SOY AND PALM OIL

Certification schemes for documenting production sustainability

JOHN E. HERMANSEN, MARIE TRYDEMAN KNUDSEN AND JANNI SØRENSEN

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Preface

This report has been commissioned by the Ministry of Food, Agriculture and Fisheries and is part of the "Contract between Aarhus University and the Ministry of Food, Agriculture and Fisheries for the provision of research-based policy advice, etc., at Aarhus University, DCA – Danish Centre for Food and Agriculture, 2012-2015".

In their requisition, the Ministry asked DCA to provide, among other things, a summary of the general impact on nature and the environment of the production of soy and palm oil and to report on whether the main market-based certification schemes used to document the soy or palm oil traded on the global market have been prepared with due consideration for nature and the environment. The background to the request by the Ministry is further detailed in Section 1 of this report.

The report examines the available evidence on production conditions and the aspects concerning certification of improved production processes.

Foulum, March 2013

Susanne Elmholt

Senior researcher, Coordinator of policy advice at DCA

RESUME

Denmark imports considerable amounts of soya and palm oil products produced under conditions that are not approved by the EU and which may entail significant negative consequences for the health of the rural population as well as the environment and nature. The present report published by DCA – Danish Centre for Food and Agriculture, Aarhus University, prepared on a request from the Danish Ministry of Food, Agriculture and Fisheries, examines the available documentation on production conditions as well as aspects in relation to certification of improved methods in connection with soya and palm oil production.

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1 The task

The Ministry of Food, Agriculture and Fisheries (MFAF), requested in a mail dated 31 January 2012 the preparation of a report by Aarhus University to cover the following:

- Review of the general impact on nature and environment of the production of soy and palm oil, including, among other things, the use of pesticides, conversion of natural areas to farming, biodiversity.
- Description of the principal market-based certification schemes used to demonstrate the sustainability of the manufacture of soy or palm oil traded on the global market.
- Discussion of the criteria to be used for an assessment of whether the global labelling and certification schemes for soy and palm oil have real substance or whether they are a case of green-washing.

The problem has emerged partly from the ethical dilemma posed by the fact that Denmark imports significant quantities of soy and palm oil products that have been produced under conditions that are not acceptable in the EU and which may have significant adverse consequences for the health of the rural population and for the natural environment in the country of production.

The report reviews the available evidence on production conditions and the aspects concerning certification of improved production processes.

2 Production of soybeans and impacts on nature, environment and health

2.1 Introduction

Soy is one of the most important animal feed ingredients in the world (Olsen et al., 2011b). Global population growth and economic growth has led to an increased consumption of meat and an increasing demand for soy for animal feed (Knudsen et al., 2006). Denmark is one of the world's leading exporters of pork, and most of Denmark's import of soybean meal is used in pig feed. The consumption of soy for animal feed in Denmark is about 1.5 million tonnes per year, most of which is imported from Argentina and Brazil (FAOSTAT, 2009). Denmark lays claim to approx. 5 percent of the soybean imported in Europe, most of which is used in feed for the production of meat, milk and eggs (Plant Directorate, 2010). The average yield in 2009 was 1.85 t/ha in Argentina and 2.64 t/ha in Brazil (FAOSTAT, 2009). In 2009, Denmark thus imported soy for animal feed corresponding to areas measuring, respectively, 567,000 and 48,000 hectares in Argentina and Brazil (FAOSTAT, 2009). This adds up to an area close to the size of Sjælland.

2.2 Argentina's soybean production

Soybean is Argentina's principal agricultural crop and its most important export product (FAOSTAT, 2009). Particularly processed soybeans, such as soybean oil and soybean meal, are exported. Argentine soybean production reached almost 53 million tonnes in 2010 (FAOSTAT, 2010). The increasing demand for soybean has resulted in the expansion of the agricultural area under soy production. More than half of the cultivated land in Argentina is reserved for soy production for which the total harvested area in 2010 exceeded 18.1 million hectares (FAOSTAT, 2010). Soy is grown primarily in the lush Pampas, but increasing demand has expanded the production area, not only in the Pampas region, but also in other important eco-regions with high biodiversity, like the great Yungas and Chaco rainforests (Pengue, 2005). As a result of the expansion of soybean production, the erstwhile cropping system that combined crop production with grazing cattle has been phased out.

