Fact sheet Soy

Product Board MVO

Contents

Executive Summary

Soy is one of the main raw materials for the global feed and food industry. Soybeans are one of the few plants that provide a complete protein and are therefore often used as a substitute for meat and dairy products. About 87% of the global soybean production is crushed into roughly 80% meal and 20% oil. During the processing, the high value by-product lecithin is also produced. About 13% of the soybeans is used directly as human food or in animal feed.

The global animal feed industry depends heavily on soybean meal to produce high performance diets. Soybean meal is a rich source of protein and amino acids that are seriously deficient in feed grains. The annual protein consumption will increase by 2% in non-OECD countries and 1.1% in OECD countries over the next decade due to high rates of growth in meat consumption (FAO-OECD 2011).

Previously soybean oil was the most consumed edible oil, but in 2005 this oil lost its leading global position to palm oil. The global consumption of soybean oil is expected to increase by almost 30% to 54.3 mln tonnes in 2025 due to demographic developments and improving purchasing power (FAPRI 2011).

Soybean oil is used in the manufacture of cooking oils, frying fats, margarine and a wide range of other food applications. Soy lecithin is a high value by-product that is added in many food products as a very effective emulsifier. Soybean oil and lecithin also have many applications in non-food products. In the last decade, an increasing proportion of the soybean oil production has been used by the biodiesel industry.

The expected growth rates in global consumption of soybean meal (+24%) and oil (+30%) will be significantly lower in the next fifteen years (FAPRI 2011) compared to the period 1995-2010. Considering the increasing pressure on resources, sustainable sourcing will become an increasingly important issue for the industry. Since 2011 certified RTRS-soy is available on the market.

The purpose of this fact sheet is to present the most striking developments in global production, trade (including trade policy) and use of soybeans, soybean meal and soybean oil and the role which sustainability issues play in the soy value chain:

- ***Impressive growth of global soybean production***

During the period 1995-2011, the world production of soybeans more than doubled to 263.8 mln tonnes, this was mainly produced by the US (+53% to 90.6 mln), Brazil (+209% to 73.8 mln) and Argentina (+299% to 49.5 mln). The production growth of Brazil (+49.9 mln) and Argentina (+37.1 mln) in this period was mainly due to soy area enlargement: +155% to 42.4 mln hectares. In 2002/2003 Brazil and Argentina together surpassed the US as the world's leading producer of soybeans. The soybean production in their neighbouring countries (Paraguay, Uruguay and Bolivia) and India also increased sharply to 12 mln tonnes (+8.7 mln) and 9.5 mln tonnes (+5.2 mln) respectively in the reference period.

The production growth in North and South America was also driven by increasing use of GM soybeans. The production of soybeans in the US (93%) and Argentina (nearly 100%) is almost entirely GM while the cultivation of GM soybeans in Brazil has risen significantly to 75% of its total soy area in 2010.

- ***Global crushing of soybeans almost doubled***

In 2010 a volume of 218 mln tonnes of soybeans was crushed compared to 118.4 mln tonnes in 1995. The increasing crush occurred mainly in Asia and South America. With 49.3 mln tonnes, China became the leading global crusher of soybeans in 2010, followed by the US (47 mln), Argentina (36.8 mln), Brazil (35.5 mln) and the EU (12.8 mln). The strong demand for meal and oil was the driving force behind the impressive growth in crushing capacities. The crushing industry in China and the EU are heavily dependent on soybean imports, mainly supplied by the US and Brazil. Argentina was also a significant supplier to China, but most of Argentina's soybean production is crushed domestically into meal and oil due its Differential Export Taxes (DETs). Export taxes in this country are applied at decreasing rates on soybeans (35%), soybean meal, soybean oil (both 32%) and biodiesel (17.5%).

- ***EU and Dutch crush in a downward trend***

The EU crushing of soybeans showed an opposite development and moved into a downward trend after 2002: -26% to 12.8 mln tonnes in 2010. The available crushing capacity in the EU was increasingly used for rapeseed due to the growing demand of the biodiesel industry. This development was also reflected in declining import volumes of soybeans (-26% to 13.4 mln) and more direct imports of soybean meal (+10% to 23 mln). Argentina took most advantage of the increasing EU imports of soybean meal. The declining EU demand for soybeans was mainly at the expense of the US (-60% to 2.8 mln) and Brazil (-35% to 6 mln). Paraguay strongly emerged as a supplier of soybeans to the EU: +1.9 mln tonnes. It is expected that the declining soybean demand of EU's crushing industry will continue in the next fifteen years resulting in a drop of the net-imports by 2 mln tonnes.

The Dutch crush of soybean showed a steady decline from 4.2 mln tonnes in 2001 to 2.4 mln tonnes in 2010. The same development occurred in Germany: -1.2 mln tonnes to 3 mln tonnes. In 2001 the Netherlands was the largest EU crusher of soybeans but was surpassed by Germany in 2002 and by Spain in 2008.

- ***92% Increase in world demand for soybean meal***

The global consumption of soybean meal increased from 88 mln tonnes in 1995 to just over 169 mln tonnes in 2010, mainly consumed by China (23%), the EU (19%), the US (16%) and Brazil (8%). The additional demand was mainly generated by China (+33.3 mln tonnes) and Brazil (+8.2 mln tonnes). The EU and the US also showed a significant growth in 1995-2005 but their consumption clearly revealed a downward trend thereafter.

The EU crushings of soybeans into meal are not sufficient to meet demand in the 27 EU Member States. With a share of 40%, the EU was by far the main global importer of soybean meal (23 mln tonnes) in 2010.

- ***Steady growth in global consumption of soybean oil***

In the period 1995-2010, global demand for soybean oil more than doubled to around 39 mln tonnes. Soybean oil also became more price-competitive compared to palm oil since the second half of 2008. Much of the additional consumption occurred in China (+7.7 mln tonnes). Brazil became the leading supplier to this country in 2010 after China's boycott of Argentinean soybean oil in April 2010. Brazil (+2.8 mln tonnes) and Argentina (+1.9 mln tonnes) also showed an impressive growth, mainly driven by the increasing demand of the domestic biodiesel industry.
Due to the expected declining EU production of soybean oil in the next fifteen years, the demand will be increasingly met by imports (+0.9 mln tonnes).

- ***Dutch soy imports mainly for re-export***

In 2010 a volume of 3.4 mln tonnes of soybeans was imported by the Netherlands. About 1 mln tonnes was re-exported and the remaining volume was crushed into meal and oil. In 2010, about 68% and 78% respectively of the Dutch soybean meal and soybean oil supply (production + import) was re-exported mainly to other EU countries. However, an increasing share of the Dutch soybean oil exports went to non-EU countries like South Africa and Iceland. An annual volume of around 1.8 mln tonnes of soy products[1] is used in the Dutch livestock industry.

1) The compostion of this volume was as follows: 76% soybean meal, 19% soybean hulls, 3% toasted soybeans and 1% soybean oil.

1. Introduction

1.1 Key characteristics

Soybeans play a dominant role in the area of oilseeds with a share of 42%. With an area of 244 million hectares in 2009/2010 oilseeds along with grains (688 million hectares), corn (157 million hectares) and rice (155 million hectares) belong to the main field crops in the world (USDA, ISTA Mielke 2011).

Composition

Although classified as a bean, a soybean is actually an oilseed. A soybean consists of 36-40% protein, 31-36% carbohydrates (insoluble and soluble sugars), 18-21% fatty oil and 5% minerals. It is one of the few plants that provide a complete protein, and it is therefore often used as a substitute for meat and dairy products. Soy protein contains enough of all the essential amino acids to meet biological requirements when consumed at the recommended level of protein intake. Most plant proteins are considered as "incomplete" because they are relatively low in one or more essential amino acids.

Nutritional aspects

Soybeans are higher in protein content than other legumes. About 35 to 38% of the calories in soybeans are derived from protein, compared to 20 to 30% in most other beans. According to the Dutch Nutrients Database (NEVO) of RIVM soybeans belong to the category of food items with one of the highest protein contents (in grams) per 100 gram of edible portion (second column in table 1.1).

In paragraph 2.5 attention is paid to lupines, beans and peas as substitutes for soybean meal in animal feed. In table 2.4 on page 20 an overview is given of the protein content of these crops.

The fatty acid composition of soybean oil is as follows:

- 61% poly unsaturated fatty acids,
- 23% mono unsaturated fatty acids and
- 16% saturated fatty acids.

Every 100 gram of soybean oil contains 51.8 gram of linoleic acid (omega-6) and 5.7 gram of alpha-linolenic acid (omega-3).

Price

Soybean meal

In order to produce high performance diets the global animal feed industry is dependent on soybean meal. Soybean meal is a rich source of protein and amino acids that are seriously deficient in feed grains. In EU's

Table 1.1 Protein content of different food items per 100 gram of edible portion and as a percentage of calories

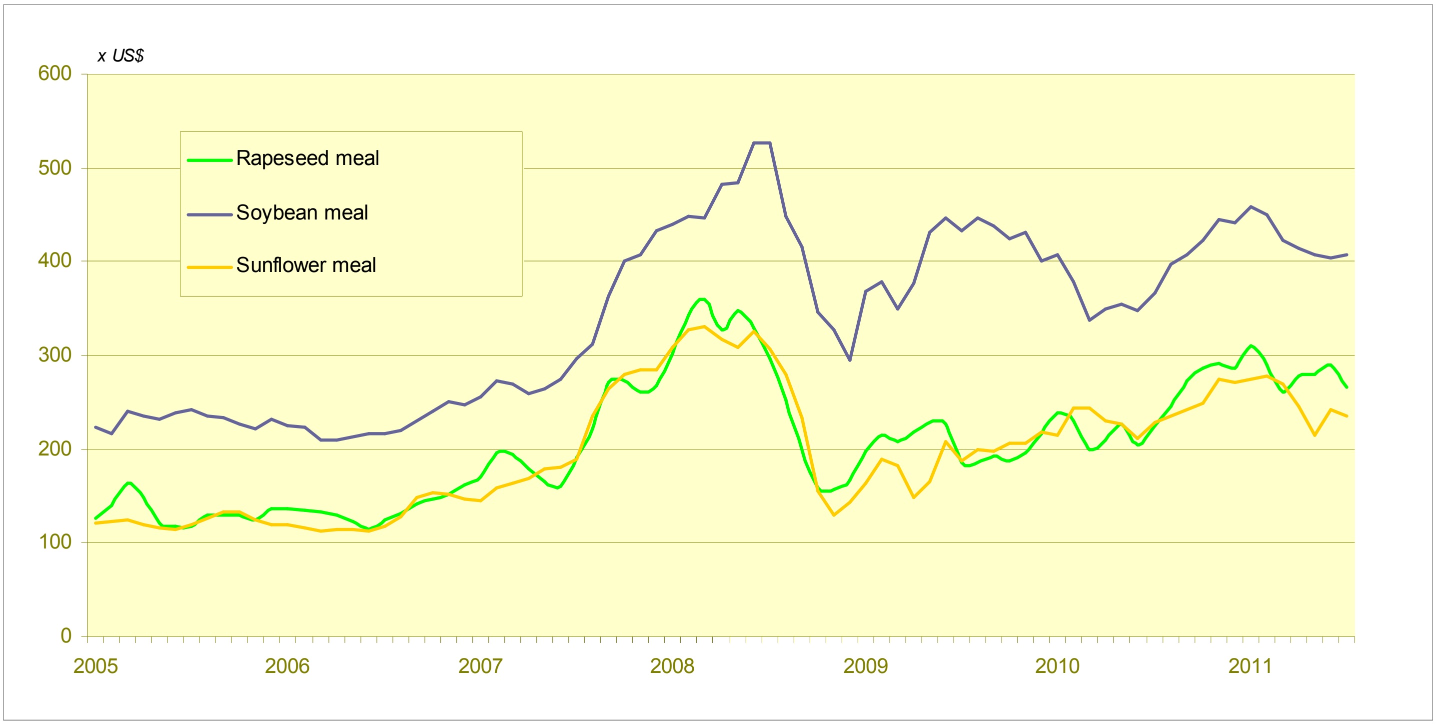
	Protein (in grams)	% calories
Soybeans, dried	35.9	*34.4%*
Cheese 20+	34.2	*56.1%*
Pumpkin seeds, raw	30.3	*21.1%*
Chicken, raw fillet	23.3	*84.7%*
Kidney beans, dried	22.1	*30.0%*
Pork 5-14% fat, raw	21.1	*84.4%*
Green peas, dried	21.0	*26.7%*
Lamb < 10 g fat, raw	20.7	*52.4%*
Fish, fat < 10 g, raw	17.8-20.1	*70.5-89.3%*
Walnuts, unsalted	15.9	*9.0%*
Chicken eggs, whole raw, average	12.3	*35.9%*

Source: RIVM 2011

animal feed industry feed grains (48%) and oilseed meals (28%) are the main feedstocks (FEFAC 2010). In the EU's consumption of oilseed meals (including corn gluten feed and corn germ meal), rapeseed meal (23%) and sunflower meal (9%) are most used in addition to soybean meal (57%). The prices of rapeseed meal and sunflower meal are significantly lower than those of soybean meal (figure 1.1) but these first two meals are also much lower in protein content and do not have the same profile of highly digestible amino acids.

Livestock feeders have benefited from the booming biodiesel industry due its price-lowering effect on oilseed meal prices. The basic economic principle is that when biodiesel demand for soybean oil and rapeseed oil increases, prices of soybean meal and rapeseed meal decrease due to the growing supply.

Figure 1.1 Monthly price developments of soybean, rapeseed and sunflower meal, 2005 - July 2011

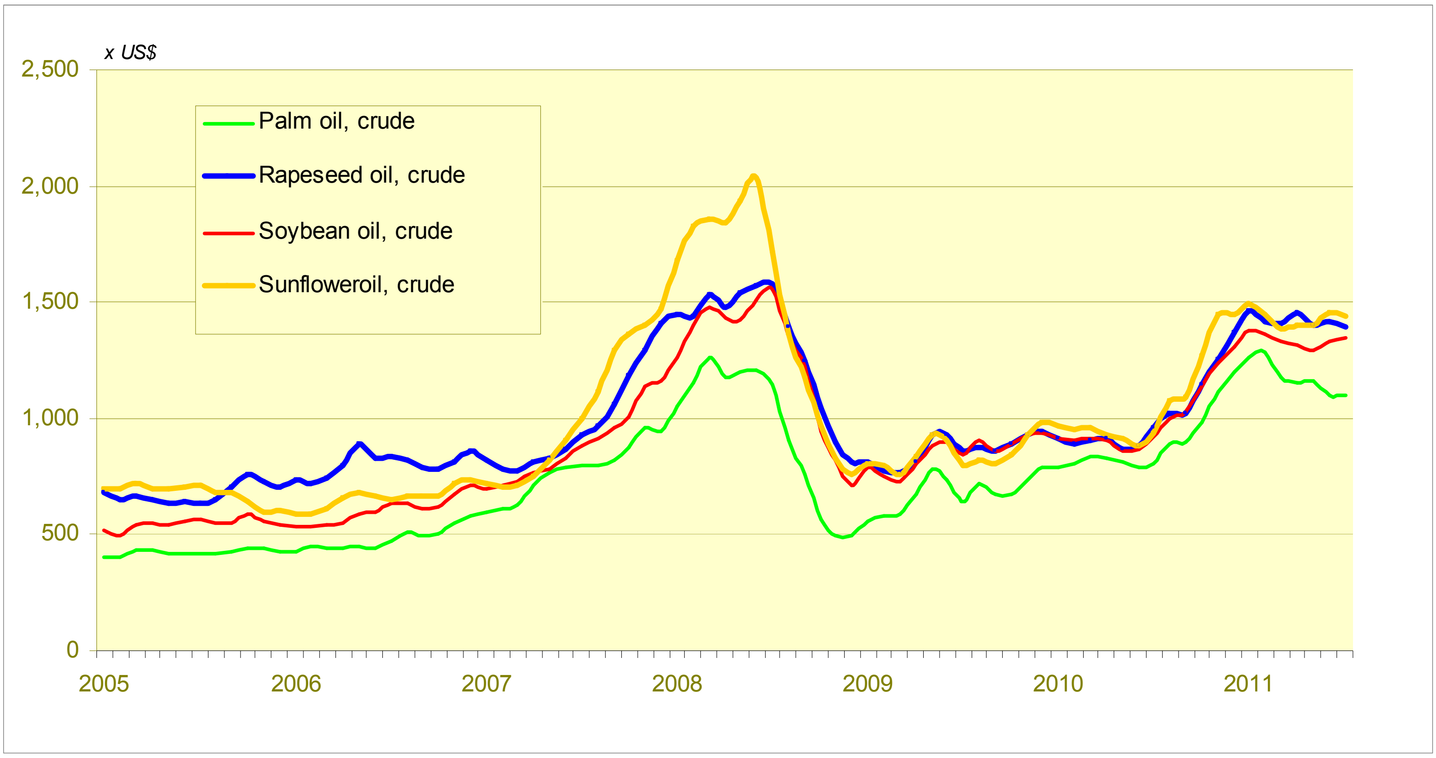


Source: Product Board MVO, August 2011

Soybean oil

Sunflower oil and rapeseed oil are normally traded against higher prices compared to soybean oil.
Palm oil has been consistently more price competitive than soybean oil due to lower production costs. The price spread between soybean oil and palm oil increases sharply in a situation of increasing demand like in the period 2007 - second half of 2008 (figure 1.2). The production of palm oil can only be adjusted to demand with a time lag of at least three years and this makes the adjustment task for competing main commodity oils such as soybean and rapeseed oil much more difficult. This is also reflected in an increasing price volatility for vegetable oils. Since the second half of 2008 the spread between soybean oil and palm oil declined sharply and reached its lowest point in the first half of 2010 (figure 1.2).

Figure 1.2 Monthly price developments of major commodity oils, 2005 - July 2011



Source: Product Board MVO, August 2011

1.2 Soy value chain and applications

Soybeans are grown for their meal and oil. Only a small portion is processed into soy protein ingredients including soy protein concentrates, isolates and textured soy proteins. These ingredients have functional and nutritional applications in various types of bakery, dairy and meat products, infant food and the so-called new generation soyfoods. The most important soybean derived products are the traditional soyfood such as tofu, soybean milk, soybean sprouts and fermented products like soy sauce, miso, tempeh and natto.

Soybean meal and crude soybean oil
Soy is a source of protein and oil with multiple uses in both human food and animal feed products and with numerous industrial applications. Soybean meal is primarily used as livestock feed while the food industry accounted for about 52% of the EU's soybean oil consumption (FAPRI, April 2011). Table 1.2 gives an impression of the wide variety of products in which soybean oil is used.

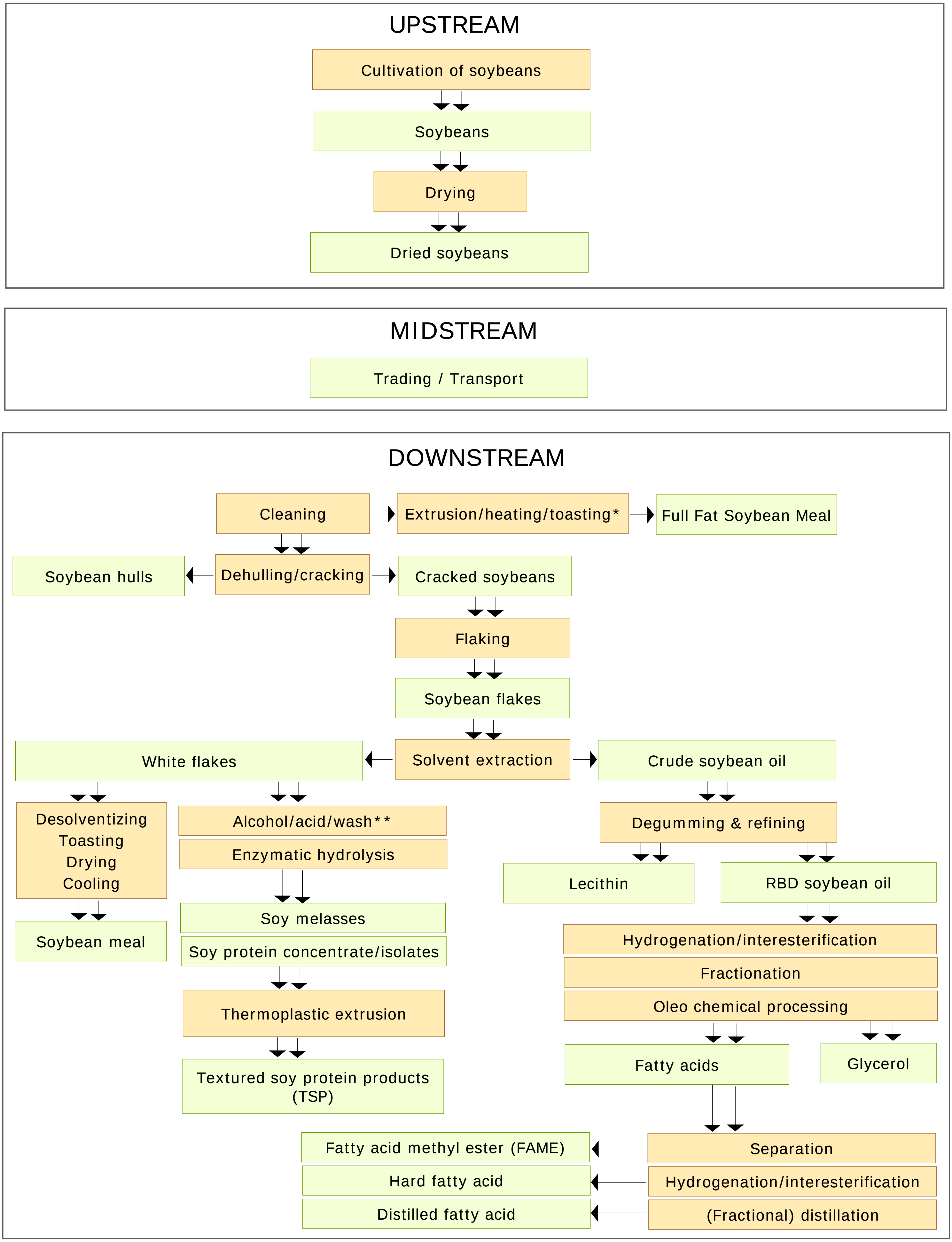
Table 1.2 Applications of soybean oil in end products

FOOD	Cooking oils, frying fats Margarine and shortenings Mayonnaise Salad dressings/sandwich spreads Confectionery, bakery and snack products Ice creams/coffee creamers/filled milk Vitamin supplements
NON-FOOD	Energy generation/biodiesel (FAME)/lubricants Soap/shampoo/detergents/solvents Cosmetics/pharmaceuticals Paints/varnishes/inks/adhesives/resins Concrete/asphalt products/caulking compounds Rubber/plastics//PVC products Animal feed Spray/waxes/coatings Pesticides/disinfectants/insecticides

Soybeans are cracked to remove the hulls and rolled into full-fat flakes. The rolling process disrupts the oil cell, facilitating solvent extraction of the oil. Solvent extraction is the most widely used method for oil extraction but mechanical extraction is often used by small extraction plants. After the oil has been extracted, the solvent is removed and the flakes are dried, creating defatted (white) soy flakes. In order to produce soybean meal, extracted white flakes are desolventized with steam to remove hexane and then toasted, ground to uniform particle size and cooled. Solvent extracted dehulled soybean meal is the main source of protein for commercial animal feed. Soybean meal with a protein content of 44-45% is often referred to as Lo-Pro and as Hi-Pro if the soy protein content is circa 49% (LEI 2010).

