Europe on imports of protein-rich crops for animal feed. Efforts to develop locally produced protein-rich crops for animal feed – the most important destination of soy – should be intensified. Besides crops like peas, beans and lupines, European production of soy may also be a viable alternative.

An overall reduction in the consumption of animal protein would immediately decrease the consumption of soy for feed. Due to the inefficient conversion of large volumes of crops to produce much smaller amounts of meat and other animal products, this would help to reduce the pressure on arable land resources and the significant climate impact of deforestation for commodity production. European countries as large consumers of soy have a special responsibility to solve the 'embedded' environmental and social problems connected to the consumption of this crop.

Appendix 1 Key sectors and companies in Belgium using soy

In this chapter, the key companies in the sectors that play an important role in the soy supply chain in Belgium are briefly profiled. For each sector, the three largest companies by revenue active in Belgium have been identified. Depending on data availability, information is provided on the share of the sector activities in the total revenues for each company. In addition, where possible the share of soy in the company's sector activities is listed.

Animal feed producers

The three largest companies active in production of animal feed in Belgium based on total revenues are:

- **Aveve Group**
 - Country of headquarter: Belgium.
 - Revenues: €1,358 million in 2014.⁶²
 - Share of animal feed in total activities: Aveve Group is the market leader in supplying the agricultural sector in Belgium with a range of products including animal compound feed.⁶³ In 2014, Aveve produced a volume of approximately 1.6 million tonnes of poultry, pig, ruminant and fish feeds.⁶⁴ Key animal feed subsidiaries are Wal.Agri active in Wallonia and Aveve Veevoeding in Flanders region.⁶⁵
 - Through its subsidiary Spoomans, Aveve is also an important player in the poultry production sector.⁶⁶
 - Share of soy: unknown.
- **Vanden Avenne Commodities**
 - Country of headquarter: Belgium.
 - Revenues: €730 million in 2015.⁶⁷
 - Share of animal feed in total activities: subsidiary Vanden Avenne Ooigem specializes in producing cattle compound feed. Vanden Avenne Ooigem's revenues amount to €330-400 million. This represents about half of Vanden Avenne Commodities' total revenues.⁶⁸
 - Share of soy: unknown, but Vanden Avenne Commodities lists soy as one of the raw materials it trades in.⁶⁹
- **Versele-Laga**
 - Country of headquarter: Belgium.
 - Revenues: €588 million in 2014 as reported by Heluca, which is the holding company of the Versele family.⁷⁰
 - Share of animal feed in total activities: Versele-Laga only produces animal feed, for both livestock and pets.⁷¹
 - Share of soy: unknown.

Meat producers

The three largest companies active in meat production in Belgium based on total revenues are:

- **Belgian Pork Group (merger of Covalis and Westvlees Group)**
 - Country of headquarter: Belgium.
 - Revenues: approximately €750 million.⁷²
 - Share of meat production in total activities: the Belgian Pork Group specializes in slaughtering of pigs and processing of pork meat.⁷³
 - Share of soy: unknown.

- **Ter Beke**
 - Country of headquarter: Belgium.
 - Revenues: €400 million in 2014.⁷⁴
 - Share of meat production in total activities: Ter Beke manufactures ready meals and processed meats. The share of processed meats is unknown.⁷⁵
 - Share of soy: unknown.
- **Plukon Maasmechelen**
 - Country of headquarter: Plukon Maasmechelen is a subsidiary of Plukon Food Group (Netherlands).
 - Revenues: Plukon Food Group: €1,300 million in 2014, Plukon Maasmechelen: €239 million in 2014.⁷⁶
 - Share of meat production in total activities: Plukon Food Group specializes in slaughtering of poultry and processing of poultry meat.⁷⁷
 - Share of soy: unknown.