A cropping system in a rotation dedicated to soy, wheat and sunflower is common practice in Argentina (Pengue, 2005). In 1997, GM soybeans were introduced into the Argentine soybean production. In 2004, 95% of the area under soybean in Argentina grew genetically modified soybeans that tolerate pesticides like glyphosate, the active ingredient in Roundup (Roundup Ready (RR) Soybean). Conservation tillage, where pesticides are used for controlling weeds, is extensively used in Argentina. Low prices and ready availability of various herbicides are key factors in the development of the cropping system (Pengue, 2005). From 1996 to 2008, the annual use of glyphosate increased from 14 to 200 million litres in Argentina (DanWatch, 2011). Other pesticides besides glyphosate are used in soybean production. DanWatch (2011) lists, among others, the chemicals atrazine, endosulfan and paraquat, all of which are banned in the EU. In this context it is important to realise that atrazine is not actually used in the soybean crop, but is likely to be applied to stubble in preparation for a subsequent maize crop. In the former cropping system where cattle grazing was part of the rotation, the Pampas was not fertilised (Pengue, 2005). The current intensive farming system and the large removal of nutrients in the crop without recycling of nutrients create, in many cases, an imbalance in soil nutrient composition. Particularly phosphorus deficiency is a problem which they are now trying to solve with fertilisers (Pengue, 2005).

2.3 Brazil's soybean production

Akin to the situation in Argentina, Brazil's soybean production has experienced considerable growth since the 1980s (Agricultural Council of Denmark, 2005). In 2010 the area with soybean in Brazil was a little less than 23.3 million hectares, corresponding to a yield of more than 68.5 million tonnes soybean (FAOSTAT, 2010). Brazil currently supplies more than 30% of the soy traded on the international market and exports more than 28.5 million tonnes of soybean (FAOSTAT, 2009). Soybeans are traditionally grown in the southern part of Brazil but also in the south-central Cerrado region (Altoé et al., 2001). The use of genetically modified soybeans has been permitted since 2004, and more than three quarters of Brazil's area with soybean is now planted with herbicide-tolerant soybeans (GMO Compass, 2011).

In Brazil, soybeans are grown in short rotations with cotton and grain, or in longer rotations (e.g. five years) with soy followed by pastures for grazing (e.g. seven years) (Clay, 2004). It is common practice to use glyphosate or similar herbicides. The warm climate and the short distance between crop rows means the plants are vulnerable to disease. In Brazil, 90 percent of the area with soybean is treated with fungicide to prevent mould, fungi and mildew (Clay, 2004). The soybeans are often produced without irrigation, and some of the soy production uses conservation tillage techniques (Clay, 2004). To avoid phosphorus and calcium deficiency in crops, the soil is fertilised and limed.

2.4 Impact on nature and environment of soybean production in Argentina and Brazil

The intensive production of soy in Argentina and Brazil has a range of repercussions for nature and environment. The agricultural production and exports of soy from Argentina and Brazil affect the environment at both the local and global level. The deforestation, drainage of wetland areas and establishment of monocultures such as soybean fields increase the risk of loss of biodiversity and habitat fragmentation (Knudsen et al., 2006). Worldwide, over the last three decades an average of 13 million hectares of forest have been cleared every year (Olsen et al., 2011b). Deforestation removes ecosystems and the conversion of wildlife areas to large agricultural fields can separate natural habitats. Lack of corridors between natural habitats reduces the genetic flow between populations and increases the risk of species or their food resources disappearing. The environmental and natural consequences are particularly associated with the incorporation of natural or semi-natural areas into farming as well as the specialisation of cultivation methods and use of pesticides.

Deforestation in Argentina and Brazil

The rising demand for soy as an ingredient in animal feed increases the pressure on tropical forests in South America, where a large proportion of the world's soy production takes place. The Brazilian Amazon has been particularly exposed to logging. Since 1997, more than 17,000 km^2 of rainforest has been felled each year. Deforestation in the Amazon region in Brazil has declined since 2004 as a result of initiatives taken by the Brazilian government (INPE, 2011).