Full fat soybean meal
Full fat soybean meal is usually produced by extrusion, micronization (heating process) or toasting/roasting. Extrusion is generally accepted as producing a high quality full-fat soybean meal with the highest energy content due to more complete rupture of oil cells than other methods. This product has a protein content of about 36%.

Figure 1.3 Soy value chain



*) Or roasting
**) More production methods are available and exact processing conditions may vary by plant.

Soybean hulls
Soybean hulls, though high in fiber, are a significant source of protein (9-12%), comparable to corn grain in the amount of crude protein.

Lecithin and RBD soybean oil
Degumming is the first phase in the process of refining. Lecithin is the gummy material which is found in crude soybean oil and which is removed by this process step. After degumming crude soybean oil is further subjected to neutralization, bleaching and deodorization (RBD soybean oil). RBD soybean oil has numerous applications in food and non-food products (table 2.1).
Lecithin is used in a large array of our daily foods, like margarine and shortenings to prevent "sweeping" of the moisture content and reduces spattering during frying. Soy lecithin is a very effective emulsifier that is added in small amounts in a wide range of food products, such as chocolates, cookies, peanut butter, confectionery coatings, baked products, dietary food, coffee creamer, instant breakfast, cheeses, meat and many other products. Furthermore, it has also many applications in the non-food industry like cosmetics, pharmaceuticals, textiles, paints, coatings and waxes etc.

Soy protein concentrate
The white flakes may also be further processed into soy protein concentrates (SPC's) by removing a portion of the carbohydrates (sugars and other soluble materials). Soy concentrates (on a dry basis) have a medium level of protein (65%-72%) and a similar high level of crude fiber as soybean meal (3.5%-5%). The carbohydrate content is in the range of 20-22%. Alcohol extraction is the most frequent production method of SPC's. SPC's are a popular application in specialty feeds such as pet and aquaculture feed (mainly as a replacement for fish meal) as well as milk substitutes.

Soy protein isolates
In soy protein isolates (SPI's) almost all soluble materials, including sugars and fibers, are removed. Therefore, soy isolates (on a dry basis) have a higher level of protein (90 - 92 percent on a dry basis) and a much lower carbohydrate content (3%-4%) than SPC's. The fiber content of SPI's is negligible.
The conventional production procedure for SPI's is based on precipitation of protein by acidification. SPI's are mainly used in the food industry to improve the texture of meat products, to enhance moisture retention, as an emulsifier and for sensorial reasons (more pleasant mouth feeling). SPI's (and SPC's) have also a very neutral flavor compared to other soy products.

Textured soy protein
Textured soy protein (TSP) is used by the food industry in many products, mainly foods that resemble meat products such as beef, pork or chicken.

1.3 Global consumption

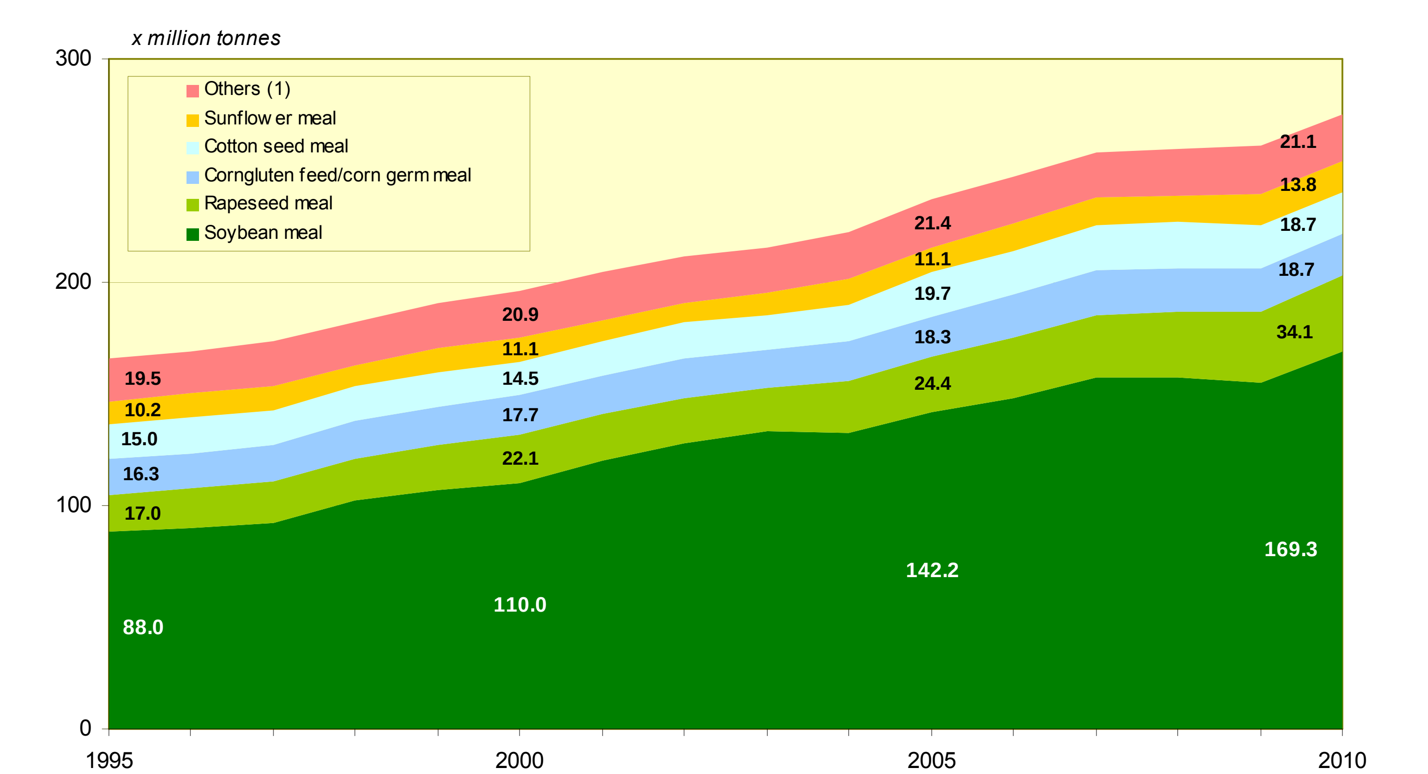
Most soybeans are crushed into soybean meal and oil. Only a small part of the global soybean production is for direct food and feed use. In the period 1995-2010 the global consumption of soybean meal (+92%) and soybean oil (+102%) showed impressive growth rates. Soy's popularity can be explained by its favorable price -quality ratio in comparison to other sources of protein and vegetable oils.

Soybean meal
Oilseed meals and cereals are the main ingredients used in animal feeds. Oilseed meals are major sources of protein while cereals are mainly used as a carbohydrate energy source.

The global consumption of oilseed meals increased from 166 million tonnes in 1995 to 275.7 million tonnes in 2010 (figure 1.4).
In this period about 90% of the volume growth was absorbed by soybean meal (+81.2 million tonnes) and rapeseed meal (+17 million tonnes).
The availability of these meals also increased due to the booming biodiesel industry. Soybean meal has strengthened its very dominant position in the global consumption of oil meals from 53% in 1995 to 61% in 2010.
In the EU there is a significant deficit in protein crop production which makes the EU very dependent on imports. In paragraph 2.5 attention is paid to a market research report of the WUR about the potential of growing protein rich crops (e.g. beans, lupines and peas) in the EU to reduce this deficit.

Soybean oil
In the period 1995-2010 the global consumption of vegetable oils and fats more than doubled to 147.1 million tonnes (figure 1.5). The additional demand of 74.8 million tonnes was mainly covered by palm oil (+31.8 million tonnes), soybean oil (+19.8 million tonnes) and rapeseed oil (+12.8 million tonnes). The global consumption of these oils was also driven by additional demand of the biodiesel industry. In 2005 palm oil surpassed soybean oil as the most consumed oil in the global vegetable oils market (figure 1.5).

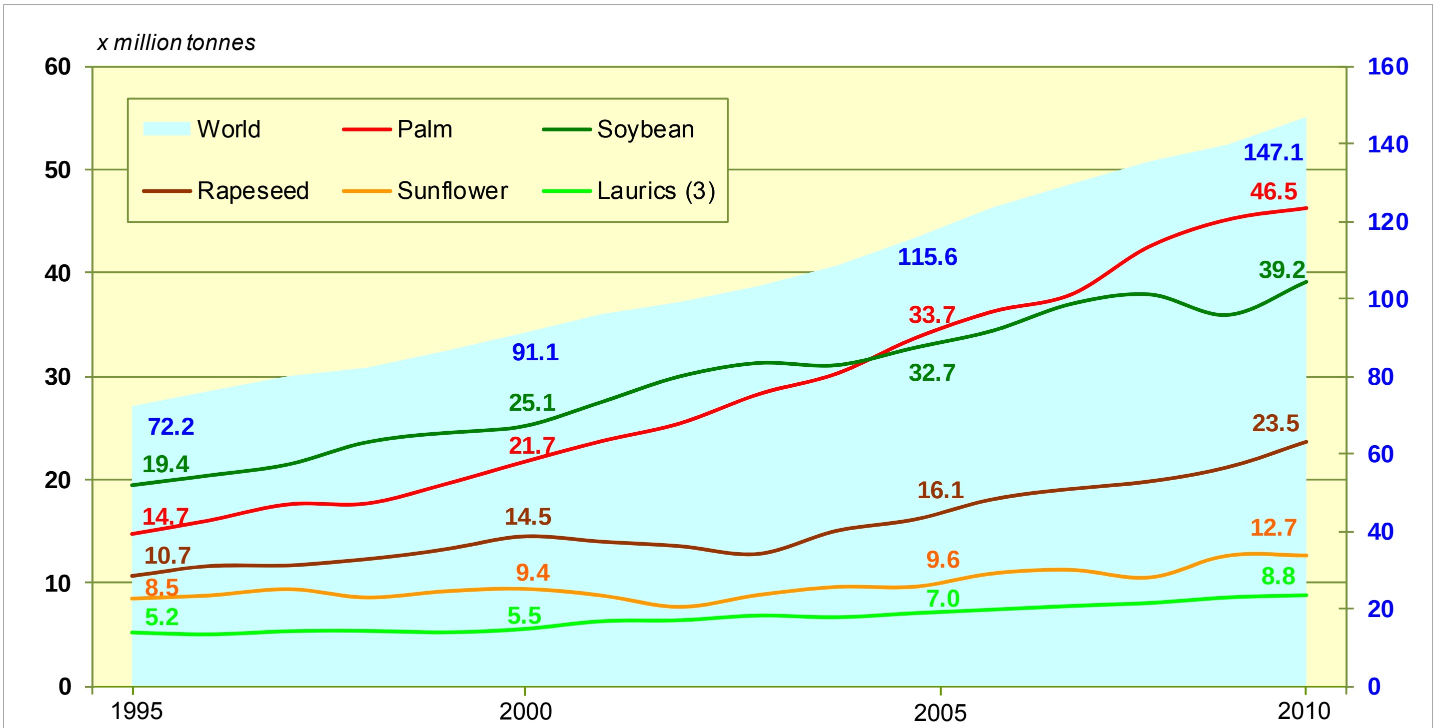
Figure 1.4 Development global consumption of oil meals in 1995-2010



(1) This category included the following oil meals in 2010; palm kernel meal (6.3 million tonnes), groundnut meal (5.7 million tonnes), fish meal (4.6 million tonnes), copra meal (2.1 million tonnes), linseed meal (1.2 million tonnes) and sesame seed meal (1.1 million tonnes).

Source: ISTA Mielke, June 2011

Figure 1.5 Development global consumption of vegetable oils and fats[2] in 1995-2010



(2) The global consumption of 147.1 million tonnes in 2010 also included cotton seed oil (4.6 million tonnes), groundnut oil (4.0 million tonnes), olive oil (3.2 million tonnes), corn oil (2.4 million tonnes), sesame seed oil (0.9 million tonnes), linseed oil and castor oil (both 0.6 million tonnes);

(3) Palm kernel oil and coconut oil.

Source: ISTA Mielke, June 2011

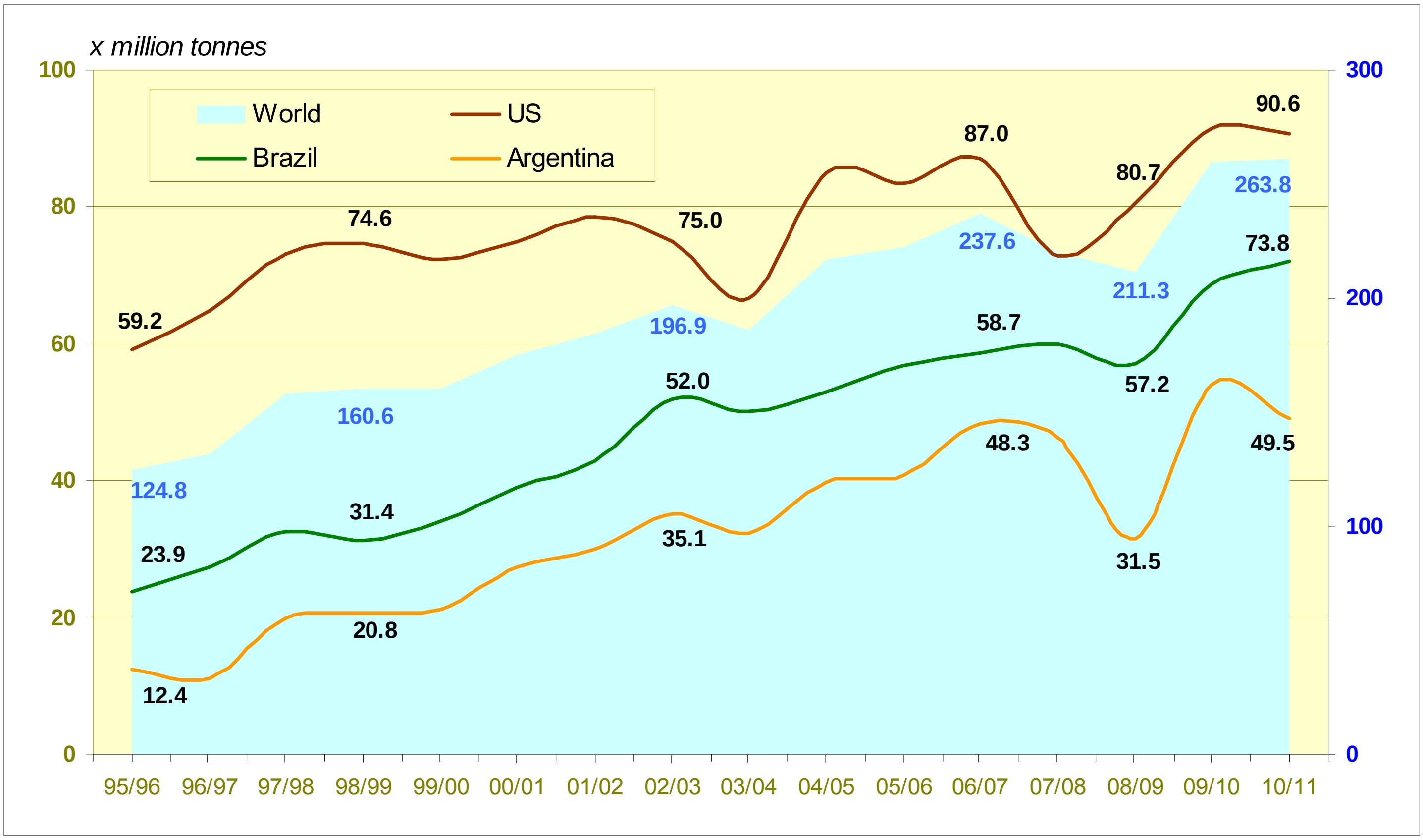
2. Supply

2.1 Major countries of origin

Global production of soybeans more than doubled in the period 1995-2011 to a new record volume of 263.8 million tonnes (figure 2.1). The annual average growth of 7.4% in this period was mainly due to area expansion (figure 2.2) while the annual average yield growth of about 1% in the main producing countries was relatively low (figure 2.3).

The additional supply of 139 million tonnes originated mainly in Brazil (+49.9 million tonnes), Argentina (+37.1 million tonnes) and the US (+31.4 million tonnes). The vigorous recovery in 2009/2010 to 259.8 million tonnes interrupted the downward trend after 2006/2007 (-11%). Last mentioned development was mainly due to a sharp decline of US and Argentina's soybean production in the seasons 2007/2008 and 2008/2009 respectively. The lower soybean harvest in the US was primarily the result of an area reduction by 4.8 million hectares (figure 2.2). Damage from severe drought and reduced fertilizer use were the main causes in Argentina.

Figure 2.1 Global production and major origins of soybeans[1]



Source: ISTA Mielke, June 2011

Area

The impressive production growth in Brazil and Argentina was mainly possible by soy area expansion (figure 2.2). In Brazil and Argentina this area increased by 126% and 209% to 24.2 and 18.2 million hectares respectively in the period 1995-2011. In the US the area expansion was relatively small in this period (+25% to 31 million hectares). Due to the huge area enlargement Argentina and Brazil together surpassed the US as the world's leading producer of soybeans in 2002/2003 (figure 2.1).

1) For the US (September - November) the bulk of harvesting time is in the first of the split years while for Brazil (January - May) and Argentina (April - May) it is in the second. Therefore, the soybean harvests of Brazil and Argentina in 2010 correspond to the season 2009/2010 while for the US it corresponds to the season 2010/2011.

Geographical maps of regions and states in Brazil and Argentina

Brazil

The states Rio Grande do Sul, Paraná and Santa Catarina in the South were the traditional areas of soybean cultivation. The most robust soy area expansion occurred in the Central-West states of Mato Grosso, Goiás and Mato Grosso do Sul (see the map on page 10). States in the Northeast and North experienced also significant growth rates in percentage terms, but started from much smaller base acreage levels. The traditional South had lower overall growth rates but also witnessed substantial expansion. In 2009/2010 the major soybean areas in Brazil were Mato Grosso (27%), Paraná (20%), Rio Grande do Sul (15%), Goiás (11%) and Mato Grosso do Sul (8%).

In the southern states the soybean production took mainly place on small to medium-sized farms. About 90% respectively 92% of the soybean area in Rio Grande do Sul and Paraná is owned by farms smaller than 1,000 hectares. Increasing of farm size in these states is often not feasible and therefore farmers tend to focus on niche markets like organically produced soybeans and conventional soybeans.

In contrast, the farms in the Central-West are mainly medium to large-sized. In the states Mato Grosso and Mato Grosso do Sul about 78% respectively 51% of the soybean area is cultivated by farms larger than 1,000 hectares (LEI 2010). Last mentioned farms are able to implement technological innovations to achieve higher yields. This explains partly the lower yields per hectare in the southern states.

Argentina

Initially, Argentina's soybean area expanded mostly in the heart of the Pampas. In 2009/2010 the central provinces of Buenos Aires (31%), Córdoba (28%) and Santa Fé (17%) represented about 76% of the total soybean area in Argentina (see the map on page 10). In recent years the soybean area in the northern and northwestern states has also increased.

Despite the concentration process in the number and size of soy farm units, soybean production still involves a large number of production units of different sizes. According to an estimate of Argentina's Oficina Nacional de Control Comercial Agropecuario (ONCCA) about 63% of the soybean production in Argentina is generated by large-scale soybean farms (table 2.1).