Dairy producers

The three largest dairy product companies active in Belgium based on total revenues are:

- **Milcobel**
 - Country of headquarter: Belgium.
 - Revenues: €1,011 million in 2014.⁷⁸
 - Share of dairy production in total activities: Milcobel is a cooperative of 1,800 dairy farmers and specializes in the production of dairy products.⁷⁹
 - Share of soy: unknown.
- **FrieslandCampina Belgium**
 - Country of headquarter: FrieslandCampina Belgium is a subsidiary of FrieslandCampina N.V. (Netherlands).
 - Revenues: FrieslandCampina N.V.: €11,348 million in 2014, FrieslandCampina Belgium: €601 million in 2014.⁸⁰
 - Share of dairy production in total activities: FrieslandCampina is a cooperative of 19,000 dairy farmers in the Netherlands, Germany and Belgium. In Belgium, there are five production locations. FrieslandCampina Belgium specialises in the production of UHT milk and dairy drinks.⁸¹
 - Share of soy: unknown.
- **Laiterie des Ardennes**
 - Country of headquarter: Belgium.
 - Revenues: €453 million in 2014.⁸²
 - Share of dairy production in total activities: Laiterie des Ardennes specializes in the production of milk. Its subsidiary Solarec specializes in the packaging of UHT milk and the production of milk powder and butter.⁸³
 - Share of soy: unknown.

Egg processors

No accurate data has been found considering egg processors in Belgium. One of the most well-known companies active in production of egg products in Belgium is:

- **Lodewijckx**
 - Country of headquarter: Belgium.
 - Revenues: €59 million in 2014.⁸⁴

- Share of egg processing in total activities: Lodewijckx specializes in the manufacturing of egg products.⁸⁵
- Share of soy: unknown.

Consumer goods producers

With respect to consumer goods producers, the focus was put on manufacturers of food products that are likely to have a comparatively large consumption of soy. For this reason, the following companies have been excluded from the selection: Barry Callebaut (chocolate products) and Syral (starch sugars and bio-ethanol). Three important companies active in production of food products in Belgium are:

- **Vandemoortele**
 - Country of headquarter: Belgium.
 - Revenues: €1,269 million in 2014.⁸⁶
 - Share of food production in total activities: Vandemoortele is a European food group that manufactures frozen bakery products and margarines & fats. The margarines & fats segment contributed 43 per cent to the total revenues in 2014.⁸⁷
 - Share of soy: Vandemoortele names soy as one of the ingredients used for retail private brands of margarines, fats and oils.⁸⁸
- **Unilever Belgium**
 - Country of headquarter: Unilever Belgium is a subsidiary of Unilever (Netherlands / United Kingdom).
 - Revenues: Unilever: €48,436 million in 2014, Unilever Belgium: €638 million in 2014.⁸⁹
 - Share of food production in total activities: Unilever Belgium produces a wide range of products including margarines, vegetable oils, but also beverages, cleaning products and personal care products.⁹⁰
 - Share of soy: unknown.
- **Puratos**
 - Country of headquarter: Belgium.
 - Revenues: €494 million in 2014.⁹¹
 - Share of food production in total activities: Puratos produces ingredients for bakery, patisserie and chocolate products. The bakery segment includes margarines and specialty fats.⁹²
 - Share of soy: unknown.

Catering service providers

The three largest companies active in providing catering services in Belgium based on total revenues are:

- **Sodexo Belgium**
 - Country of headquarter: Sodexo Belgium is a subsidiary of Sodexo (France).
 - Revenues: Sodexo: €18,016 million in 2014, Sodexo Belgium: €336 million in 2014.⁹³
 - Share of catering in total activities: Sodexo derives 96 per cent of its revenues from on-site services, which include catering, vending machines, reception and cleaning services.⁹⁴
 - Share of soy: unknown.
- **Compass Group Belgilux**
 - Country of headquarter: Compass Group Belgilux is a subsidiary of Compass Group (United Kingdom).