The culprits behind the forest clearings in South America are now no longer the smallholders who clear the forest to convert land into pastures for cattle, but businesses and large-scale farmers, who establish permanent soybean farms. The shift is driven by market demand, which has previously been national but today has largely become international.

Deforestation has consequences for the climate and the natural environment in terms of loss of agricultural resources, loss of biodiversity and global warming (Knudsen et al., 2006). It is estimated that around 15% of global greenhouse gas emissions originates from deforestation and degradation of forests (Olsen et al., 2011b).

Changes to other natural habitats

In recent years there has been a shift in agricultural land use in Brazil (Cederberg et al., 2009). The expansion of the area under farming is the main explanation for the clearing of the Amazon rainforest (IRD, 2012), but from 1995 to 2006 changes have taken place both in crop production and in the conversion to pastureland (Cederberg et al., 2009), which also affects Brazil's native vegetation. Cattle production has during this 10-year period moved up to the north and northwestern parts of Brazil and the cattle population in the same period has increased by more than 80% in the northern region (the Amazon rainforest), while large grazing areas are converted to the production of soy and cotton in the south and southeastern regions of Brazil (Cederberg et al., 2009). The crop production – especially soybeans – has led to a further expansion of the area farmed in the north and northwestern regions of Brazil during the same period (IBGE, 2007). In 2002, 4.9 million hectares in Brazil's north and northwestern areas grew soybeans, while a tenfold larger area in the region had been converted to pasture (Kaimowitz et al., 2004). According to Kaimowitz et al. (2004), logging is only partly to blame for the deforestation, while grazing has had a much more serious impact on deforestation.

Pesticides and genetically modified soybeans

With frequent use and if applied in high concentrations pesticides can leach into surface and ground waters and certain compounds can be toxic to aquatic organisms (Cartwright et al., 1991). Leaching of pesticides into rivers, lakes and coastal waters can cause harm to the aquatic biodiversity (OECD, 2001). The degree and effects of pesticide pollution are often discovered long after they have been applied because of the time lag between the time of application and discovery in the aquatic environment.

It is not only the aquatic environment that is affected by pesticide use but also the terrestrial flora and fauna (OECD, 2001). A high use of pesticides reduces biodiversity by killing species or by removing their food resources. Herbicides reduce the number of species in the flora of cropping systems (Andreasen et al., 1996; OECD, 2001). Along hedgerows and field boundaries biodiversity is often high, but herbicides will also reduce biodiversity in these areas. If, for example, the first link of an ecosystem's food chain is removed, this may have consequences for the higher trophic levels in the food chain, such as birds and mammals (Chiverton & Sotherton, 1991). Biodiversity loss as a result of pesticide use may therefore take place long after the initial treatment.

Conservation tillage or reduced tillage are farming techniques that are used in many places in Brazil (Clay, 2004). This form of management results in a soil where far more organic material is left on the soil surface and where the total number of hours working agricultural machinery on the land is reduced and thus also the overall cost of production (Clay, 2004). Pesticide use is generally higher with conservation tillage than under ploughing (Abildtrup et al., 2008). The warm climate throughout the year means that some diseases in crops can create problems that are further aggravated by the short distance between soybean crop rows (Clay, 2004).

The growth of soybean production in Argentina has especially been facilitated by the use of genetically modified soybeans. It is still unclear what the consequences may be of cultivating genetically modified soybeans. So far there are both positive and negative aspects to growing GM soy. GM soybeans are resistant to glyphosate. This means GM soy is well suited to a management system such as conservation tillage, because mechanical weed control can be omitted (Clay, 2004). With GM crops, pesticide use was expected to fall (Clay, 2004), but recent results from the U.S. covering the last 13 years show that pesticide use in GM crops has actually increased, among other things because of the development of resistance (Benbrook, 2009). Concerns about the use of genetically modified soybean plants are founded on the risk that the plants will hybridise with other plant species and develop glyphosate resistant weed varieties (Clay, 2004). This would mean new pesticides would have to be developed that may be more environmentally damaging than glyphosate. The unilateral use of glyphosate will eventually trigger the development of a natural resistance to this type of herbicide (Clay, 2004).