Table 2.1 Stratification of soybean producers in Argentina

Hectares	Number of farms	% of total production
< 100	49,308	13.6%
>100 and < 330	16,691	23.5%
> 330	7,478	62.9%

Source: ONCCA 2008

US

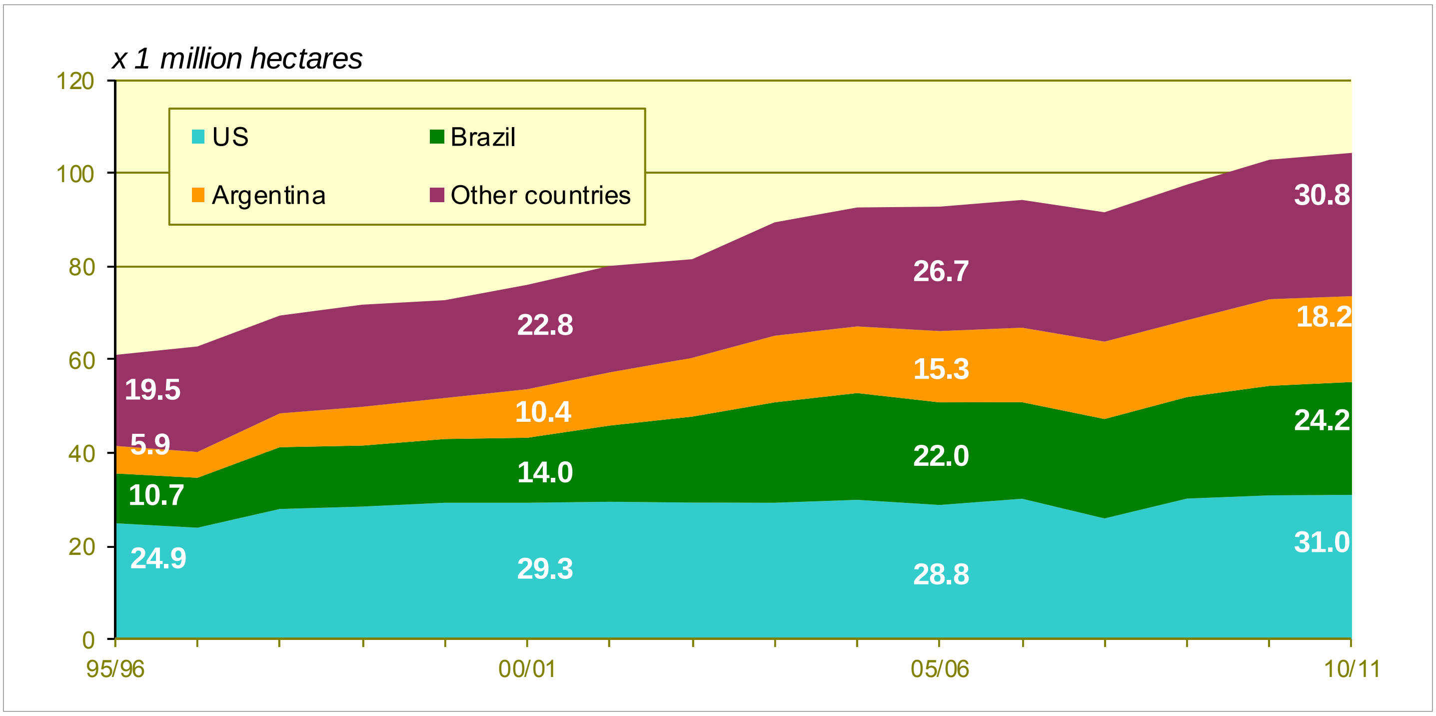
In the last decade the US soybean area stagnated and declined even to 26 million hectares in 2007/2008 but showed a vigorous recovery to 31 million hectares in 2010/2011. The states Iowa (12.7%), Illinois (11.8%) and Minnesota (9.6%) are the main soybean areas in the US. Indiana (6.9%), Missouri, Nebraska (both 6.7%), Ohio (5.9%), Kansas (5.6%), South and North Dakota (both 5.4%) are also significant soybean growing states. While soybean acreage is still expanding into northern and western parts of the country, those areas tend to have lower yields than the core production region in the Midwest (USDA 2010).

No-till farming

In the last two decades production of soybeans in Brazil and Argentina showed an impressive growth due to the increase in acreage and new technologies implemented (improved seeds, fertilizers, chemicals, machinery, no-till farming etc.). No-till farming protects the soil from erosion and structural breakdown, and untouched crop residues help both rain and irrigation water infiltrate the soil, limit evaporation, and conserve water. This practice increases farming on previously dry land.

In the whole of Brazil, no-till cropping systems have been adopted on around 70% of cultivated land in the country; particularly in soybean culture no-till cropping systems are widely spread (FEBRAPDP 2010). In Argentina the adoption rate is 88% in soy farming (Aapresid 2011).

Figure 2.2 Development of soybean area in the world, US, Brazil and Argentina, 1995-2011

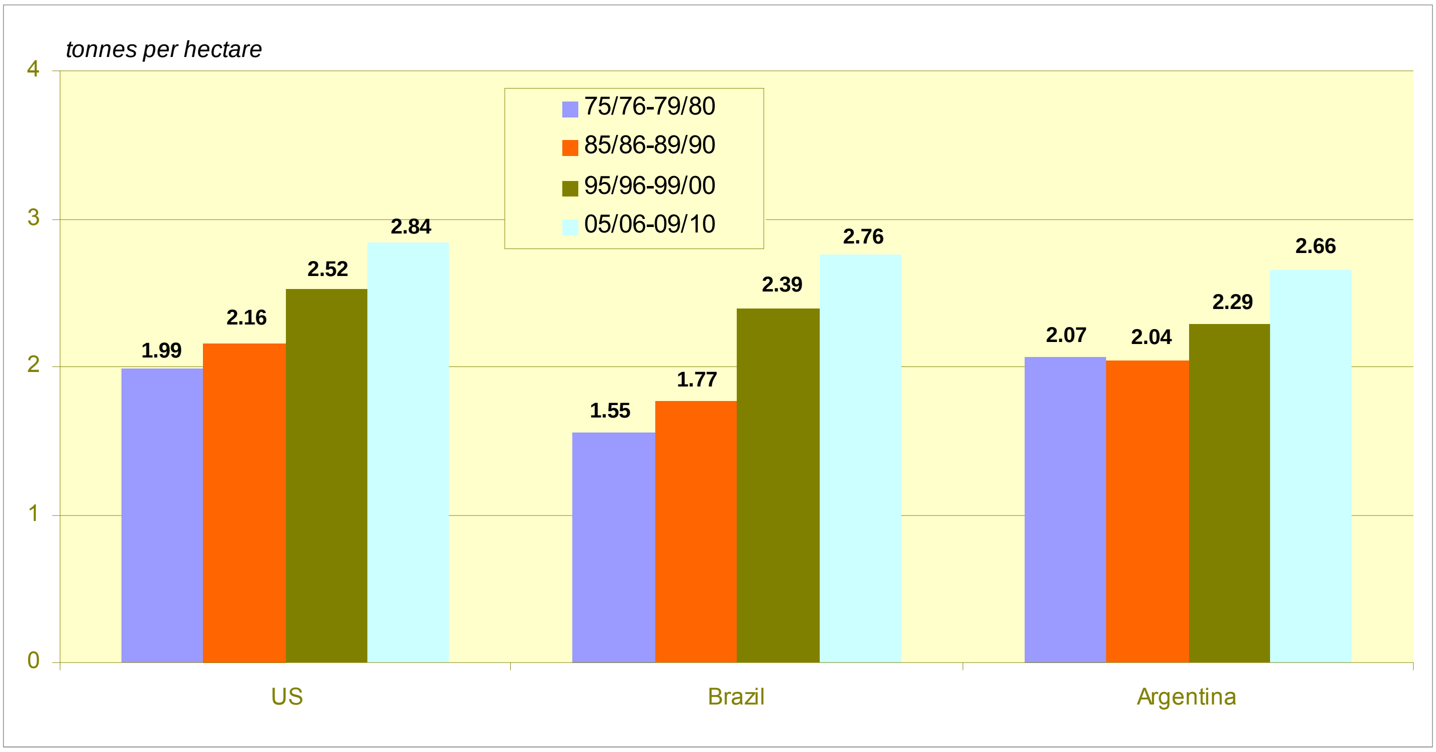


Source: ISTA Mielke, June 2011

Yields

The higher yields in the major producing countries also had a stimulating effect on production. The yields in the US improved by 13% while Argentina and Brazil showed even higher growth rates (both +16%) in the period 1995-2010 (figure 2.3). In this period the yield improvement was accelerated by the introduction of genetically modified (GM) soybeans. In 1996 the first GM soybeans were planted in the US. In 2010 eleven countries grew GM soybeans on an impressive area of 73.3 million hectares (ISAAA 2010). Paragraph 2.4 describes genetic modification in more detail.

Figure 2.3 Long-term development of the average soybean yield per hectare in the US, Brazil and Argentina, 1975-2010

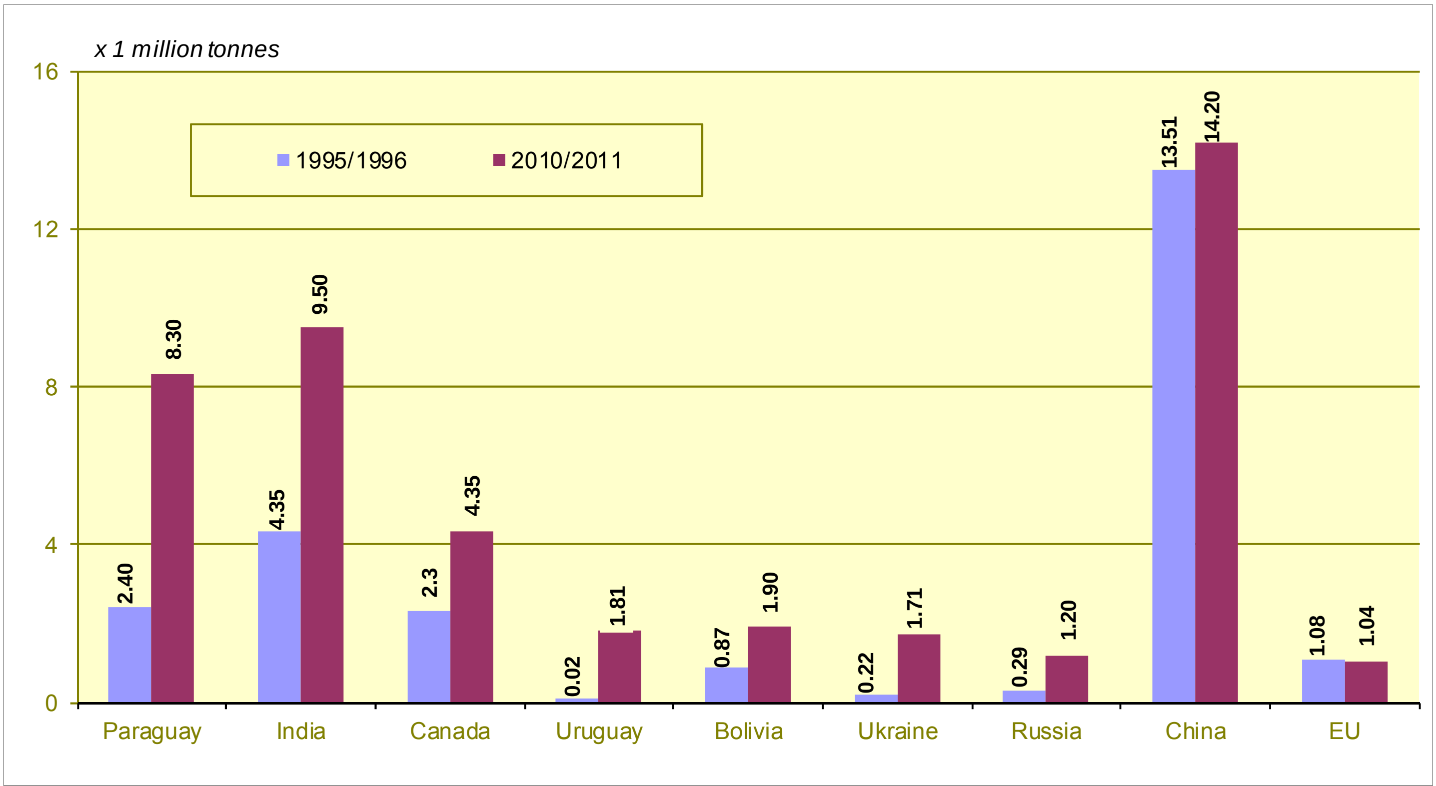


Source: ISTA Mielke, June 2011

2.2 Other countries of origin

Over the past fifteen years the soybean area in other parts of the world increased from 19.5 to 30.8 million hectares in 2010/2011 (figure 2.2). The production of soybeans outside the US, Brazil and Argentina showed an impressive growth from 29.3 million tonnes in 1995/1996 to 49.9 million tonnes in 2010/2011. About 89% of the additional volume was supplied by Paraguay, India, Canada, Uruguay, Bolivia, Russia and Ukraine (figure 2.4).

Figure 2.4 Other soybean producing countries[2] with the strongest volume growth, 1995-2011



Source: ISTA Mielke, June 2011

The annual average soy yields per hectare in the period 2005/2006-2009/2010 in China (1.68 tonnes), Ukraine (1.38 tonnes), Russia (1.04 tonnes) and India (0.98 tonnes) were much lower compared to those in the major producing countries (figure 2.3). The difference can be explained by a lack of good agriculture practices in combination with the fact that cultivation of higher yielding GM soybeans is not allowed while the US, Brazil and Argentina are growing by far the largest hectarage of herbicide tolerant soybeans (paragraph 2.4).

China
China's soybean production (mainly in the north and north-east provinces) is rising slowly due to its low yields per hectare, low average farm size and the limited availability of farmland. China's harvested soybean area in 2010 (8.6 million hectares) was only slightly higher (+5.8%) compared to 1995. In addition, soybean crushers in China (mainly located in the south and southeast provinces) have shifted to imports due to the price advantage compared to domestically grown soybeans.

European Union
With a harvest of just over 1 million tonnes in 2010/2011 the EU is only a modest soybean producer. Italy (619,000 tonnes), France (140,000 tonnes), Hungary (82,000 tonnes) and Romania (78,000 tonnes) were the main EU soybean producers. The supply from Romania showed a strongly declining trend after the record crop of 341,000 tonnes in 2006/2007. As from 1 January 2007 (date of its EU accession) Romania had to prohibit the cultivation of the Roundup Ready soybeans because EU legislation does not allow the cultivation of GM soybeans.

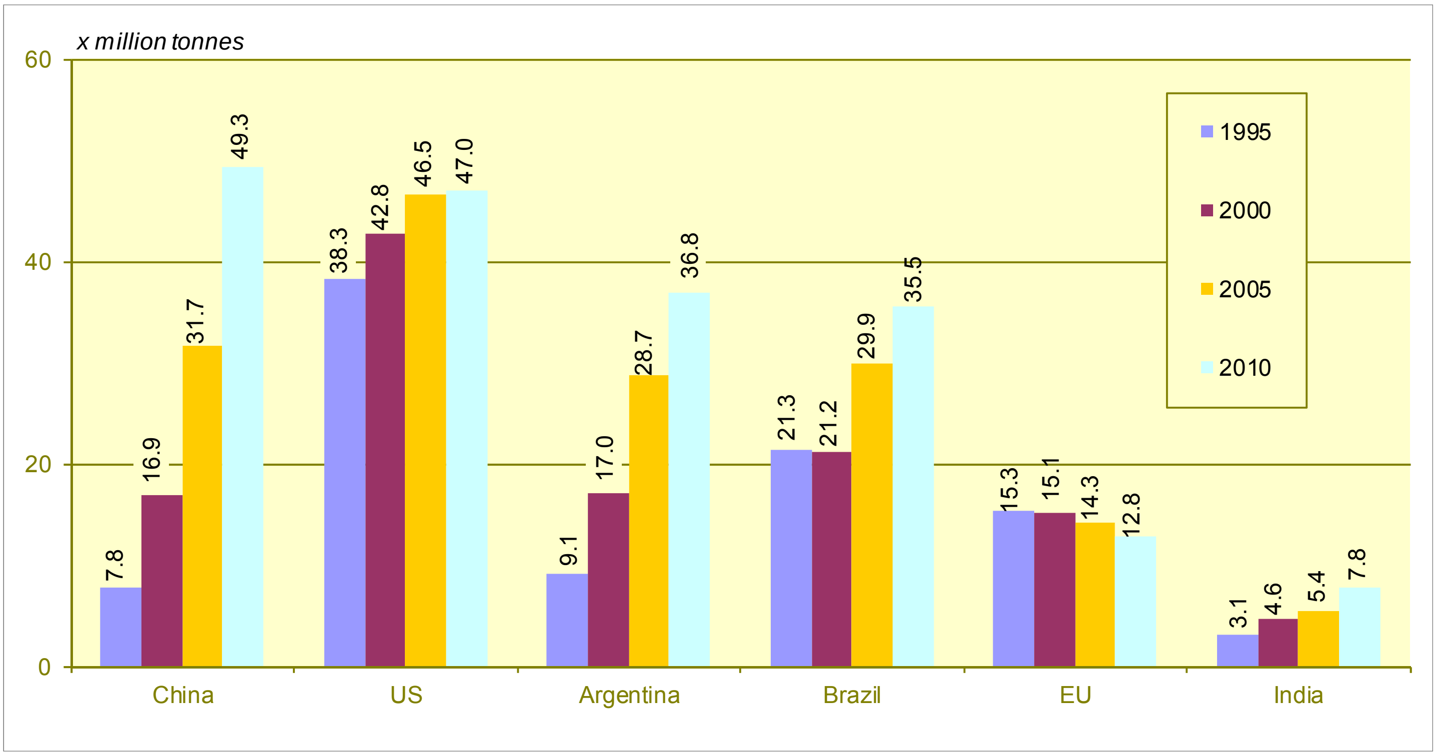
2) For China (Augustus - November), the EU (September), Ukraine, Russia (both September - October), and Canada (September - November) the bulk of harvesting time is in the first of the split years while for Paraguay (March-May) and Uruguay (April - May) it is in the second. For Bolivia and India this period is in September - May and October - January respectively.

2.3 Structure global soy crushing industry

Since 2010 China is the largest soybean crusher in the world. In the period 1995-2010 the global processing of soybeans increased by 94% to 218 million tonnes.

The additional crush of 105.6 million tonnes mainly occurred in China, Argentina, Brazil and the US (figure 2.5). The EU and India also crushed significant volumes in 2010.

Figure 2.5 Geographical distribution of utilized soy crushing capacities, 1995-2010



Source: ISTA Mielke, June 2011

China
Prior to the mid 1990's China was a net soybean exporter. Chinese consumers shifted their consumption from grains, such as rice and wheat, to meat and other animal products due to rising personal incomes. The sharply increased protein demand of China's livestock industry resulted in a rapid increase of soybean imports by the domestic crushing industry. In 1998 China introduced a differential import tax structure which favored imports of whole soybeans. The value-added taxes on all soy products are the same (13%) but the import tariffs of soybeans (3%) are much lower compared to soybean meal (5%) and oil (9%). These developments not only turned China into the world's largest soybean importing country (figure 2.6), but also reshaped the geographical distribution of China's oilseed crushing industry. Earlier, China's soybean crushing plants were mainly located in the soybean producing regions (Northeast and Northern Plains). Beyond the late 1990s, many new soybean crushing plants were built along the coastal region of China to receive imports more readily.

As part of China's crushing expansion, many existing crushing plants added more production lines to expand their capacity. Most of the newly built crushing facilities were located in the major livestock provinces and near the main port areas to take advantage of the good transportation systems and, eventually, solely rely on imported soybeans from the US and South America for their crushing needs (figure 2.6). Though the strong demand for meal and oil has been the driving force behind the phenomenal growth in processing capacity and soybean imports, preferential policies of the central government (e.g. lower rates of income taxes for foreign ventures) and local governments (e.g. land rent rebates) have also played an important role in encouraging (foreign) investments in the Chinese soybean crushing industry.
In China the crushing capacity has increased to 100 million tonnes which means a utilization degree of only 50%. China's booming demand for soybeans was also reflected in the sharply decreased self-sufficiency rate in the period 2000-2010 (table 3.1 on page 21). More information about China's consumption of soy products is given in paragraph 3.2.

US
Because of the economics of shipping soybeans and soybean products, soybean mills tend to be located near potential markets for soybean meal. These markets exist where large amounts of livestock feeds are used, or where good transportation to such areas is available. Therefore, the major crushing facilities are located in the Midwest. Reflecting the rapid rise of soybean production in southern states, quite a few

soybean crushing plants started in the South, especially along the Mississippi River.
America's soybean crushing industry produced primarily for the domestic market. In 2010 the US exported only 25% and 19% of its national production of soybean meal and soybean oil respectively (figure 2.6). In the last decade, intense competition from soybean processors in Argentina and Brazil has gradually cut the US share of soybean meal and soybean oil in foreign markets. In the US there is no export distorting tax system like in Argentina but tax credits to domestic bioethanol producers are also damaging the soybean meal market at home. Distillers dried grains (DDGs), a byproduct of ethanol production, is a very competitive feedstock in animal feed. The domestic soybean oil market also suffered from increasing demand for healthier cooking oils like canola oil. US' story as a leader in soybean production has been more as an exporter of soybeans and not as an exporter of processed products like Argentina and to a much lesser extent Brazil. In 2010 about 47% of the soybean harvest in the US was destined for export (figure 2.6).

Argentina
In the past the import-substitution policy of Argentina had a negative influence on the international competitiveness of its soybean sector. In the 1990's economic, structural and agricultural reforms created a more favorable environment for (foreign) investments and growth in the soybean sector. One of the measures was a reduction of Argentina's import taxes on fertilizers and other agro-chemicals and elimination of import bans. Currently, Argentina's soybean chain is the most integrated to world trade: about 87% of the total production of soybean meal and soybean oil is destined to international markets, while the US and Brazil are much more orientated on the domestic market (figure 2.6).

Argentina should continue to dominate world exports of soybean meal and soybean oil, as the country's modest domestic use and differential export taxes (DETs) make it comparatively economical to process soybeans there. Argentina is assumed to maintain taxes on soybean exports (35%) at a higher rate than the exports of soybean meal, soybean oil (both 32%), and biodiesel (17.5%), which favors demand by domestic processors. The domestic supply could be supplemented with rising imports (mainly from Paraguay), provided that Argentina restores a tax incentive that was provided since 2004 to soybean imports for processing and exporting the resulting soybean oil and meal. In April 2009 Argentina has scrapped this tax break in a bid to promote local crushers using domestic supplies of the oilseed. As in Argentina the potential farmland for soybean cultivation is more limited compared to Brazil, production and exports by Brazilian processors could gradually gain market share. Argentina may see its soybean exports drift lower so that the country's large crushing industry can operate near full capacity.