- Revenues: Compass Group: €21,834 million in 2014, Compass Group Belgilux: €163 million in 2014.⁹⁵
 - Share of catering in total activities: Compass Group is a provider of food and support services, providing catering services to companies, the health sector and the educational sector.⁹⁶
 - Share of soy: unknown.
- **AC Restaurants & Hotels Beheer**
 - Country of headquarter: AC Restaurants & Hotels Beheer is a subsidiary of Autogrill Group (Italy).
 - Revenues: Autogrill Group: €3,930 million in 2014, AC Restaurants & Hotels Beheer: €127 million in 2014.⁹⁷
 - Share of catering in total activities: Autogrill Group is a provider of food and beverage services for travellers. AC Restaurants & Hotels Beheer is an operator of restaurants and hotels in Belgium and the Netherlands.⁹⁸
 - Share of soy: unknown.

Retailers

The three largest companies active in food retailing in Belgium based on total revenues are:

- **Delhaize Group**
 - Country of headquarter: Delhaize Group is in the process of merging into the Ahold Group (Netherlands). The merged company will be named Ahold Delhaize and will be headquartered in the Netherlands.⁹⁹
 - Revenues: €21,361 million in 2014.¹⁰⁰
 - Share of retail in total activities: Delhaize Group is a grocery retailer headquartered in Belgium with operations in seven countries on three continents: North America, Europe and Asia.¹⁰¹
 - Share of soy: unknown.
- **Colruyt Group**
 - Country of headquarter: Belgium.
 - Revenues: €8,917 million in 2014.¹⁰²
 - Share of retail in total activities: Colruyt Group is a grocery retailer headquartered in Belgium which derives 75 per cent of its revenues from retail, 17 per cent from wholesale and food services and 8 per cent from other activities.¹⁰³
 - Share of soy: unknown.
- **Carrefour Belgium**
 - Country of headquarter: Carrefour Belgium is a subsidiary of Carrefour Group (France).
 - Revenues: Carrefour Group: €74,700 million in 2014, Carrefour Belgium: €4,513 million in 2014.¹⁰⁴
 - Share of retail in total activities: Carrefour Group is the second largest grocery retailer in Europe.¹⁰⁵
 - Share of soy: unknown.

Appendix 2 Yield per hectare

The calculation of the soy cultivation surface that is necessary for the Belgian imports uses the figures from Table 20.¹⁰⁶

Table 20 Average yield per hectare in the period 2012 until 2014 in various production countries

Producer country	mt/ha
Canada	2.87
United States	2.95
Argentina	2.81
Brazil	2.96
Paraguay	2.54
Uruguay	2.55
China	1.79
India	0.91
Ukraine	1.98
Other countries	1.84
Average productivity (weighted)	2.80

Source: USDA Foreign Agriculture Service (n.d.), "Production, Supply and Distribution Online", online: apps.fas.usda.gov/psdonline/psdQuery.aspx, viewed in June 2014.

The average yields in the different producing countries have been weighted according to the share that the country has in soy imports to Belgium. This has been done to account for the fact that Belgium sources most of its soy from just four or five countries. Since we do not have accurate figures for soy imports in Belgium by country of origin, we have used soy imports for the whole EU as a proxy. This results in an average soy yield of 2.80 tonnes per hectare.

Appendix 3 Calculation of soybean equivalents

The crushing of soybeans results in oil and meal. Both are traded on the world market and world market prices determine the sales for the grower, trader, crusher and other parties further up the chain. Soybean meal cannot be produced without producing oil at the same time and the other way around. As the income from both products is needed for the cultivation of soybeans to be profitable, a part of the surface on which soybeans are grown needs to be assigned to soybean meal and a part to soybean oil.

As soybeans are annual crops, growers decide each year whether to grow soybeans or another crop. This decision is largely based on the expected financial yield from the soy crop, which is for 61 per cent determined by the sales of soybean meal and for 39 per cent by the expected sales of soybean oil (= sales volume x price). Therefore, we think the price should be included in the calculation of the agricultural land for soybean meal and soybean oil.