2.5 Impact on human health in Argentina from pesticide use

Pesticide use in the soy production in Argentina is so widespread that many Argentinians come into daily contact with toxins (DanWatch, 2011). Not only are the farmers and farm workers who handle the chemicals affected, but so is the local population living in close proximity to the soybean fields (Antoniou et al., 2010). Although glyphosate is considered to be a relatively harmless pesticide, Robinson (2010) showed that the chemical may pose a health risk if the concentration is high and people are directly exposed to it. With direct contact, glyphosate can in the short term cause respiratory diseases such as asthma, rashes and diarrhoea (Robinson, 2010). In the long term, Robinson (2010) claims that the consequences of getting the dosage wrong can be damage to DNA that may lead to miscarriages and premature births, birth defects and cancer. In the Argentine province of Chaco, where – among others – suppliers for the Danish farmers procure their soy, aircraft are used to treat fields growing soy (DanWatch, 2011). Public areas such as streets, school grounds and the like are therefore exposed to these sprays. A health study by the Chaco health authority in 2010 showed a significant increase in recent years in diagnoses of leukaemia, cancer, tumours, spontaneous miscarriages and malformations in these communities (DanWatch, 2011). As previously mentioned in the section on *Argentina's soybean production*, Argentina uses pesticides that are banned in the EU due to their adverse health and environmental effects. The agrichemicals endosulfan and paraquat are still being used, despite the fact that the chemicals have been proven to have neurotoxic, carcinogenic and endocrine-disrupting properties (DanWatch, 2011).

3 Production of palm oil and its impact on nature, environment and health

3.1 Introduction

With the increase in the consumption of vegetable oils over the last 30 years, the area with oilseed crops has grown faster than for any other industrial crop in the last 40 years (Clay, 2004). The total area under oil palm plantations has increased since 1990 by almost 10 million hectares, with the largest increases occurring in Malaysia and Indonesia (RSPO, 2012b). Palm oil may be separated into a wide range of different oils with different characteristics. Palm oil is used in products such as cooking oils, margarine, liquid detergents, soaps, cosmetics, waxes and polishes (Clay, 2004) and also for livestock feed. In the early 1970s there was a major expansion of palm oil plantations in Malaysia and Indonesia. In year 2000 the two countries together grew just over half of the world's oil palms, while Nigeria was responsible for 30% of the world's palm oil production (Clay, 2004). In 2009, Denmark imported 150,000 tonnes palm oil (FAOSTAT, 2009). Most of these imports came from Malaysia and Indonesia, with just over 60,000 tonnes from Malaysia and a little less than 50,000 tonnes from Indonesia. Indonesia is the fifth-largest consumer of palm oil in the world, while Malaysia exports more than 90 percent of its palm oil production (Clay, 2004).

3.2 Palm oil production

In Southeast Asia, the production of palm oil usually takes place in large monocultures varying in size from 400 to 73,000 hectares (Clay, 2004), and typically takes the following course: During the planting, the existing vegetation is removed by cutting and/or burning. The oil palms are subsequently planted in a grid pattern, which takes very little account of landscape topography (Clay, 2004). One-year-old oil palm seedlings are typically planted in an 8 x 8 meter grid with 143 trees per hectare. After approximately three years, the oil palm will flower for the first time and the tree will then continue production for 40-50 years. From flower pollination it takes around six months for the fruit to mature. The fruit bunch contains between 1000 and 3000 oil seeds. New varieties of oil palm have been developed that are more productive and have a shorter life. The new varieties grow to a lower height, making it easier and cheaper to harvest the seeds. It is possible for oil palm plantations to become profitable after eight years of growth. Before the planting of oil palms, the land must be carefully prepared and must subsequently be maintained in order to sustain a good production. The soil in the plantation must be ploughed and weeds treated either mechanically or with herbicides before planting. It is also important that the soil is fertilised in order to maintain the high yields. The cost of fertiliser alone constitutes 40-60 per cent of total maintenance costs, or 15-20 percent of the total production costs of palm oil seeds (Syamsulbahri, 1996). Oil palms can be grown on degraded land, but the plantations are often established on newly deforested areas.