Currently, Argentina's soy complex is the largest economic industry of Argentina's agriculture sector and it is the main source of export revenues. Argentine overseas sales of soy products reached a trade value of 17.3 billion US$ in 2010, equivalent to 25.4% of Argentina's total export value according to the central statistics office INDEC.

Brazil
In the 1970s and 1980s Brazil installed policies of import-substitution and government market intervention to stimulate agricultural development. As a result of government incentives, there was significant investment in soybean processing. However, in 1996 export taxes on soybeans (13%) and soybean meal and oil (both 10%) were abolished. After removing of this tax system Brazil's exports shifted clearly to soybeans at the expense of last mentioned products. The declining exports of soybean meal and oil also reflects growing domestic demand of the livestock and biodiesel industry respectively. While Brazil has a tremendous capacity to produce some of the cheapest soybeans in the world, it still lacks the transportation infrastructure and domestic industrial cluster to make inland processors globally competitive. About half of all domestically produced soybeans has to cross borders of interior states to reach crushing facilities. In addition, soybeans are taxed at 12% if they cross these borders. Therefore, a considerable share of Brazil's soybean harvest is sold on the global market (in 2010: 42%) and the country is far less an exporter of processed products than Argentina. In 2010 about 51% and 23% of Brazil's production of soybean meal and soybean oil respectively were shipped to international destinations (figure 2.6).

According to the Brazilian Association of Vegetable Oils Industries (ABIOVE, May 2011) Brazil's exports of soy products were one of the main sources of foreign currency accounting for about 17.1 billion US$ in 2010. This meant a 8.5% share in the country's total export value. Brazil's soy complex also generates approximately 1.4 million jobs. China has become an increasingly important investor in this complex (also in Argentina) as the world's second biggest economy seeks new sources of raw materials for its booming industries.

European Union
Soybean production in the EU is relatively low. In order to produce meal and oil the crushing industry is heavily dependent on soybean imports from South America and the US (figure 2.6). However, the domestically produced soybean meal is not sufficient to meet the EU's demand so it has to import large amounts of soybean meal. In paragraph 3.3 extensive attention is paid to the development of the EU's crushing industry and its demand for soy products.

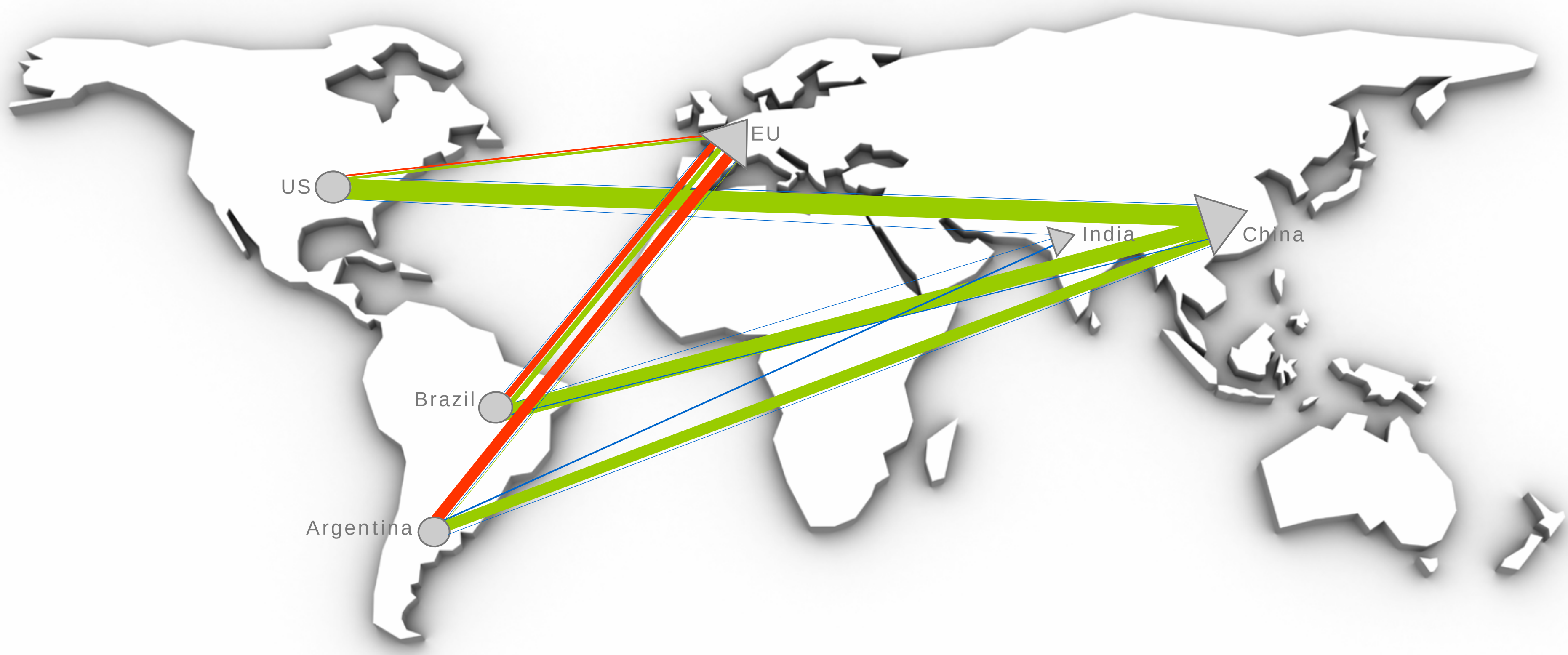
India
This country is self-sufficient in soybean production and the soybean meal volumes generated by the domestic crushing industry are more than enough to cover national requirements. India was even a soybean meal exporter in 2010. However, in 2010 this country imported a significant volume of soybean oil, mainly from Argentina (figure 2.6).

Figure 2.6: Trade flows between major players in the global soy crushing industry in 2010

US x mln tonnes	Soybeans	Soybean meal	Soybean oil
Crush	47.04		
Production	90.61	37.14	8.77
Export:	42.35	9.46	1.66
Import:	0.45	0.16	0.05

EU x mln tonnes	Soybeans	Soybean meal	Soybean oil
Crush	12.83		
Production	1.04	10.10	2.38
Import:	13.38	23.05	0.70
Argentina	0.23	11.75	0.32
Brazil	6.05	9.73	0.06
US	2.84	1.08	0.00
Export:	0.03	0.45	0.44

CHINA x mln tonnes	Soybeans	Soybean meal	Soybean oil
Crush	49.30		
Production	14.20	39.74	8.63
Import:	54.79	0.19	1.34
Argentina	11.19		0.16
Brazil	18.59		0.90
US	23.59		0.28
Export:	0.16	1.02	0.06



Brazil x mln tonnes	Soybeans	Soybean meal	Soybean oil
Crush	35.51		
Production	68.69	27.00	6.93
Export:	29.07	13.67	1.56
Import:	0.12	0.03	0.02

Argentina x mln tonnes	Soybeans	Soybean meal	Soybean oil
Crush	36.83		
Production	53.90	28.66	7.00
Export:	13.45	26.11	4.94
Import:	0.20	-	-

INDIA x mln tonnes	Soybeans	Soybean meal	Soybean oil
Crush	7.79		
Production	9.50	6.36	1.39
Import:	-	0.00	1.57
Argentina			1.28
Brazil			0.08
US			0.16
Export:	0.03	3.30	0.00

Source: ISTA Mielke, June 2011

Crushing companies

The global processing of soybeans is dominated by four multinational corporations: Archer Daniel Midlands (ADM), Cargill, Bunge, and Louis Dreyfus. In China's top 8 of crushers there are three foreign companies: Wilmar, Cargill and Noble Group. All these firms have significant soybean crushing interests throughout the world. Due to remapping of their strategies the crushing capacity increase occurred mainly in South America and China in the last decade (figure 2.5). Molino Rio de la Plata is the largest crushing facility in Argentina. COFCO, Heilongjiang 93 Oil, Chinatex Grains & Oils and Sanhe Hopeful are major domestic players in China (Rabobank 2011).

2.4 GMO

Soybeans are with 73.3 million hectares, approximately 50% of the total global area (148 million hectares) of genetically modified (GM) crops in 2010, the principal GM crop. The US (30 million hectares), Argentina (19.5 million hectares) and Brazil (17.8 million hectares) are by far the main global producers of GM soybeans. The production of soybeans in the US (93%) and Argentina (nearly 100%) is almost entirely GM while the cultivation of GM soybeans in Brazil has increased significantly, and in 2010 accounted for approximately 75% of its total production area of soybeans. Céleres (August 2011) expects this share will grow to 82.7% in 2011. Other countries that have cultivated GM soybeans are Paraguay, Canada, Uruguay, Bolivia, South Africa, Mexico, Chile and Costa Rica.

The first generation of commercially released GM soybean traits mainly consists of single events which are tolerant to specific herbicides, such as glyphosate or glufosinate-ammonium. In the meantime, a wide range of other GM soybean traits has been developed. This range of products does not only cover new traits that are tolerant to other herbicides (e.g. dicamba or imidazolinone) but also soybean traits that are resistant to insects (e.g. lepidopteran) or viruses (e.g. golden mosaic virus) and/or have an enhanced fatty acid profile. Furthermore, there is a clear trend towards the development of so-called "stacked" events. For a complete overview of the GM soybean traits that have been approved for cultivation in the US, Brazil and Argentina and the GM soybean traits that have been approved for import, processing, food/feed application in the EU please see Annex.

EU imports of agricultural commodities (including soybeans and products thereof) originating in North and South America face serious trade barriers. These trade barriers are a result of the so-called "asynchronous approval" (scientific safety assessment and political approval of GMOs take significantly more time in the EU than in third countries, in particular the US, Brazil and Canada) and EU's zero-tolerance policy towards the adventitious presence of minute traces of EU non approved GMOs in bulk cargoes of soy products. In 2009 the presence of minute (< 0.1%) traces of two (at that time) EU non approved GM maize lines resulted in a half year EU import stop for soy products originating in the US.

In the meantime, the EU member states have agreed on a "technical solution" for minute traces of certain EU non approved GMOs in feed, for example soybean meal (but not in food). This Regulation[1] that has introduced a de facto 0.1% threshold for traces of certain (presently eight) EU non approved GMOs, including three soybean traits, in feed provided that:

- The GMO has been authorised for commercialization by a third country;
- A valid application for this GMO has been submitted in the EU and the authorisation procedure has been pending for more than 3 months;
- The GMO has not been identified by the European Food Safe Authority (EFSA) as susceptible to have adverse effects on health or the environment;
- The EU's Joint Research Centre (JRC) has published the GMO specific validated detection method;
- The certified reference material of the GMO fulfills the conditions.

The European Commission has announced that it will present a similar "technical solution" proposal for food at a later stage. However, the exact timeframe is far from clear. Such a technical solution for both food and feed might give traders and feed/food manufacturers some relief but in the end a system of global synchronization or mutual recognition is the only real solution. Looking at the enormous amount of newly developed GM crops in the legal pipeline (pending approval) and in the companies' development pipeline, and the expectation that the EU will not improve efficiency in its approval process soon, the number of "incidents" might even increase despite the technical solution for feed and the envisaged solution for food.

In the meantime, not only the US but also Brazil and Argentina (Argentina in particular for maize) have abandoned their so called "mirror policy" towards the EU. These countries simply no longer wait for the EU before they approve GMOs that have passed their national safety assessments. In June 2011 the EU has approved 3 GM soybean traits (all single events) for import, processing and food/feed application, whereas Brazil has approved 7 GM soybean traits (including 1 stack) for cultivation. The US has approved 6 GM soybean traits (single events), unlike in the EU separate approval for "stacks" from approved single events is not required in the US.

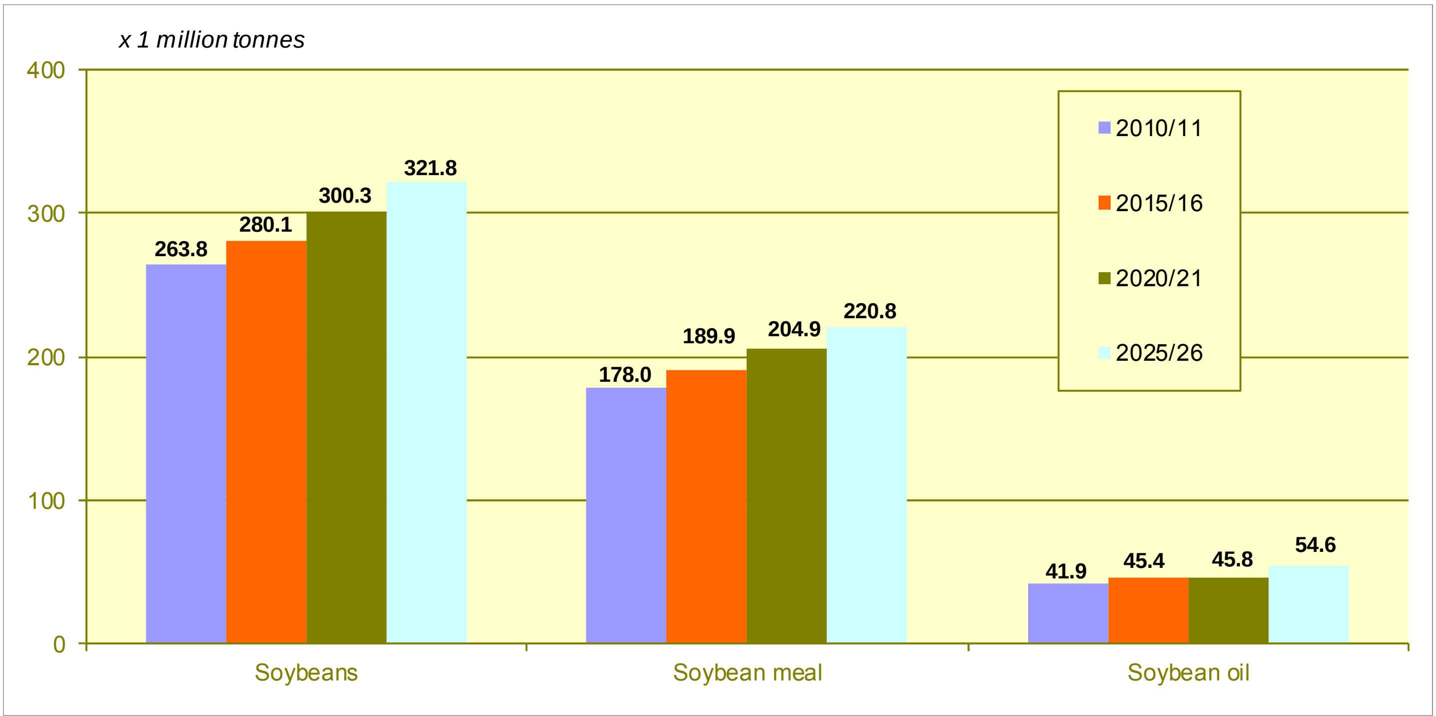
Information about the discussion on GMO's and sustainability you can find in paragraph 4.1.

1) http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:166:0009:0015:EN:PDF

2.5 Outlook

The global production (and consumption) of soybeans (+22%), soybean meal (+24%) and soybean oil (+30%) will according to the Agriculture Outlook 2011 of the US Food and Agriculture Policy Research Institute (FAPRI) show a significant growth in the next 15 years (figure 2.7). These growth rates are significantly lower compared to the period 1995-2010 (figure 1.4, 1.5 and 2.1 on page 8 and 9).

Figure 2.7 Outlook global production of soybeans, soybean meal and soybean oil, 2010-2025



Sources: ISTA Mielke, FAPRI, June 2011

Soybeans

It is expected that the global production of soybeans will increase by 58 million tonnes in the next fifteen years (table 2.2). Assuming a harvest of 263.8 million tonnes in the current season (ISTA Mielke, June 2011) global production of soybeans will reach a volume of nearly 322 million tonnes in 2025/2026 (figure 2.7). The additional soybean volume will mainly originate in Argentina (+21.1 million tonnes), Brazil (+20.8 million tonnes) and the US (+9.1 million tonnes). The US (85%) and Argentina (71%) will largely use these volumes as a feedstock for the domestic crushing industry while Brazil will export most of its extra volume (table 2.2).

The increasing supply of soybeans on the world market (+29% to 120.7 million tonnes) will be mainly absorbed by China's crushing industry. The net-import of this country will increase by 50% to 80.9 million tonnes in 2025/2026. EU's crushing industry is also a major demander of soybeans on the world market but the net-imports of this community will decline by 2 million tonnes to 11.3 million tonnes.

Table 2.2 Outlook global production and crushing of soybeans specified by country/region

	2010/2011[a]		2025/2026		Growth[b]	
x 1 million tonnes	*Production*	*Crush*	*Production*	*Crush*	*Production*	*Crush*
World	**263.8**	**225.6**	**321.8**	**280.8**	**58.0**	**55.2**
US	90.6	45.1	99.8	52.8	+9.1	+7.7
Brazil	73.8	36.2	94.6	38.4	+20.8	+2.3
Argentina	49.5	38.6	70.6	53.5	+21.1	+14.9
China	14.2	53.6	14.7	81.8	+0.5	+28.2
India	9.5	9.3	10.6	10.0	+1.1	+0.7
EU	1.0	13.1	1.1	11.2	+0.0	-2.0

Sources: a) ISTA Mielke, b) FAPRI, June 2011

Soybean meal

In the next 15 years the global production of soybean meal is expected to increase by 24% (FAPRI 2011) to nearly 221 million tonnes. The additional volume of 42.8 milllion tonnes (table 2.3) will mainly generated by China (+22.4 million tonnes), Argentina (+11.5 million tonnes) and the US (+5.9 million tonnes). The volume growth in these countries (except Argentina) will be completely absorbed by the domestic market. The net-exports of these 3 countries will also decline in the period 2011-2026. In 2025/2026 a soybean meal volume of 68 million tonnes (+15% compared to 2010/2011) will be available on the world market mainly supplied by Argentina (58%), Brazil (19%) and the US (10%).

The EU is also a major user (and importer) of soybean meal but its demand will decline by 0.9 million tonnes in the next 15 years (table 2.3).

Table 2.3 Outlook global production and consumption of soybean meal specified by country/region

	2010/2011[a]		2025/2026		Growth[b]	
x 1 mln tonnes	*Production*	*Consumption*	*Production*	*Consumption*	*Production*	*Consumption*
World	**178.0**	**177.8**	**220.8**	**221.4**	**+42.8**	**+43.6**
China	43.2	43.0	65.6	65.5	+22.4	+22.5
US	36.1	27.7	41.9	34.9	+5.9	+7.1
Argentina	30.0	1.3	41.5	2.2	+11.5	+0.9
Brazil	27.4	13.6	29.2	17.3	+1.7	+3.7
EU	10.3	34.1	8.8	33.2	-1.6	-0.9
India	7.6	3.2	8.2	3.7	+0.6	+0.5

Sources: a) ISTA Mielke, b) FAPRI, June 2011

Protein shortages

The European Feed Manufacturers Association (FEFAC) and other EU feed chain organizations have repeatedly warned about future protein shortages for animal feed in the European Union. The supply of protein-rich feedstuffs is also negatively influenced by the present EU zero-tolerance policy on traces of GMOs not yet approved in the EU in feed materials from third countries (paragraph 2.4).

The EU is dependent for more than 80% on imports of vegetable proteins (FEFAC 2011) for which there are no substitution possibilities in the short term. In order to reduce the EU's structural import dependence of soy products Platform Agriculture, Innovation and Society (April 2011) has proposed different recommendations to the Dutch government in its report 'The vulnerability of the European agriculture and food system to calamities and geopolitics (2011-2020)':

1. Stimulating the cultivation of protein rich crops (e.g. peas, beans and lupines) in the EU by innovations, subsidies and, if necessary, import duties;
2. Stimulating the cultivation of energy crops in the EU (e.g. rapeseed) which also generate protein as a by-product that is appropriate as animal feed. The obligatory10% target of biofuels in mineral fuels in 2020 can also be met by biofuels imports. The EU has to set the requirement that a substantial part of biofuels will be produced from Europe-grown energy/protein crops. However, research is necessary about the sustainability of this option;
3. Easing of restrictions concerning the ban on meat and bone meal. Since 2000 there is a total ban on the use of processed animal proteins in animal feed. The European Commission would allow poultry proteins in pig feed and pig proteins in poultry feed. As a rough estimate, this could replace 4-11% of soy imports;
4. Initiate a campaign to discourage meat consumption in the EU.

In 2008 the Wageningen University and Research Centre (WUR) published a report called 'Perspectives of soy substitutes in feed' about cultivation of different protein rich crops (e.g. peas, beans, lupines) in Europe that may be used as potential soybean meal substitutes in animal feed (table 2.4).

However, soybean meal is not only high in crude protein content but this product is also very attractive compared to its substitutes due to its higher ileal digestible protein (IDP) level. IDP is true protein digested in the intestine and this value is used to come to an optimal mix of protein in cattle feed.

The WUR concluded that beans and lupines have the potential to replace soybean meal in animal feed for cattle under the condition that market prices for these crops declined sufficiently. The same applied to peas as substitutes for soybean meal used in the pig and poultry industry.

However, production of soybean meal is more environmentally friendly than the growing of lupines and peas. In its report 'Environmental side-effects of animal feed' WUR concluded that soybean meal had lower values on different aspects of environmental impact (land use, energy use, CO_2 emissions, acidification and overfertilization) compared to lupines and peas. It should be noted that deforestation effects are not included in this comparison.

PBL's Environmental Balance 2009 examined the environmental benefits of growing beans in the Netherlands as a substitute for soy imports. The environmental benefit is 'only' a phosphate reduction of 5 kilograms per hectare (-10% reduction) while growing of these crops required much more farmland (+82%).