The alternative is to base this calculation solely on the weight of the products, which would mean that 1 tonne of soybean meal would equal 1 tonne of soybeans, as would 1 tonne of soybean oil. However, this approach neglects the price differences between the two products. The incentive to produce more soybeans is mostly determined by the financial yield, which argues against a neglect of these price differences. The net value of soy production is thus determined by combining soybean meal and soybean oil according to their relative share in the weight of soybeans. Soybeans for human consumption, which were found to account for about 6 per cent of the value, are unlikely to have an impact on a production decision. Hulls, which account for less than 1 per cent of the value, can be neglected.

Table 21 Conversion to soybean equivalent, 2013-2015

Crushing	Soybean production (million mt)	Soybean products (million mt)	Crushing ratio	Price (in US\$, average 2013-2015)	Value (US\$ million)	%	Soybean equivalent (mt/mt)
Soybean production	290.2						
of which crushed	244.3						
Soybeans for food consumption		16.1		441	7,097	5.5%	1
Soybean meal		191.8	78.5%	432	82,905	64.8%	0.826
Soybean oil		45.2	18.5%	832	37,603	29.4%	1.590
Soybean hulls*		2.4	1.0%	110	269	0.2%	0.210
Total					127,873	100%	

* price estimate based on US data for June 2014.

Source: USDA Foreign Agriculture Service (n.d.), "Production, Supply and Distribution Online", online: apps.fas.usda.gov/psdonline/psdQuery.aspx, viewed in April 2016; ISTA Mielke (2014, May), Oil World Annual 2014; International Monetary Fund, "IMF Primary Commodity Prices", online: www.imf.org/external/np/res/commod/index.aspx, viewed in June 2014; Hoste, R., LEI Wageningen UR, and information by Nicolaj, J. (IDH), July 2014; CME Group (n.d.), "CBOT Rulebook Chapter 11c - Soybean Board Crush Spread Options", online: www.cmegroup.com/rulebook/CBOT, viewed in February 2016.

Table 21 illustrates that in the years 2013-2015, on average 16.13 million tonnes of soybeans were used for human consumption. Worldwide, 244.3 million tonnes were crushed annually, resulting in 191.8 million tonnes of soybean meal and 45.2 million tonnes of soybean oil.¹⁰⁷ The crushing ratios are based on data reported by the USDA Agricultural Service for the key countries of origin of EU imports of soybeans and meal: Argentina, Brazil, Canada, Paraguay, USA, and other countries. The ratios of these countries are weighted according to their contribution in volume. In addition, 2 per cent losses during the crushing process have been considered. Assuming a division of one-third hi-pro (48 per cent protein meal) and two-thirds low-pro soybean meal requested by the EU feed industry, the crushing of soybeans on average yields 78.5 per cent soybean meal and 18.5 per cent soybean oil. The remainders are hulls (1 per cent) and waste.¹⁰⁸ Of the resulting oil, about 81 per cent is destined for food consumption, while 18 per cent is accounted for by industrial uses.¹⁰⁹

As the market prices achieved for meal and oil are quite different, contribution of soybean meal and soybean oil to the total value of the global soybean industry is also different. The 191.8 million tonnes of soybean meal have a value of US\$83 billion and 45 million tonnes of soybean oil has a value of US\$38 billion. We can therefore assume that the total value of soybeans for 29 per cent is determined by the soybean oil and for 65 per cent by the soybean meal produced.

To produce 1,000 tonnes of soybean meal, 1,274 tonnes of soybeans are required ($=1,000/0.785$). Of the total value of this amount, 64.8 per cent is determined by soybean meal. We thus assume that of these 1,274 tonnes of soybeans, 826 tonnes (64.8 per cent) are exclusively used to produce soybean meal. For conversion purposes, 1,000 tonnes of soybean meal thus equal 826 tonnes of soybeans.

To produce 1,000 tonnes of soybean oil, 5,405 tonnes of soybeans ($=1,000/0.185$) are required. Of the total value of this amount, 29.4% is determined by soybean oil. We thus assume that of these 5,405 tonnes of soybeans, 1,590 tonnes (29.4 per cent) are exclusively used to produce soybean oil. For conversion purposes, 1,000 tonnes of soybean oil thus equal 1,590 tonnes of soybeans.

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