Table 2.4 Potential soybean alternatives: crude protein and IDP levels of different crops

	Crude protein content (in grams per kilogram)	IDP (in grams per kilogram)
Soybean meal	430	221
Crop		
Soybeans	351	152
Lupines	314	128
Beans	275	117
Peas	211	107

Source: WUR 2008

Soybean oil

Global production of soybean oil is expected to increase to 54.6 million tonnes in 2025/2026 (FAPRI 2011) compared to 41.9 million tonnes in 2010/2011 (table 2.5). In particular China will produce much more soybean oil (+7 million tonnes) for its own use in 2025/2026. Argentina (+3.4 million tonnes) will also generate a significant volume growth in the period 2011-2026. The EU production will show an opposite development (-0.4 million tonnes) while its consumption of soybean oil will increase (+0.4 million tonnes). The EU (1.2 million tonnes) will belong to the top 3 of global net-importers of soybean oil in 2025/2026 after India (1.7 million tonnes) and China (1.6 million tonnes). In 2010 the EU net-imports of this oil reached a volume of 0.28 million tonnes (ISTA Mielke, July 2011).

Table 2.5 Outlook global production and consumption of soybean oil specified by country/region

	2010/2011[a]		2025/2026		Growth[b]	
x 1 mln tonnes	Production	Consumption	Production	Consumption	Production	Consumption
World	**41.9**	**41.9**	**54.6**	**54.3**	**12.7**	**12.4**
China	9.4	10.9	16.4	17.9	+7.0	+7.0
US	8.7	7.5	10.1	8.2	+1.5	+0.7
Argentina	7.4	2.3	10.8	2.7	+3.4	+0.4
Brazil	7.1	5.6	7.5	6.8	+0.4	+1.2
EU	2.4	2.8	2.1	3.2	-0.4	+0.4
India	1.7	2.9	1.8	3.6	+0.2	+0.8

Sources: a) ISTA Mielke, b) FAPRI, June 2011

3. Demand

The world meat consumption continues to experience a high rate of growth in the period 2011-2020 and mostly in the faster growing non-OECD countries like China and Brazil (OECD-FAO 2011). In this group of countries the annual demand for poultry, pig meat and beef will increase by 2.7%, 2.1% and 1.9% respectively due to demographic growth and improvement of purchasing power. The annual growth in protein meal consumption is projected at 2% in non-OECD countries compared to 1.1% in OECD countries due to sustained growth and intensification of livestock production.

In OECD-FAO's Outlook global consumption of vegetable oils (including soybean oil) will increase on average by 2.2% per year to 182.2 million tonnes in 2020/2021. This growth is much lower compared to the 5.3% growth in the last decade. In the projection period annual demand growth in developing countries, like India, China and Brazil, will be significant higher (2.4%) compared to OECD countries (1.9%).

3.1 Self-sufficiency ratio

Only the US, Brazil and Argentina are self-supporting in their demand for soy products. These countries have for soybeans, soybean oil and soybean meal a self-sufficiency ratio (SSR) far above 100% (table 3.1). In 2010 the SSR's of the EU and China were very low for soybeans but much higher for soybean meal and soybean oil due to the domestic crushing of mainly imported soybeans.

Table 3.1 Self-sufficiency ratio (SSR[1]) of major soy products consuming countries/regions

	1995	2000	2005	2010
Soybeans				
US	142%	160%	161%	181%
Brazil	114%	150%	164%	181%
Argentina	131%	119%	132%	139%
India	117%	95%	121%	110%
China	95%	63%	41%	23%
EU	6%	7%	8%	7%
Soybean meal				
Argentina	4,724%	3,774%	3,716%	2,798%
India	476%	346%	255%	214%
Brazil	339%	240%	266%	208%
US	125%	122%	121%	133%
China	117%	99%	103%	103%
EU	44%	42%	33%	31%
Soybean oil				
Argentina	2,711%	3,347%	1,729%	362%
Brazil	162%	134%	188%	131%
US	120%	111%	112%	125%
EU	128%	147%	110%	90%
China	54%	89%	76%	86%
India	81%	50%	35%	47%

*1) National production / Domestic consumption * 100.*

Source: ISTA Mielke, June 2011

3.2 Consumption

In 2010/2011 the global dependence on soybeans and soy products will be increasing, owing to growing overall demand. The production of meat and aquaculture products is increasing worldwide. The sharply reduced production and high prices of grains shifted also additional demand to soybean meal. According to ISTA Mielke's forecast (July 2011) the global crushing of soybeans will this season increase by 6.3% to 224.6 million tonnes. The additional volume of 13.3 million tonnes will be mainly crushed in China (+6 million tonnes), Argentina (+4.4 million tonnes) and Brazil (+2.7 million tonnes).

3.2.1 Soybeans

In 2010 a volume of about 250 million tonnes of soybeans was consumed, largely by the crushing industry (87%). More details about the global crushing industry you can find in paragraph 2.3. About 13% was used directly in animal feed and as human food, mostly in Asia. In China a volume of 14 million tonnes of soybeans was intended for direct use.

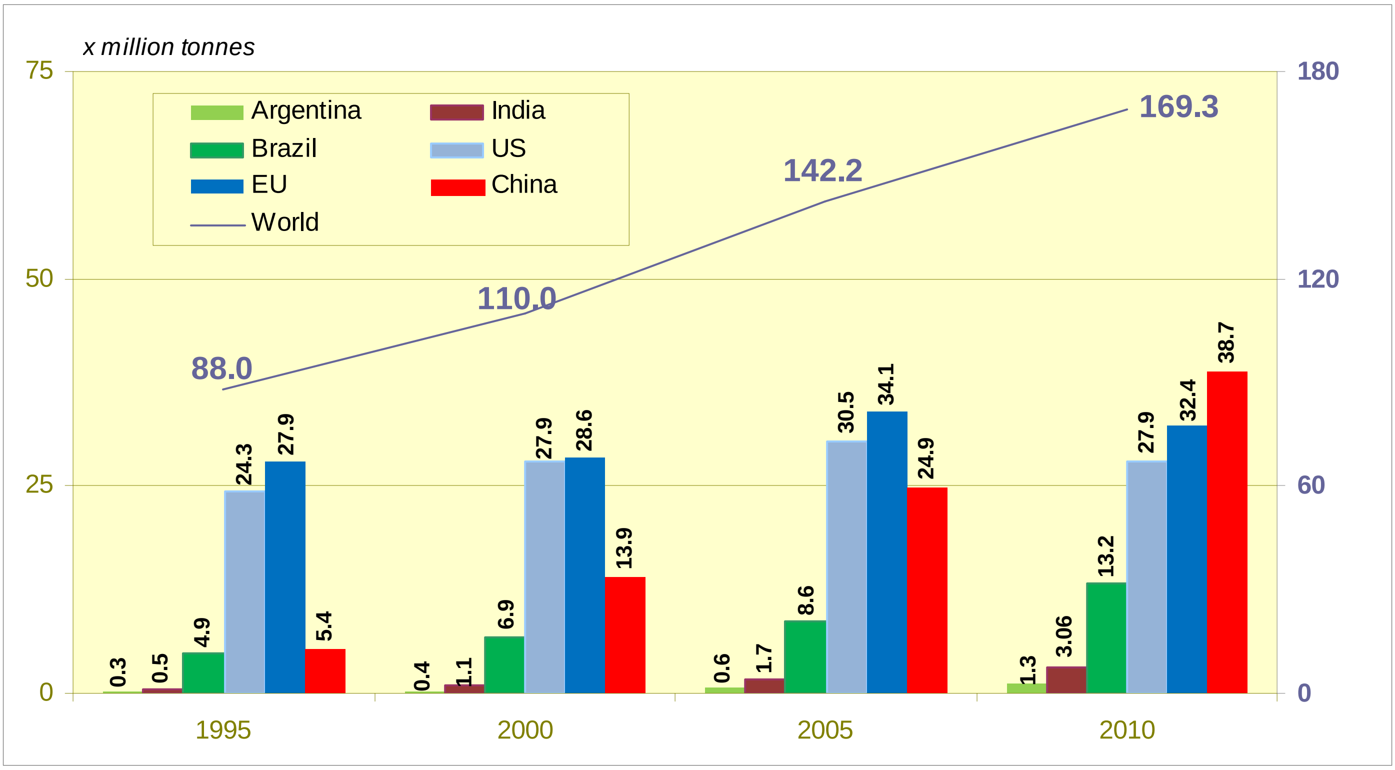
China's import dependence for soybeans increased sharply in the period 1995-2010 (table 3.1). With a volume of 54.8 million tonnes, China's import accounted for 58% of world imports of soybeans in 2010, compared with only 0.9% in 1995. The EU also had to import almost all soybeans and was with a share of 14% another significant global importer (paragraph 3.3.2). The US and Brazil are the dominant suppliers of soybeans, which is also reflected by their relatively high SSR's (table 3.1). In 2010 China's international demand for soybeans was mainly met by the US (43%), Brazil (34%) and Argentina (20%).

3.2.2 Soybean meal

In the period 1995-2010 the global consumption of soybean meal increased by 92% to 169.3 million tonnes. The increasing demand was mainly generated by China (+33.3 million tonnes) and Brazil (+8.2 million tonnes). In the US and the EU the consumption also showed a significant growth in the period 1995-2005 but their demand for soybean meal was clearly in a downward trend thereafter (figure 3.1). This development was determined by a comparatively slow expansion of meat production and a rising supply of substitute protein feeds from the biofuels industry (e.g. rapeseed meal in the EU and dried distillers grains (DDGs) in the US).

China, the US, Brazil, Argentina and India crushed sufficient volumes of soybeans to meet their domestic demand for soybean meal. With a share of 40% the EU took a very dominant position in the global imports of soybean meal in 2010 (57.4 million tonnes). Indonesia, Thailand (both 5%) and Japan (4%) followed at a big distance. More details about the EU import of soybean meal are included in paragraph 3.3.2.

Figure 3.1 Global consumption of soybean meal itemized by country/region, 1995-2010

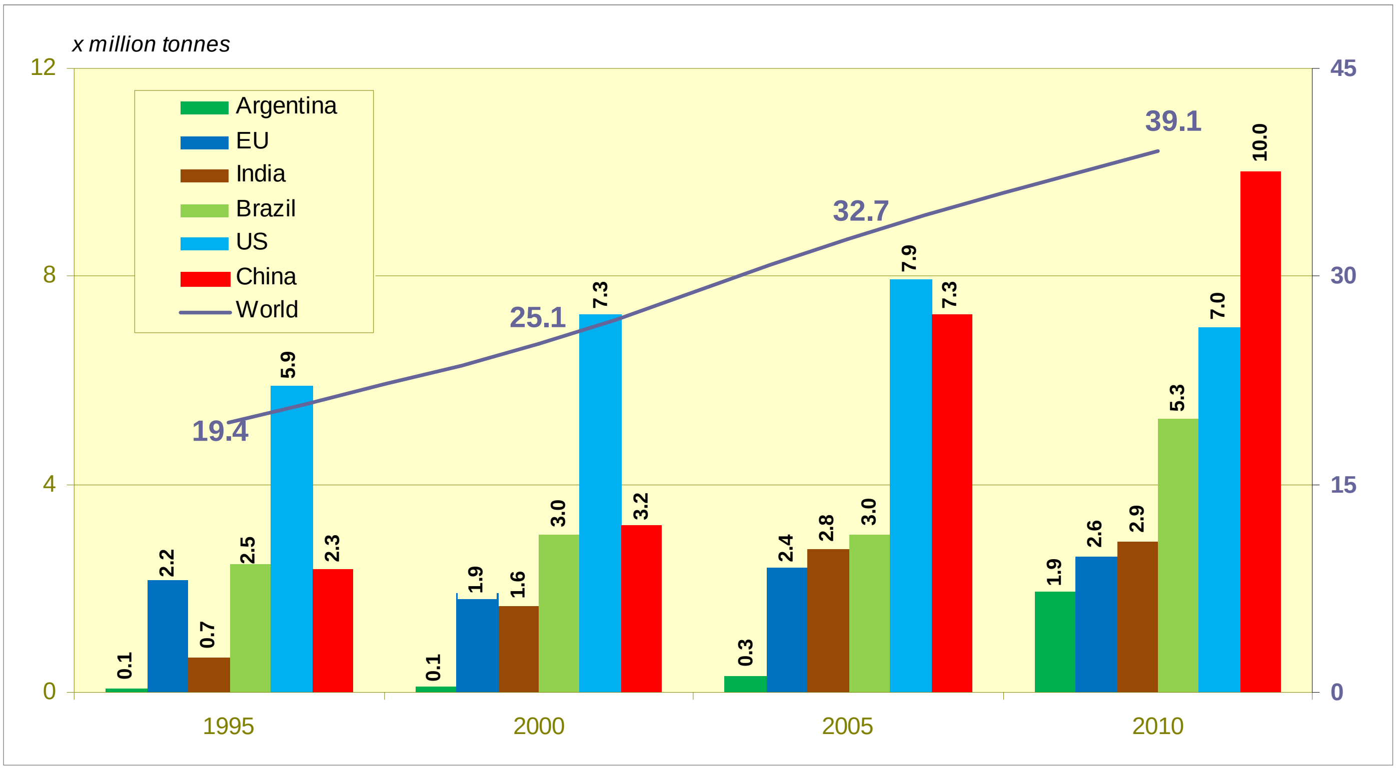


Source: ISTA Mielke, June 2011

3.2.3 Soybean oil

The global consumption of soybean oil showed a steady growth from 19.4 million tonnes in 1995 to 39.2 million tonnes in 2010. A large part of the additional soybean oil consumption occurred in Asia, in particular China (+7.7 million tonnes) and India (+2.2 million tonnes). Brazil (+2.3 million tonnes) and Argentina (+1.6 million tonnes) also showed an impressive growth after 2005, mainly driven by an increasing demand of the domestic biodiesel industry (paragraph 3.2.4).

Figure 3.2 Global consumption of soybean oil itemized by country/region, 1995-2010



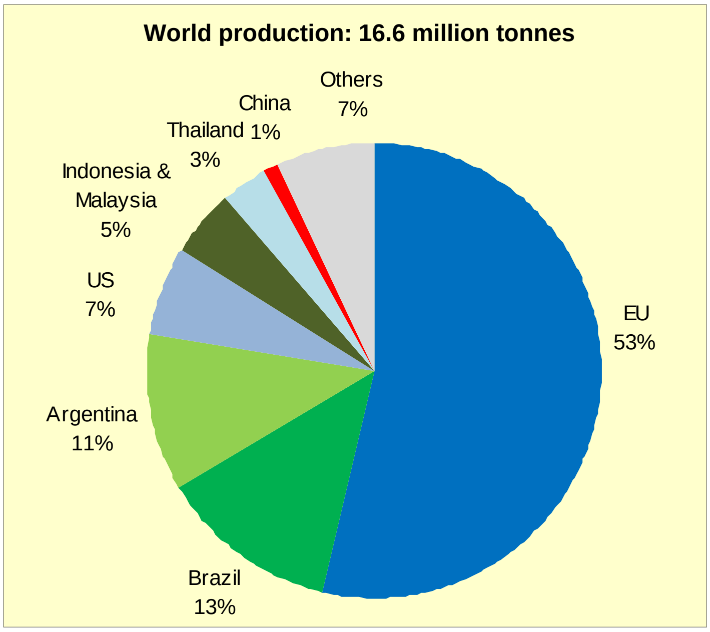
Source: ISTA Mielke, June 2011

Argentina is the dominant player for covering the international demand for soybean oil in China, the EU and India (table 3.1 and figure 2.6 on page 16). However, in April 2010 China's Ministry of Commerce banned imports of soybean oil from Argentina as a part of a wider trade dispute. The dispute initially stemmed from Argentina's move to place a trade barrier on imports from China, which then spiraled into China taking retaliatory measures, including the boycott of Argentinean soybean oil. Therefore, in 2010 China's soybean oil imports originating from Argentina plummeted to nearly 0.16 million tonnes, compared to 1.84 million tonnes in 2009. With a volume of 0.9 million tonnes Brazil became the leading supplier of soybean oil to China while in 2009 this country had "only" a share of 21% (0.5 million tonnes) compared to 77% for Argentina. North Africa[1] was with 1.2 million tonnes also an important global importer of soybean oil in 2010. This volume was mainly supplied by Argentina (44%), the US (36%), the EU and Brazil (both 9%).

3.2.4 Biodiesel

In the last decade the governments of a growing number of countries have promoted large-scale production and use of biodiesel and backed that commitment with financial support. The result was a booming biodiesel industry of which production increased from 0.7 million tonnes in 2000 to 16.6 million tonnes in 2010. The most important producing countries are presented in figure 3.3.

Figure 3.3 Global production of biodiesel in 2010, itemized by origins



Sources: Agra Informa, ISTA Mielke, FAPRI, June 2011

1) Algeria, Egypt, Libya, Morocco and Tunisia.

Biodiesel is commonly produced by the transesterification of vegetable oils, recycled frying fats or animal fats. In the category of vegetable oils rapeseed, soybean and palm oil are most commonly used. Large-scale production of soy-based biodiesel occurred largely in the main producing countries of soybeans: the US, Brazil and Argentina.

In the period 2008-2010 the production of soy-based biodiesel in Brazil more than doubled to 1.73 million tonnes. Argentina also showed an impressive volume growth (+1.1 million tonnes) in this period to 1.81 million tonnes while US' production declined sharply (-60%) to about 0.54 million tonnes. The developments in the US and Argentina can partially be explained by a shift in the EU's biodiesel imports. In 2010 the EU demand for US biodiesel collapsed almost completely (-0.38 million tonnes) while imports of Argentinean biodiesel increased sharply (+38% to 1.2 million tonnes). In March 2009 EU trade authorities imposed extensive anti-dumping and countervailing duties on imports of heavily subsidized and dumped biodiesel from the US (known as "B99"). These duties were circumvented, either via triangular trade through various countries (e.g. Canada) or via blends such as B19 or lower biodiesel blends. In May 2011 anti-dumping and countervailing duties were extended to imports of biodiesel in a blend containing by weight 20% or less and biodiesel consigned from Canada.

Brazil

Rising domestic requirements of the biodiesel industry have resulted in a massive decline of Brazilian soybean oil exports in 2008-2010: -33% to 1.56 million tonnes. The current 5% biodiesel admixture mandate in Brazil will probably be raised to 7% (B7) in the second half of 2011. Under former President Lula ambitious targets were announced with an increase of the admixture mandate to 10% in 2014 (B10) and 20% in 2020 (B20). These targets would imply a boost in biodiesel consumption from 2.1 million tonnes in 2010 to 4.9 million tonnes in 2014 and as much as 12.6 million tonnes in 2020. This would curb Brazilian exports of soybean oil further because domestic crushing capacity is unlikely to grow sufficiently (table 2.2 on page 18).

Argentina

It is generally expected that the Argentinean government will raise the admixture mandate to 10% in the course of 2011 (B10), from 7% (B7) since October 2010. This would result in a further sharp increase of domestic soy-based biodiesel production in 2011 and Argentina's export supplies of soybean oil will be curbed accordingly. Argentina provides a strong production incentive for biodiesel, as the export tax levied on soybean oil is 32 percent but only 17.5 percent for biodiesel. FAPRI expects an increase of 24% in Argentina's soy-based biodiesel production to just over 2.3 million tonnes in 2018 (table 3.2) but a decline thereafter.

The increasing production of soybean oil for a growing biodiesel industry, is creating a larger exportable surplus of meal. Argentina and Brazil are the main suppliers of soybean meal to the EU (figure 3.7B) and this community may benefit of such a development due to its price-lowering effect.

US

The re-introduction of the tax-credit in 2010 will give a new boost to biodiesel production in the US. FAPRI expects a large increase in US biodiesel production in the next 15 years (table 3.2) but the relative importance of soybean oil as a feedstock will decline in favor of other vegetable oils (e.g. corn oil, canola oil), tallow and greases.

EU

In the EU biodiesel is largely produced from rapeseed oil. The share of soybean oil in the feedstock used for this production in 2010 was only 7% but will slightly increase in the next 15 years (table 3.2).

Table 3.2 The (projected) biodiesel output (x 1 million tonnes) in the most important producing countries and the share of soybean oil in the feedstock, 2010-2025

US	**2010**	**2018**	**2025**
Production	1.08	3.21	3.81
Share soybean oil	*49.6%*	*34.6%*	*29.7%*

Argentina	**2010**	**2018**	**2025**
Production	1.81	2.32	2.27
Share soybean oil	*100%*	*100%*	*100%*

Brazil	**2010**	**2018**	**2025**
Production	2.11	2.60	2.63
Share soybean oil	*82%*	*80%*	*77%*

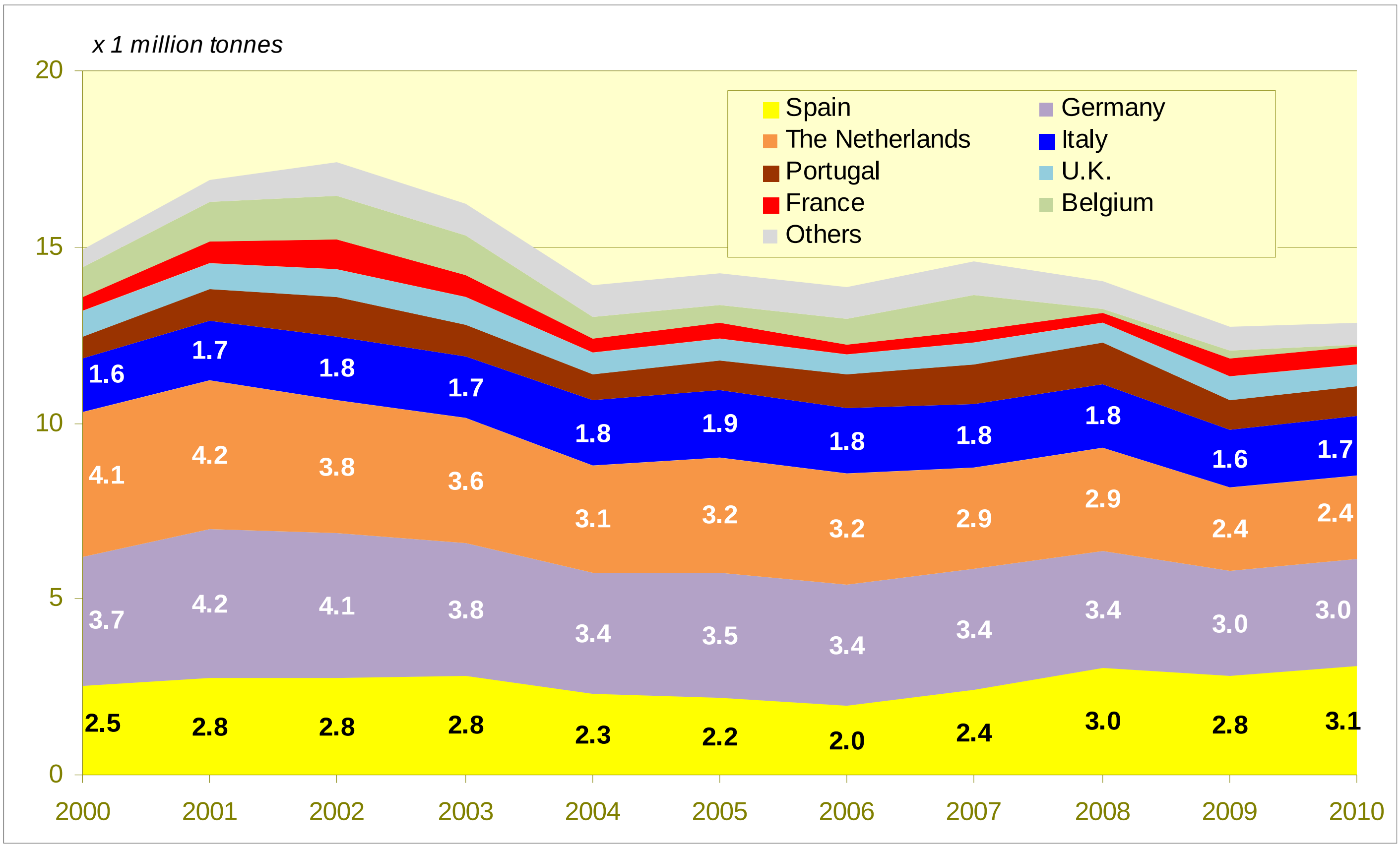
EU	**2010**	**2018**	**2025**
Production	8.9	9.9	11.6
Share soybean oil	*7.2%*	*8.7%*	*8.7%*

Sources: FAPRI, ISTA Mielke, Agra Informa, May 2011

3.3.1 Crush

The EU crushing of soybeans moved into a downward trend after 2002: -26% to just over 12.8 million tonnes in 2010 (figure 3.4) due to a strong shift to rapeseed. In particular The Netherlands (-1.4 million tonnes), Belgium (-1.2 million tonnes to only 77,000 tonnes) and Germany (-1 million tonnes) crushed much lower volumes of soybeans in this period. In 2000 The Netherlands was the biggest EU crusher of soybeans but Germany and Spain surpassed our country in 2002 and 2008 respectively. With a share of 24.2% Spain became even the leading EU crusher of soybeans in 2010 (figure 3.4), followed by Germany (23.7%), The Netherlands (18.5%) and Italy (13.3%). The EU (6%) has played only a modest role in the global processing of soybeans.

Figure 3.4 EU crushing of soybeans itemized by member states, 2000-2010



Sources: ISTA Mielke, Product Board MVO, June 2011

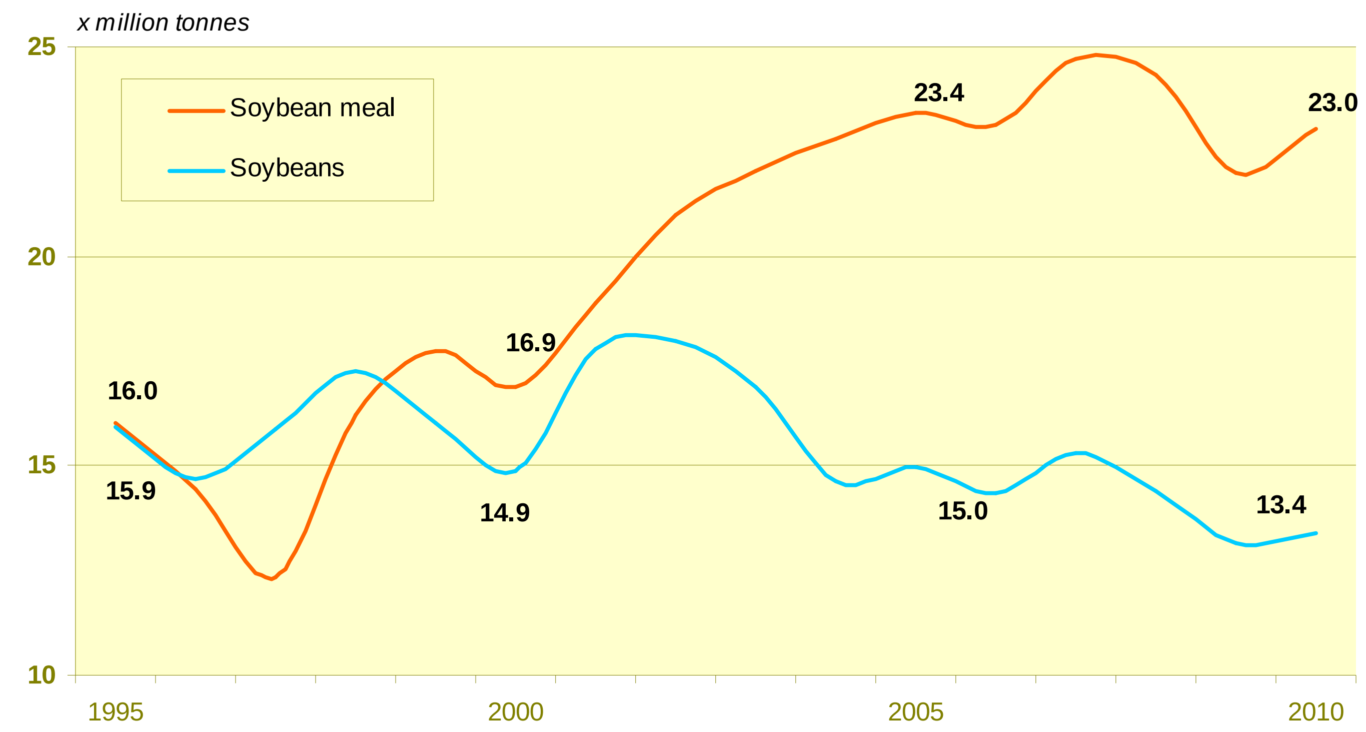
3.3.2 Imports

The downward trend in the EU crushing of soybeans is also reflected in declining import volumes of soybeans and more direct imports of soybean meal (figure 3.5).

Soybeans

The EU imports of soybeans from third countries increased sharply from 14.9 million tonnes in 2000 to 18.1 million tonnes in 2002 but showed a downward pattern thereafter (figure 3.5). In particular the import volumes of The Netherlands (-1.7 million tonnes), Belgium (-1.2 million tonnes) and Germany (-1.0 million tonnes) were much lower in 2010 compared to 2002 while Spain showed an increase of 0.3 million tonnes. In figure 3.6A the current import volumes of these countries are represented. The declining EU demand for soybeans went mainly at the expense of the US (-4.1 million tonnes), Brazil (-3.2 million tonnes) and Argentina (-1.0 million tonnes). As of July 2009, several soybean shipments from the US were not allowed due to the presence of traces from GM maize varieties which have not been authorized by the EU. With 6 million tonnes Brazil remained the major supplier to the EU in 2010 (figure 3.6B), followed at a large distance by the US (2.8 million tonnes). Paraguay has strongly emerged as a supplier of soybeans to the EU: 2.3 million tonnes in 2010 compared to 0.37 million tonnes in 2002.

Figure 3.5 The EU imports[1] of soybeans and soybean meal, 1995-2010



1) Excluding intra-EU trade

Source: ISTA Mielke, June 2011

Soybean meal

The EU's demand for soybean meal from third countries showed an opposite development compared to that of soybeans with a steady growth in the period 2000-2007: plus 46% to 24.7 million tonnes. In 2008-2009 the import volume of soybean meal dropped by 11% but showed a modest recovery in 2010 (figure 3.5). The additional sales to the EU (+6.2 million tonnes) in the period 2000-2010 were mainly sold to The Netherlands (+3.7 million tonnes), Germany (+1.3 million tonnes), Poland (+1.1 million tonnes) and the United Kingdom (+1.0 million tonnes). The import volumes of France (-0.5 million tonnes) and Italy (-0.3 million tonnes) were lower in 2010 compared to 2000. Figure 3.7A gives a specification of the import volumes by EU country in 2010.

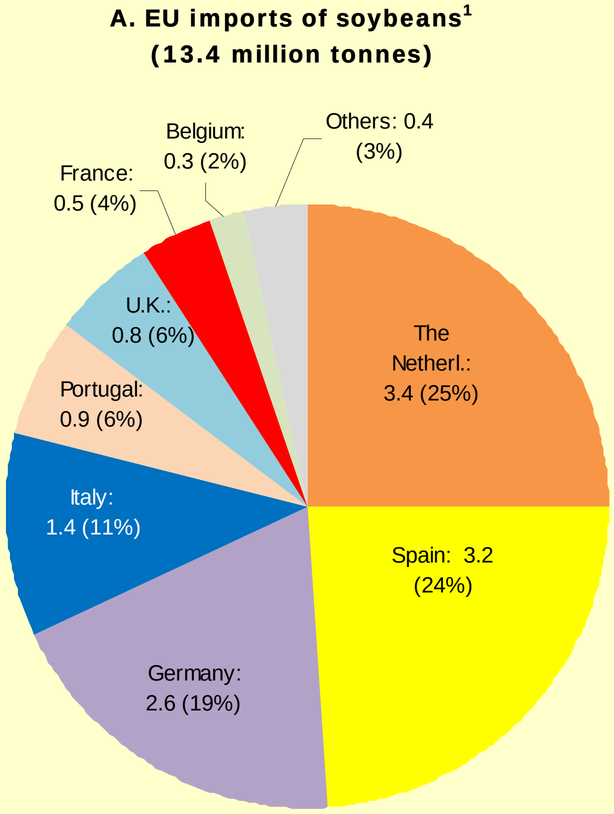
Argentina (+4.1 million tonnes) took most advantage of the increasing EU demand for soybean meal. Brazil (+1.7 million tonnes) and the US (+0.8 million tonnes) also benefited but to a much lesser extent. In figure 3.7B the major suppliers of soybean meal to the EU in 2010 are represented.

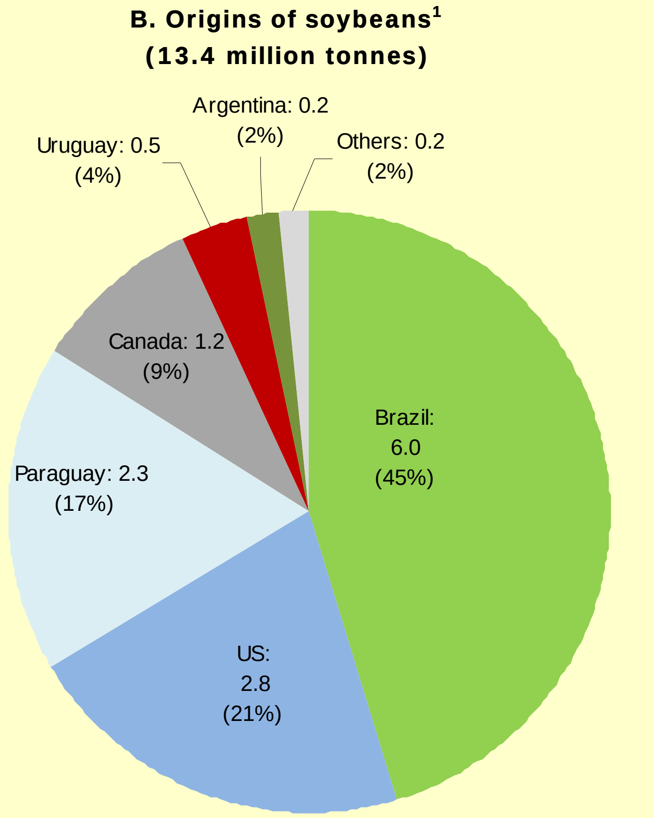
Soybean oil

The EU's import volumes of this product were relatively modest in the period 2000-2004 fluctuating between 50,000 and 110,000 tonnes but increased sharply thereafter to 1.1 million tonnes in 2008. Last mentioned development was due to increasing demand of EU's biodiesel industry. In 2009 the EU's international demand for soybean oil more than halved but recovered vigorously in 2010 (+28% to 695,500 tonnes). In figure 3.8A an overview is given of the major EU importers of soybean oil in 2010 and in figure 3.8B of their supplying countries.

The same patterns of sharp declines in the EU imports of soy products in 2009 and subsequent growth in 2010 can be mainly explained by the economic recovery of the EU in 2010 after the recession which started in the second half of 2008. The lower import volumes of soybean oil in 2009-2010 compared to 2008 were also the result of more direct imports of biodiesel.

Figure 3.6 Major gateways for soybeans entering the EU and the most important suppliers of these products in 2010

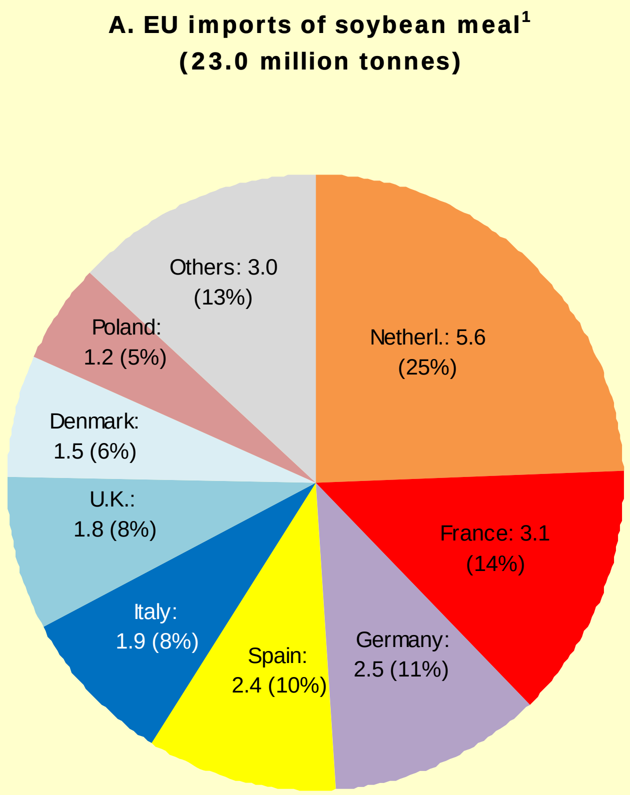


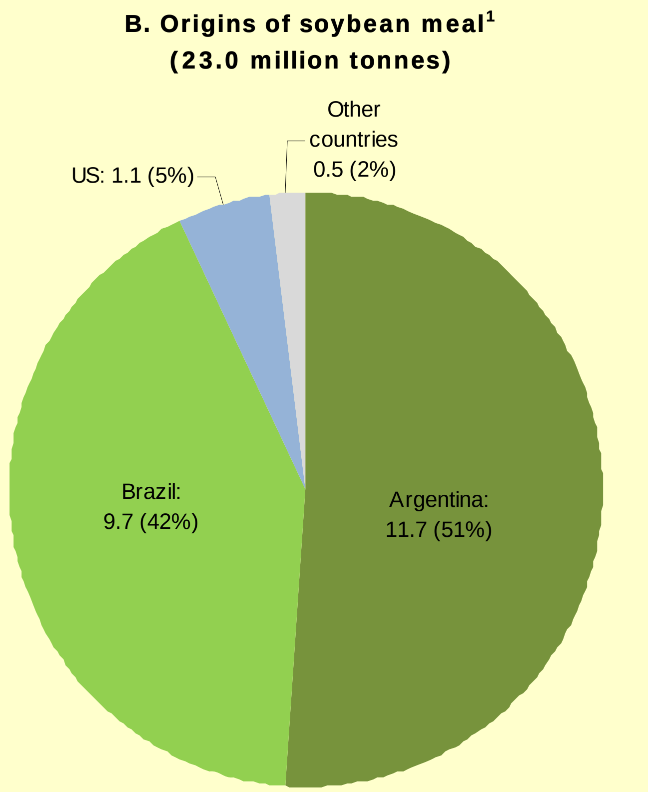


1) Excluding intra-EU trade

Sources: Product Board MVO, ISTA Mielke, June 2011

Figure 3.7 Major gateways for soybean meal entering the EU and the most important suppliers of this product in 2010

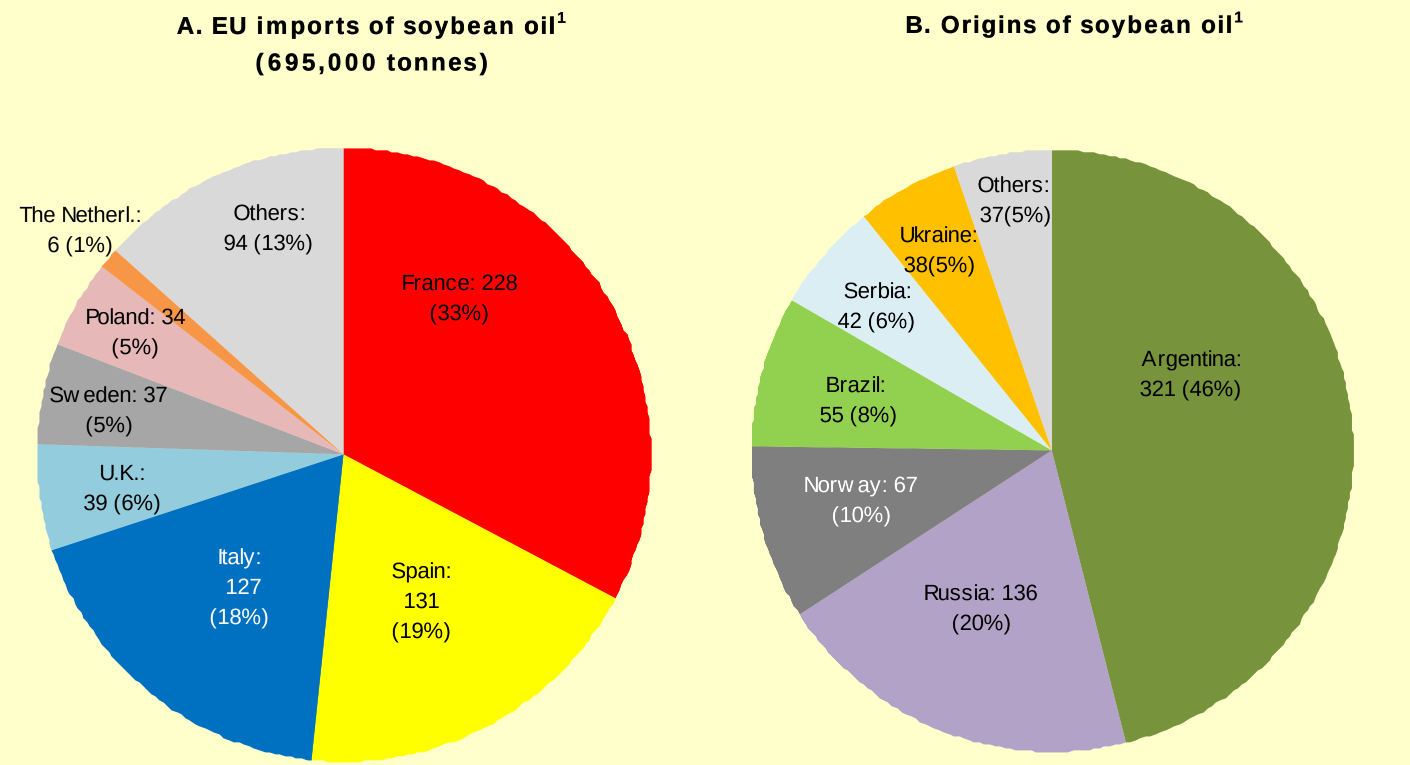




1) Excluding intra-EU trade

Sources: Product Board MVO, ISTA Mielke, June 2011

Figure 3.8 Major gateways for soybean oil entering the EU and the most important suppliers of this product in 2010



1) Excluding intra-EU trade. Volume x 1,000 tonnes.

Sources: Product Board MVO, ISTA Mielke, June 2011

3.3.3 EU import duties

Based on the EU's present Generalized System of Preferences (GSP), that has been recently extended to the end of 2013, imports of soybean oil and soy based biodiesel originating in countries such as Argentina, Brazil, Paraguay, Ukraine and Russia are eligible for preferential duties or even duty free access (see table 3.3). However, on 10 May 2011 the European Commission proposed that more advanced developing countries – including Argentina and Brazil - should no longer benefit from the trade preferences of the revised GSP that is expected to be introduced on 1 January 2014.

In May 2010 the EU and Mercosur countries (Brazil, Argentina, Paraguay and Uruguay) re-launched negotiations on a Free Trade Agreement (FTA). So, if Brazil and Argentina loose their GSP based tariff preferences they might gain even better EU market access for their soybean oil (and other oils, such as sunflower oil and groundnut oil) under the future FTA provisions. However, it is not expected that this envisaged FTA will be effective before 2013. The FTA negotiations between the EU and Mercosur will not only cover the mutual tariff dismantling of import duties but also the abolition of Argentina's differential export taxes on the soybean complex (beans, oil and meal) and soy based biodiesel. If the EU-Mercosur negotiations do not result in an FTA and Brazil and Argentina also loose their GSP status, the EU import duties on soybean oil originating in these South American countries might rise to the same (MFN) duty levels as the ones the EU applies to imports of soybean oil of US and Canadian origin.

Furthermore, the EU has signed Free Trade Agreements with a wide range of third countries, such as Serbia and Norway. Soybean oil originating in Serbia is already eligible for duty free access to the EU market while the EU is expected to introduce such a zero tariff regime for soybean oil of Norwegian origin late 2011 or early 2012.

Finally, in the WTO Doha Round more than 150 countries seek further global trade liberalisation. Based on the present draft texts the EU would have to abolish its customs duty on crude soybean oil for non-food applications (CN heading 1507.1010) while it would have to lower its customs duties (MFN) on the other three soybean tariff lines with 57%.

The EU imports of soybeans and soybean meal are exempt from duties.

Table 3.3 EU import duties on soybean oil

CN heading	Description	MFN (e.g. originating in the US or Canada)	GSP 2011-2013 (e.g. originating in Argentina, Brazil or Paraguay, Ukraine and Russia)	FTA (e.g. originating in Serbia and Norway)
1507.1010	Crude, non-food	3.2%	0.0%	0%
1507.1090	Crude, food	6.4%	2.9%	0%
1507.9010	Refined, non-food	5.1%	1.6%	0%
1507.9090	Refined, food	9.6%	6.1%	0%
3824.9091	Soy based biodiesel	6.5% [1]	0%	0%

1) plus anti-dumping duties and countervailing duties

Source: Product Board MVO, 2011

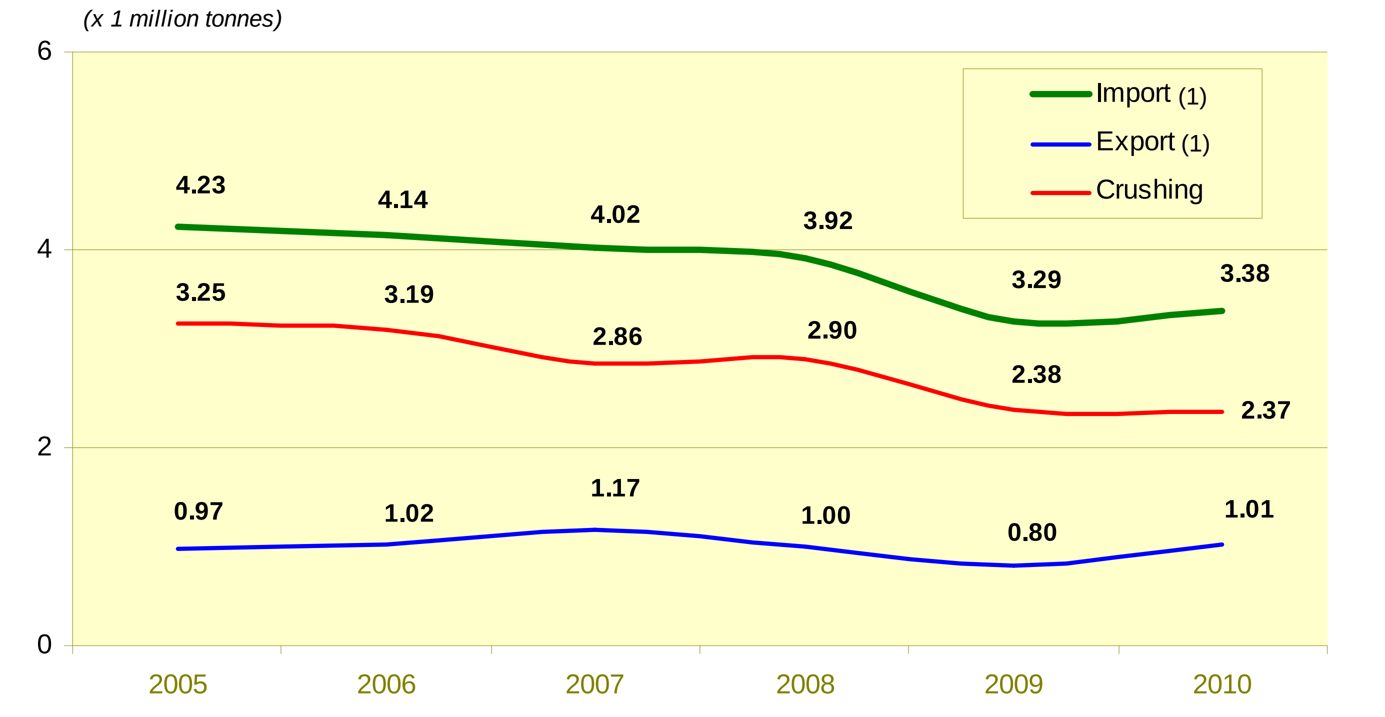
3.4 The Netherlands

3.4.1 Soybeans

In the period 2005-2010 the Dutch processing of soybeans declined steadily by 27% to just over 2.37 million tonnes (figure 3.9). In 2010 The Netherlands accounted for just over 18% of the total EU crushing of soybeans.

Cargill and ADM are the major processors of soybeans in The Netherlands. Due to the lower crush the Dutch imports of soybeans declined from 4.2 million tonnes in 2005 to 3.3 million tonnes in 2009. Brazil (61%), the US (25%) and Paraguay (7%) were the main suppliers in this five-year period. In 2010 the Dutch import showed a modest recovery to 3.38 million tonnes (+2.9%). As of July 2009, several soybean shipments from the US were not allowed due to the presence of traces from GM maize varieties which had not been authorized by the EU. However, in 2010 the Dutch imports of US soybeans recovered strongly (+57% to 1 million tonnes) at the expense of Brazil (-40% to 1.25 million tonnes). Paraguay (0.55 million tonnes), Uruguay (0.25 million tonnes) and Canada (0.23 million tonnes) were also significant suppliers in 2010 and showed a sharp increase in their sales of 125%, 40% and 261% respectively. In the period 2005-2010 a significant part of the soybeans that arrived in the Port of Rotterdam were re-exported to other EU countries and Germany (89%) in particular.

Figure 3.9 Dutch trade and consumption of soybeans, 2005-2010



1) Including intra-EU trade

Source: Product Board MVO, June 2011

3.4.2 Soybean meal

In the period 2005-2010 the Dutch production of soybean meal decreased by 27% to 1.85 million tonnes. The Netherlands accounted for about 18% of the total EU soybean meal production in 2010.

Domestic consumption

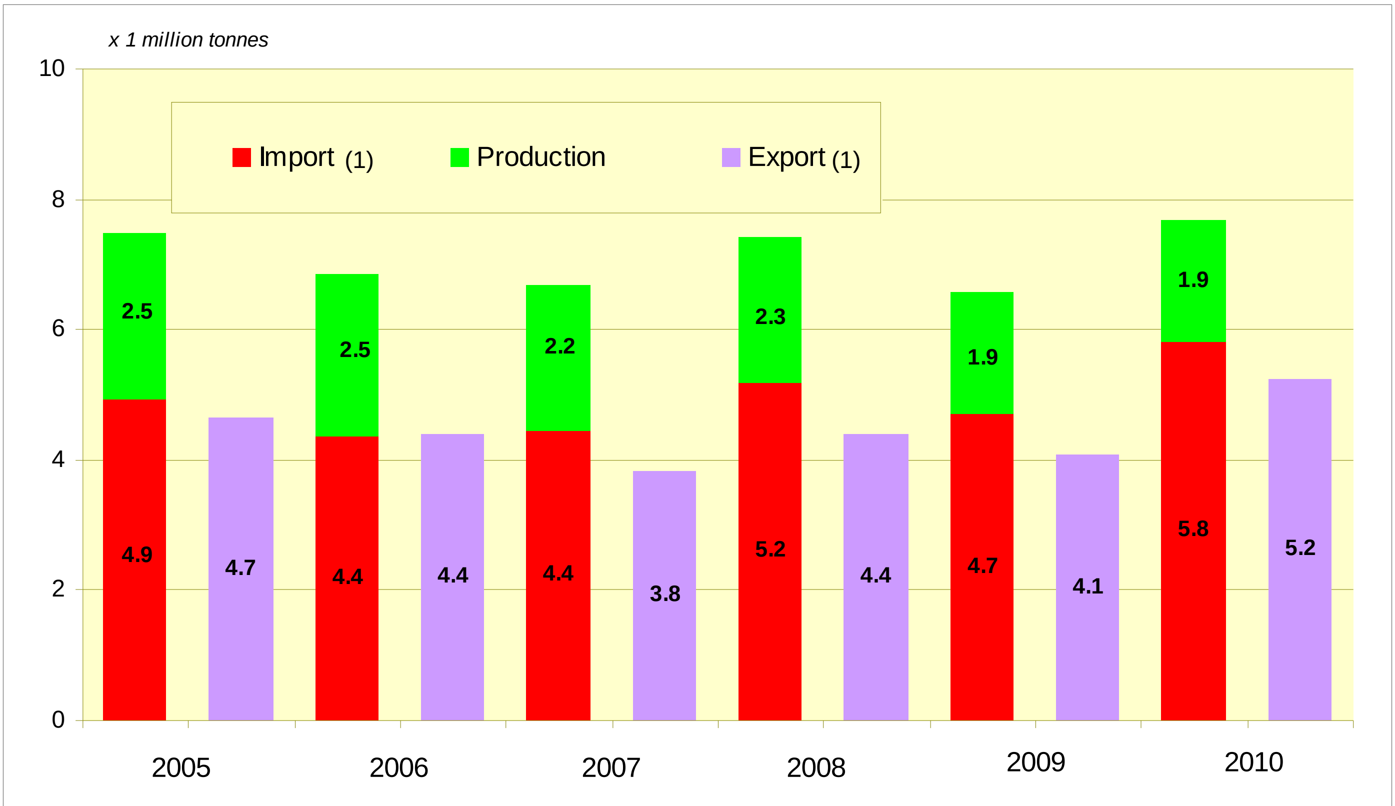
At the request of the Task Force Sustainable Soy, LEI has carried out research on the total use of soybeans, soybean meal, soybean oil and soybean hulls in the Dutch livestock feed production. LEI concluded in its report “Soy use in The Netherlands” that in the period 2008 - April 2010 an annual average volume of 1.8 million tonnes of soy products was used in the Dutch livestock industry. The composition of this volume was as follows: 76% soybean meal, 19% soybean hulls, 3% toasted soybeans and 1% soybean oil.

Based on this consumption figure a specific calculation was made about the arable footprint of The Netherlands. Assuming an average yield of 2.8 tonnes per hectare LEI calculated that an area of 0.7 million hectares is needed to harvest a volume of 2 million tonnes of soybeans to produce the earlier mentioned volume of soy products.

International trade

In the period 2005-2010 The Netherlands was a net-importer of soybean meal although an increasing share of domestic supply (production + import) was re-exported (figure 3.10). This share was 68% in 2010 compared to 57% in 2007.

Figure 3.10 Dutch re-exports of soybean meal versus domestic supply, 2005-2010



Sources: Product Board MVO, ISTA Mielke, June 2011

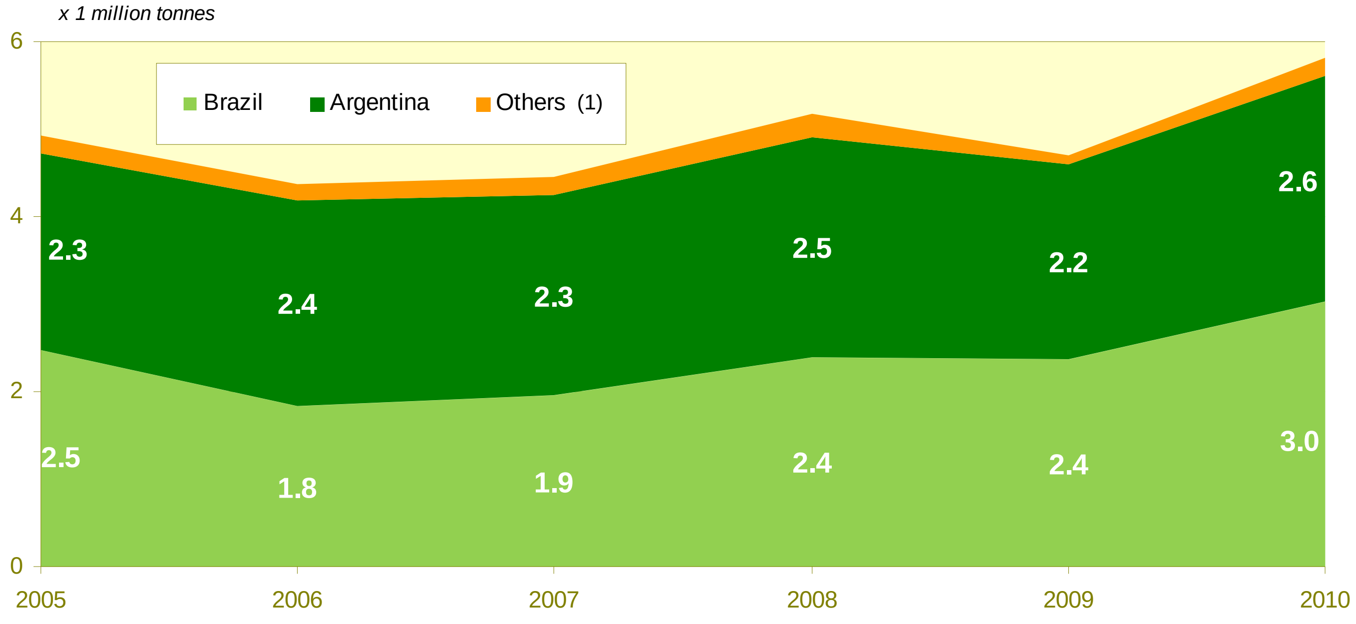
Re-exports

In the period 2005-2010 about 96% of the Dutch re-exports of soybean meal went to other EU members, in particular Germany with an annual volume fluctuating around 2 million tonnes. After 2007 the Dutch export of soybean meal to Belgium increased by 129% to nearly 1.1 million tonnes in 2010. Mainly due the additional sales to this country and Poland (+210% to 0.45 million tonnes) the Dutch export volume of this product increased by 28% to 5.2 million tonnes in 2010 (figure 3.10). Switzerland (38%), Russia (31%) and Ukraine (15%) were the main non-EU destinations in the period 2005-2010.

Imports

In the period 2005-2010 the Dutch imports of soybean meal (figure 3.11) largely originated in Argentina and Brazil (both 48%). Brazil succeeded in increasing its share in these imports from 42% in 2006 to 52% in 2010 at the cost of Argentina (-9.7% percent points to 44.1%). Germany (65,400 tonnes) and the United Kingdom (60,400 tonnes) were the most important EU suppliers in 2010 but their shares (about 1%) in the total import were very modest.

Figure 3.11 Dutch import of soybean meal by country of origin, 2005-2010



1) *Mainly the EU*

Source: ISTA Mielke, June 2011

3.4.3 Soybean oil[1]

In the period 2005-2010 the Dutch production of soybean oil declined by 28% to 461,000 tonnes (figure 3.12). The Netherlands accounted for about 18% of the total EU soybean oil production in 2010.

Domestic consumption

The Dutch consumption of soybean oil fluctuated around 160,000 tonnes in the period 2005-2007 but was in a clearly downward trend thereafter to 119,000 tonnes in 2010. This volume was mainly used in food (65%), followed by feed (25%) and technical applications (10%).

International trade

The Netherlands is a net-exporter of soybean oil. In the period 2005-2010 about 67% of the domestic supply (production + import) was re-exported (figure 3.12).

Re-exports

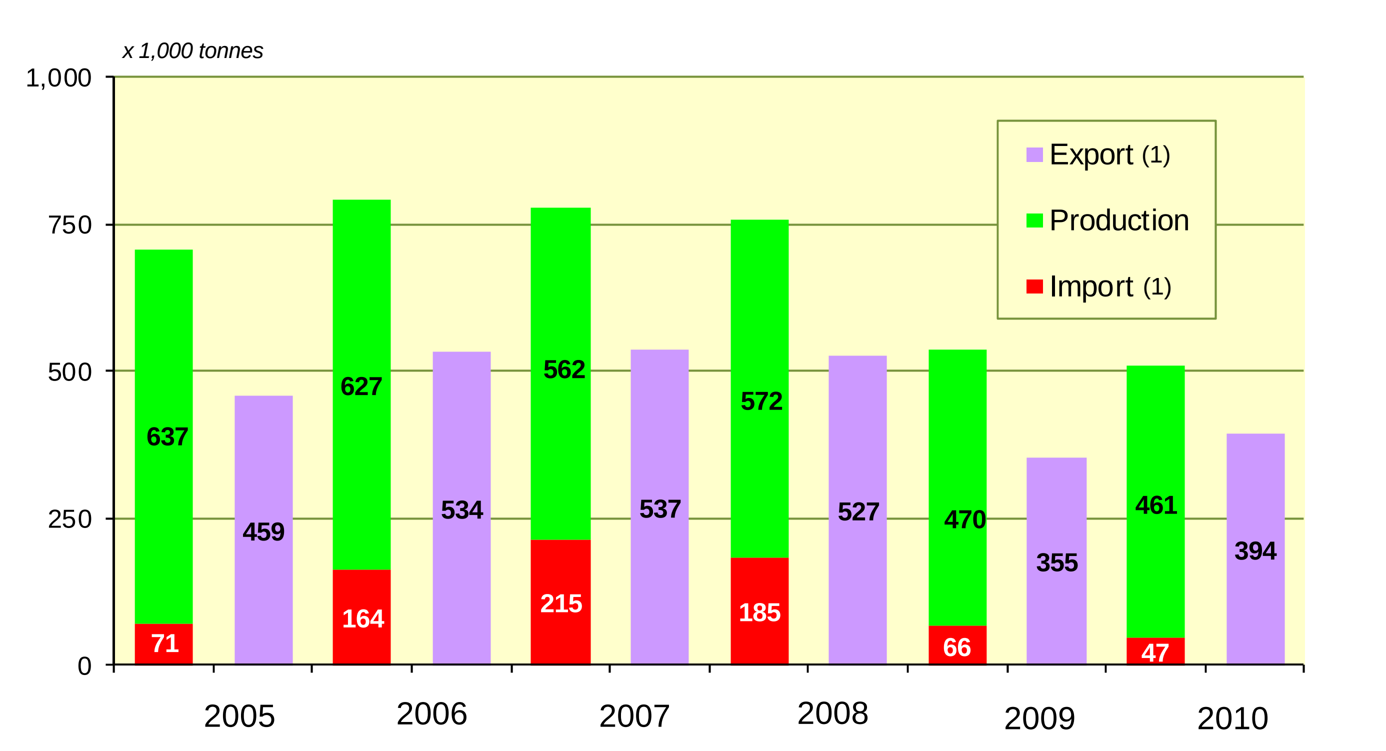
Due to the economic recession in 2009 the Dutch re-export of soybean oil dropped by 33% to 355,000 tonnes but showed a significant recovery (+11%) in 2010 (figure 3.12). This recovery was almost entirely due to much more Dutch exports of soybean oil to third countries, in particular South Africa (+57,630 tonnes), Iceland (+17,300 tonnes) and Russia (+10,161 tonnes after the 70% drop in 2009 to 4,061 tonnes). South Africa (70,630 tonnes) has entered the Top 3 of buyers in 2010. On the other hand, the Dutch intra-community deliveries of soybean oil declined sharply in the period 2008-2010: -45% to 274,409 tonnes. In particular the sales to Belgium (-53% to 90,729 tonnes), the United Kingdom (-36% to 78,817 tonnes), Germany (-59% to 40,733 tonnes), and Ireland (-42% to 13,184 tonnes) collapsed. The sales to France increased by 39% to 38,212 tonnes in 2010 after the drop in 2009 (-5,043 tonnes).

Imports

The Dutch imports of soybean oil declined sharply from 215,000 tonnes in 2007 to only 47,000 tonnes in 2010 (figure 3.12). This development went mainly at the cost of Brazil (-111,455 tonnes) and Belgium (-47,696 tonnes). In 2008 the Dutch purchases of German and Argentinean soybean oil increased sharply to 76,568 tonnes and 22,963 tonnes respectively but declined sharply thereafter. On the other hand, the United Kingdom succeeded to ship much more soybean oil (+11,642 tonnes) to The Netherlands after 2008. This country (13,245 tonnes) became the biggest supplier of soybean oil to The Netherlands in 2010, followed by Belgium (11,867 tonnes) and Germany (11,268 tonnes). Brazil (237 tonnes) and Argentina (216 tonnes) almost disappeared as countries of origin.

1) *Including hydrogenated or inter-esterified soybean oil. This product is classified under customs heading 151620.98 but includes also other hydrogenated or inter-esterified vegetable oils. Because the Product Board collects import and export data from Dutch companies by itself it has the possibility to follow the Dutch consumption and trade flows of this product.*

Figure 3.12 Dutch re-exports of soybean oil versus domestic supply, 2005-2010



1) Including intra-EU trade

Source: Product Board MVO, June 2011

4. Sustainability

4.1 Sustainability of soy production

Soy is a highly efficient crop. The plant has a very high protein yield per hectare, while the production costs are relatively low. Because of its efficiency and its good amino acid composition it is an attractive source of protein for the feed industry.

However, soy production is also associated with negative impacts. As illustrated in paragraph 2.1 the acreage of soy production in Brazil and Argentine has expanded with 126% and 209% respectively in the last 15 years. There are concerns that in some cases this expansion has taken place at the expense of natural vegetation and thus results in biodiversity loss. Another concern is that during expansion the land rights of indigenous people are not always respected. On existing soy plantations areas of attention are the respect of labour rights on the farms, the use of pesticides and erosion.

The introduction of GM events in soy has raised discussions about the sustainability effects. Several reports[1,2] show that current GM events can contribute positively to a number of sustainability aspects related to People, Planet and Profit. The contribution of the GM event on sustainability aspects depends largely on the Good Agricultural Practices that are used. GM is seen as one of the technologies that play an important role in increasing food production and sustainable development.

A major challenge for the near future is to ensure that the increasing demand for soy is met in the most sustainable way. This is one of the reasons why the international multi-stakeholder platform called the ‘Round Table on Responsible Soy Association’ was established (RTRS). Apart from the RTRS also other initiatives have been launched to promote more responsible soy production. The subsequent paragraphs provide an overview.

4.2 The Round Table on Responsible Soy (RTRS)

The RTRS was set up in 2005 to promote the production and use of responsible soy. The initiative was taken by WWF, Unilever and a number of soy growers. The RTRS was officially established in 2006 in Switzerland as a multi-stakeholder initiative which aims to facilitate a global dialogue on soy production that is economically viable, socially equitable and environmentally sound. The RTRS’ more than 150 members include soybean growers, crushers, traders, food and feed manufacturers and civil society organizations. They work together to put on the market certified soybeans that are produced in a responsible way and to maximize the amount of soybeans that can be RTRS certified.
The RTRS has an executive secretariat in Buenos Aires in Argentina.

RTRS
Round Table on Responsible Soy Association

RTRS Principles and Criteria for Responsible Soy
In 2009 the RTRS presented its first global standard for responsible production. After a year of field testing the final version of the standard was approved in 2010. The RTRS Principles and Criteria for Responsible Soy Production were formulated after a process of intensive collaboration between civil society organizations, primary producers and industry. The final standard, as presented in 2010, consists of 5 Principles and 39 Criteria.

RTRS Certified Soy | RTRS Certified Soy | RTRS Certified Soy

The criteria require for example that a safe and healthy workplace is provided for all farmworkers, the maintenance or improvement of soil quality and the application of Integrated Crop Management techniques when pesticides are used. The criteria also specify that after May 2009 expansion of soy may not have taken place on native forest unless it is in line with official maps or when it is guaranteed that no valuable biodiverse land is converted.

1) http://library.wur.nl/WebQuery/wurpubs/405896
2) http://gmsoydebate.global-connections.nl/content/gm-related-sustainability-agro-ecological-impacts-risks-and-opportunities-soy-production-arg

The RTRS has made available three supply chain models to ensure the RTRS certified soy can be traded: Segregation, Mass Balance and Certificate Trading. As of mid 2011 all models can be used. More information can be found on the website: www.responsiblesoy.org.

RTRS and GMO's
The RTRS aims to promote responsibility both in GM and in non-GM production. As such RTRS is technologically neutral. The main sustainability problems occur both in GM soy production and in non-GM soy production. By ignoring the majority of soy production, crucial sustainability issues common in both GM and non-GM production would remain unaddressed. Consequently, the RTRS Standards allows for certification of GM and non-GM soy production. For the non-GM soy a special annex to the Standard has been formulated.

RTRS and biofuels
The RTRS developed a special biofuels annex, so producers can choose to certify the RTRS Production Standard plus biofuels annex. In July 2011 The European Commission decided to recognize the RTRS RED scheme as voluntary scheme with which compliance with the EU Renewable Energy Directive can be demonstrated.

RTRS market developments
In May 2011 the first soy farms were certified against the RTRS Standard. By the end of 2011, annual production capacity will probable reach close to 500,000 tonnes. The Dutch food and feed industry has bought in June 2011 the first batches of RTRS certified soy. 85,000 tonnes were purchased by the Initiative for Sustainable Soy (IDS) and Unilever bought 5,000 certificates covering a part of their use of soy oil in Brazil.

4.3 Other International Soy Sustainability Initiatives

Besides the RTRS a number of other soy sustainability initiatives has been introduced.

The Amazon Moratorium
In July 2006, ABIOVE (Brazilian Vegetable Oil Industry Association), ANEC (Brazilian Grain Exporters Association) and their respective member companies pledged not to trade soy originated after that date in deforested areas within the Amazon Biome. This initiative became known as the Soy Moratorium or the Amazon Moratorium.

Since its creation in 2006 the Moratorium has been yearly prolonged and carried forward by ABIOVE. Every year around June/July progress has been reported. Since 2009 the initiative is also supported by the Brazilian government. Over the years the monitoring of the Moratorium has intensified. In 2010 a tool was introduced that allows monitoring of polygons with a deforested area of 25 hectares, whereas previously this was 100 ha. The monitoring results show that in the third year roughly 300,000 hectares was monitored finding 6,300 hectares of soy plantings. This corresponded that year with 0.25 % of the deforestation that occurred in the Amazon Biome.

More information can be found on the website:
www.abiove.com.br/english/ss_moratoria_us.html

Soja Plus
Soja Plus is a Brazilian program that is in development organised by ANEC, ABIOVE, ARES, (the Brazil Responsible Agribusiness Institute) and APROSOJA, the association of soy producers in Mato Grosso, with the aim to create a process for continuous improvement in soybean production and to implement and monitor best agricultural practices at soybean farmers. The program is still under development. The Soja Plus program will not include certification.

More information and the latest developments can be found via: www.sojaplus.com.br/index_us.html

Basel criteria
The Basel Criteria for Responsible Soy Production were developed in 2004 by the Swiss retailer Coop together with WWF. The use of this standard is currently not widespread as it excludes the use of genetically modified crops.

More information can be found on the website:
http://wwf.panda.org/?16872/The-Basel-Criteria-for-Responsible-Soy-Production

International Sustainability and Carbon Certification - ISCC
The ISCC was developed in Germany as a system for the certification of biomass and bioenergy. ISCC is oriented towards reduction of Greenhouse Gas emissions, sustainable use of land, protection of natural biospheres and social sustainability. ISCC System has been approved by the German Authority BLE and the European Commission as a Certification System for sustainable Biomass and Biofuels.

More information can be found on the website:
www.iscc-system.org/

Roundtable on Sustainable Biofuels – RSB
The Roundtable on Sustainable Biofuels (RSB) is a multi-stakeholder organization hosted by the Swiss Federal Institute of Technology in Lausanne (EPFL). The RSB provides and promotes the global standard for socially, environmentally and economically sustainable production of biomass and biofuels. RSB is approved by the the European Commission as a Certification System for sustainable Biomass and Biofuels.

More information can be found on the website:
http://rsb.epfl.ch/

4.4 Dutch Initiatives

In The Netherlands soy sustainability frequently returns in political and societal debates. In The Netherlands a number of initiatives have been set up to support the RTRS in the Dutch context.

Dutch Task Force Sustainable Soy

The Task Force Sustainable Soy (TFSS) is a platform of Dutch companies active in the soy chain that wish to contribute to the ecologically and socially responsible cultivation of soy. It was set up in 2007 with the aim to support more responsible soy production. The Task Force participants see the Round Table on Responsible Soy as the most widely supported forum for this purpose and has decided to support this initiative. The secretariat is shared by Nevedi, the Dutch association of compound feed manufacturers and the Product Board MVO.

The Task Force supports the RTRS by co-financing RTRS outreach activities in Europe. This is done together with the Dutch Sustainable Trade Initiative (IDH-see below). In 2010 the Task Force members presented the ambition that as of 2015 all soy destined for use in the Dutch market should be produced according to the RTRS standard or covered by certificates supporting the production of responsible soy.

More information can be found on the website: www.taskforcesustainablesoy.org/

Dutch Initiative Sustainable Soy

The Dutch Initiative Sustainable Soy (IDS) is a Dutch platform led by Nevedi uniting a group of soy users in The Netherlands including Ahold, Storteboom, Vion, Gebr. Van Beek and FrieslandCampina. Together they have developed plans to take common responsibility to start sourcing RTRS Certified soy. The IDS activities closely link with the activities of the Dutch Task Force Sustainable Soy and are also supported by the Dutch Sustainable Trade Initiative.

More information can be found on the website: www.verantwoordesoja.nl/

The Dutch Initiative Sustainable Trade

The Dutch Sustainable Trade Initiative (IDH) is a government funded organization that sets up action oriented coalitions of governments, NGOs and companies to accelerate sustainable market transformation in different sectors such as tropical timber, cocoa, tea, aquaculture, natural stone, tourism, electronics, spices, cotton and soy. The soy program aims to contribute to transforming the worldwide production and trade of soy towards sustainability through resolving bottlenecks regarding up-scaling of RTRS production and trade. This can include the support of compliance of (large and small scale) soy farmers, creating awareness and support for the RTRS, the resolving of issues surrounding transport and trade and increasing demand for RTRS soy in western markets. The focus regions of the program are Europe, South America, India and China.

More information can be found on the website: www.duurzamehandel.com/en/home

4.5 Market Commitments

The participants of the Dutch Task Force Sustainable Soy have committed themselves to ensure that at the end of 2015 the amount of sustainable soy that is needed to satisfy Dutch market demand should be produced in accordance with the RTRS Principles and Criteria. The Dutch Feed Industry has committed themselves to ensure the volume they use in The Netherlands is sustainable in 2015. This amounts up to roughly 2 million tonnes and they will start sourcing in 2011.

On European level more market commitments regarding RTRS have been made: The Belgian Feed Association (BEMEFA) has made a commitment to ensure all their soy use, amounting to roughly 1 million tonnes, is RTRS certified as sustainable in 2015. Also the UK feed industry, by the voice of the UK Agricultural Industries Confederation (AIC), has indicated it supports the goals of the RTRS and is working with RTRS and supply chain partners to investigate how the current situation can best be adapted to accommodate RTRS requirements. The European Feed Federation is considering whether they can set a commitment as well.

4.6 Challenges ahead

A major challenge for the near future is to ensure that the increasing demand for soy products can be met in a responsible way. This is one of the main reasons why the RTRS was set up. However, the RTRS initiative is only successful if supply and demand reach a sufficient scale. For this it is important that the attention for sustainable practices grows in both the soy producing and consuming markets (Europe, Latin-America, China, India and the US).

Annex

GM soybean traits: market approval in the EU (import) and main cultivating countries (cultivation)

Unique identifier	Event/Species	Applicant	Traits	EU (import and processing) Approved	US (cultivation) Approved	Brazil (cultivation) Approved	Argentina (cultivation) Approved
MON-Ø4Ø32-6	MON 04032 (Roundup Ready)	Monsanto	HT (glyphosate)	√ 7)	√	√	√
MON-89788-1	MON 89788 (Roundup Ready 2 Yield)	Monsanto	HT (glyphosate)	√	√	√ 5)	
ACS-GMØØ5-3	A2704-12 (Liberty Link)	Bayer CropScience	HT (glufosinate-ammonium)	√	√	√	favourable opinion CONABIA
ACS-GMØØ6-4	A5547-127	Bayer BioScience	HT (glufosinate-ammonium)	Favourable opinion EFSA. SCoFCAH vote expected this summer/autumn 8)	√	√	favourable opinion CONABIA
DP-356Ø43-5	356043 (Optimum GAT)	Pioneer Hi-Bred	HT (glyphosate and acetolactate synthase-inhibiting herbicides)	Favourable opinion EFSA. SCoFCAH vote expected this autumn 8)	√		
MON-877Ø1-2	MON 87701 (Genuity)	Monsanto	IR (lepidopteran)	Favourable opinion EFSA. SCoFCAH vote expected this autumn 8)	Pending approval (Period for public comments expires on 29 Augus 2011)	√ 5)	
BPS-CV127-9	BPS-CV127-9	BASF Plant Science	HT (imidazolinone)	In EFSA pipeline 6)	Pending approval	√	
MON-Ø4Ø32-6 x DP-3Ø5423-1	305423 x (Plenish) MON 04032 (Roundup Ready)	Pioneer Hi-Bred	HT (glyphosate) FA (high-oleic)	In EFSA pipeline 3)	√ 1)		
DP-3Ø5423-1	305423 (Plenish)	Pioneer Hi-Bred	FA (high-oleic)	In EFSA pipeline 6)8)	√		
MON-87769-7	MON 87769	Monsanto	FA (sda / omega 3)	In EFSA pipeline 3)	Pending approval		
MON-877Ø5-6	MON 877Ø5 (Vistive gold)	Monsanto	FA (high-oleic) HT (glyphosate)	In EFSA pipeline 3)	Pending approval (Period for public comments expires on 29 Augus 2011)		
MON-877Ø1-2 x MON-89788-1	MON 87701 x (Genuity) MON 89788 (RR2Yield)	Monsanto	IR (lepidopteran) HT (glyphosate)	In EFSA pipeline 6)	Pending approval 2)	√	
MON-87769-7 x MON-89788-1	MON 87769 x MON 89788	Monsanto	FA (sda / omega 3) HT (glyphosate)	In EFSA pipeline 3)	Pending approval 2)		

Source: Product Board MVO, 1 August 2011

1/2

HT - Herbicide Tolerant
FA - Fatty Acid composition (change in)
IR - Insect and/or Virus Resistant
IY - Increased Yield

Unique identifier	Event/Species	Applicant	Traits	EU (import and processing) Approved	US (cultivation) Approved	Brazil (cultivation) Approved	Argentina (cultivation) Approved
DAS-68416-4	DAS-68416-4	Dow Agro Science	HT (2,4-D and glufosinate)	In EFSA pipeline [9)]	Pending approval		
MST-FGØ72-2	FG72	Bayer CropScience	HT (glyphosate and HPPD inhibitor herbicides)	In EFSA pipeline [4)]	Pending approval		
MON-877Ø8-9	MON 877Ø8	Monsanto	HT (dicamba)	In EFSA pipeline [6)]	Pending approval		
MON-87712-4	MON 87712	Monsanto	IY		Pending approval		
		Embrapa	IR (golden mosaic virus)			pending approval	

HT - Herbicide Tolerant
FA - Fatty Acid composition (change in)
IR - Insect and/or Virus Resistant
IY - Increased Yield

1) In the US there is no (separate) approval required for "stacked events", at least when all the individual events that are part of such a stack have been approved. The US has approved both the DP-305423-1 and the MON-04032-6.
2) The US has not approved the MON-87701-2 and MON-87769-7 yet while it has approved the MON-89788-1 in August 2007. See also footnote 1.
3) EFSA status: additional data request
4) EFSA status: under consideration
5) On 19 August 2010 Brazil's CTNBio approved the stacked Bt Roundup Ready 2 Yield (MON 87701 x MON 89788) while it had not approved the separate GMOs previously.
Now the stack has been approved there seem to be no legal barriers for the separate GMOs anymore.
6) EFSA status: in progress
7) Renewed favourable EFSA opinion. Vote in SCoFCAH this summer / autumn.
8) De facto threshold for adventitious presence (max 0.1%) of minute traces of this GMO in feed (not food)
9) Waiting for full dossier

Sources:

EU: GM soybean traits (approved) http://ec.europa.eu/food/dyna/gm_register/index_en.cfm
EU: GM soybean traits (pending approval) http://registerofquestions.efsa.europa.eu/roqFrontend/questionsListLoader?panel=GMO
US: GM soybean traits (approved and pending approval) http://www.aphis.usda.gov/biotechnology/not_reg.html
Brazil: GM soybean traits (approved) www.ctnbio.gov.br/index.php/content/view/14782.html
Argentina: GM soybean traits (approved) www.minagri.gob.ar/SAGPyA/areas/biotecnologia/50-Evaluaciones/_archivo4/000200-Eventos%20con%20evaluación%20favorable%20de%20la%20CONABIA%20y%20permiso%20de%20comercialización.php

Source: Product Board MVO, 1 August 2011

Consulted literature

Aapresid (Argentina's No Till Farmers Association, 2011)
Survey about the cropped area under no till in 2010.

ABIOVE (Brazilian Association of Vegetable Oil Industries, 2011),
Argentina's production and exports of soy products: 1992-2011.

ADM
Manufacturing of soy protein concentrate for animal nutrition.

Agra Informa (2011),
a. *World biodiesel balance 2011;*
b. *Various articles about the global soy complex;*
c. *The China soybean industry policy.*

Agrarisch Dagblad (2011),
a. *Tot 500.000 ton duurzame soja in 2011;*
b. *Gewasfirma's aan de slag met EU-eiwitteelt.*

AIDEnvironment (2004),
Managing the soy boom: Two scenarios of soy production expansion in South America.

ASA-IM (American Soybean Association International Marketing),
Selecting soy protein for animal feed.

CE Delft (2010),
Zuid-Amerikaanse soja en Europese peulvruchten vergeleken.

Céleres (2011),
Biotechnology report.

European Biodiesel Board (2009-2011),
a. *EU biodiesel potential, defining the opportunities;*
b. *EU biodiesel production and capacity;*
c. *Estimated US biodiesel production.*

European Commission, Directorate-General for Agriculture and Rural Development (2007),
Economic impact of unapproved GMOs on EU feed imports and livestock production.

Eurostat (2011),
EU 27 import and export of products in the soybean complex, 2006-2010.

FAO (2011),
a. *Crop prospects and food situation;*
b. *Processing of soybeans in various soy products.*

FAPRI (Food and Agricultural Policy Research Agency, 2011),
Agricultural Outlook 2011 a) Oilseeds and products b) Biofuels c) Feed grains d) Meat.

FEBRAPDP (Federação Brasileira de Plantio Direto na Palha, 2010)
Evoluçao Área de Plantio Direto no Brasil.

FEDIOL (2011),
Flow chart of the production chain of soybean meal and oil products.

FEFAC (European Feed Manufacturers' Federation, 2011),
a. *Statistical Yearbook Feed - Food 2009;*
b. *Compound feed production 1989-2009.*

Food Holland (2011),
US market for soy products shrinks.

INSTA-PRO International,
Production of textured soy protein and soy protein isolates.

Iowa State University (2011),
Modification of soybean oil to improve its nutritional qualities.

ISAAA (International Service for the Acquisition of Agri -Biotech Applications, 2010),
Global Status of commercialized biotech/GM crops: 2010.

ISTA Mielke (2001-2011),
a. *Oil World Annuals 2001-2010;*
b. *Oil World weekly/monthly: No.1-52 (January-December 2010-2011);*
c. *The revised Oil World 2020: Soybean yields per hectare 1975-2000.*

Latin American and Caribbean Chief Economist Office (2009),
The soybean chain in Argentina.

LEI (Landbouw Economisch Instituut, 2008-2010),
a. *EU policy on GMO's. A quick scan of the economic consequences;*
b. *Soy use in the Netherlands;*
c. *Quick scan of the direct economic consequences for the Netherlands by an import stop on soy from the US from October 2009 until March 2010.*

LMC International (2010),
Impact of Argentina's system of Differential Export Tax Rates (DETs).

US National Biodiesel Board (NBB, 2011),
a. *Soybean oil and meal economics: How livestock producers benefit from biodiesel production;*
b. *Estimated US biodiesel production by fiscal year (October-September): 2009-2010.*
c. *Biodiesel: feedstock supply. Achieving 1 billion gallons of biodiesel while protecting valuable feedstocks.*

NASS (US National Agricultural Statistics Service (2011),
Soybeans and feed grains.

OECD-FAO (2010),
Agricultural Outlook 2011-2020.

Open Geography Journal, No. 4 (2011),
Argentine clustering of soy biodiesel production: The role of international networks and the global soy oil and meal markets.

Planbureau voor de Leefomgeving (PBL, 2011)
Environmental Balances 2005-2009.

Platform for Agriculture, Innovation and Society (2011),
The vulnerability of the European agriculture and food system for calamities and geopolitics. Report and advice to the State Secretary of Economic Affairs, Agriculture and Innovation.

Product Board MVO (2007-2011),
a. *Various Newsletters Trade policy and Biotechnology about GSP and GM soybeans;*
b. *Statistical yearbooks 2006-2010;*
c. *Factsheet: genetically modified soy in a sustainable agriculture;*
d. *Dutch Trade Review 2009 and 2010;*
e. *Databank Prices: soy products.*

Profundo (2009),
a. *Soja barometer 2009;*
b. *Soy consumption for feed and fuel in the European Union.*

Public Ledger (2010-2011),
Various articles about the production and consumption of soy products and biodiesel.

Rabobank International (2010-2011),
a. *Cultivating growth: Accessing the future of the global soybean complex;*
b. *Soft commodities monthly;*
c. *Various Agri Cmmodity Market Research reports: corn, soybeans, wheat and cotton;*
d. *Structural challenges in US soy crushing.*

RIVM (Rijksinstituut voor Volksgezondheid en Milieu, 2011),
Nederlands Voedingstoffenbestand (NEVO-online).

RTRS (Round Table on Responsible Soy Association, 2011),
a. *Soy news;*
b. *Various documents about sustainability principles and criteria.*

Soyatech (2011),
Soy facts.

SIK (Swedish Institute for Food and Biotechnology, 2010),
Pesticide use and glyphosate resistant weeds – a case study of Brazilian soybean production.

Task Force Sustainable Soy (2011),
a. *Background, position and tasks;*
b. *Facts soy;*
c. *Round Table on Responsible Soy;*
d. *Amazon Moratorium.*

United Soybean Board (2010),
Soybean use and trends 2005-2010.

USDA (United States Department of Agriculture, 2010-2011),
a. *Oilseeds and products annuals of several countries (including updates);*
b. *Grain: World Markets and Trade;*
c. *World on the Edge: Food and Agriculture Data – Crops;*
d. *Soybean and oil crops: Market Outlook 2010-2019.*

WUR (Wageningen University and Research centre (2009-2011),
a. *Quick scan: animal protein consumption and sustainability: fact and figures in perspective;*
b. *GM-related sustainability: agro-ecological impacts, risks and opportunities of soy production in Argentina and Brazil;*
c. *Perspectives of soy substitutes in feed;*
d. *Dutch trade and biodiversity: Biodiversity and socio -economic impacts of Dutch trade in soya, palm oil and timber;*
e. *Technologie en grondstoffen voor vleesvervangers en hoogwaardige eiwitten;*
f. *Sustainability of current GM crop cultivation;*
g. *Environmental side-effects of animal feed.*

In conjunction with the business community, the Product Board for Margarine, Fats and Oils MVO is committed to an internationally competitive sector that takes its social responsibilities seriously.

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