3.3 Impact on nature and environment of palm oil production in Malaysia and Indonesia

The main environmental issue associated with palm oil production is the conversion of natural areas into palm oil plantations, which poses a critical threat to many endangered species as their habitats disappear. Additionally, there may be environmental problems associated with the use of toxic substances in the production, air pollution from burning forests, soil erosion and heavy sedimentation of rivers and streams, as well as the discharge of wastewater from palm oil mills.

Conversion of habitats and biodiversity loss

The greatest environmental threat with palm oil productions is the risk that natural areas of high conservation status may be converted to oil palm plantations. In Indonesia and Malaysia there is a direct link between deforestation and the establishment of oil palm plantations and many protected areas have illegally been converted (Clay, 2004), but due to poor mapping and planning of land use in Indonesia, the decision on whether a conversion is illegal or not can in some cases be unclear (Wakker, 2005). In Indonesia large areas of rainforest are being cleared to establish oil palm plantations (Clay, 2004). Most of the new oil palm plantations have been planted on recently cleared forest land. This is despite the fact that more than 20 million hectares of former farmland suitable for the establishment of oil palm plantations is not being cultivated (Clay, 2004). Oil palm producers clear forested land to grow their crops rather than recultivate former farmland, because farmland needs more fertiliser. The cost of clearing the forest is equivalent to the price of the timber (Clay, 2004).

The conversion from forest to oil palm plantations has been shown to have a negative effect on the number of plant species, and especially the number of species in the Malaysian and Indonesian rainforests (Wakker, 1998). There are, for example, nearly 80 species of mammals in Malaysia's native rainforest. In the disturbed rainforests there are just over 30 species, while the oil palm plantations provide a habitat for only up to 12 species (Wakker, 1998). Similar examples can be found for insects, birds, reptiles and micro-organisms (Wakker, 1998). The establishment of oil palm plantations in Malaysia and Indonesia constitutes moreover one of the world's greatest threats to a variety of endangered megafauna species (Clay, 2004). These include the Asian elephant, the Sumatran rhinoceros, the tiger and the orangutan. These very different species often have different habitats, and the few areas where they coexist (e.g. Sumatra and peninsular Malaysia) are precisely where oil palm plantations are being expanded (Clay, 2004).

Oil palm plantations have contributed to the fragmentation of the habitats of the endangered species. Species insulation therefore minimises the possibility of genetic exchange and thus a crucial genetic diversity among the populations (Clay, 2004). Burning has been used as part of the deforestation strategy as a method to clear forest vegetation on especially moist peaty soils. Once the areas have been cleared, the soil dries and it is possible to establish palm plantations (Clay, 2004). Forest fires are not a common phenomenon in the tropical rainforest regions, but in the late 1990s many forest fires raged and affected more than 6% of the total area of Indonesia (Wakker, 2005). The fires were often uncontrolled and have been cited to cause air pollution in large areas of Southeast Asia (Clay, 2004). Research suggests that forest fires in 1997 were the main cause of the record-high global CO_2 emissions measured in that year (Page et al., 2002). The process of burning has now been banned in Malaysia and Indonesia (Clay, 2004), but there are still reports of illegally lit forest fires in these countries (Wakker, 2005).

Other natural consequences of palm oil production

The rat is the most common mammal found in oil palm plantations (Clay, 2004). Rats thrive in these plantations because they live off the oily palm seeds and the predators that normally hunt rats disappeared during the initial deforestation. Traditionally, snakes and similar predators are removed if they try and recolonise oil palm plantations. Once established in the plantations, the rats can be very difficult to remove. Rat poison has been used extensively, but the poison kills many other species besides rats. Therefore, some palm oil companies now release owls into the plantations and abstain from killing the pythons and other predators that catch rats.

Pesticide use is generally low in oil palm plantations. During plantation establishment it may be necessary to treat with herbicide until the palms have developed a canopy that can shade out the undergrowth (Clay, 2004). Fertilisation of oil palm plantations is necessary because of the high nutrient content in the harvested fruit bunches. Palm oil production, however, requires less fertiliser per unit output than other oilseed crops (Clay, 2004). Chemical fertilisers are regularly used in oil palm plantations with the consequent risk of nutrient leaching into freshwater systems. The risk factors for nutrient leaching in the plantations include the slope of the land, vegetation cover and whether plant residues and other organic materials are left to cover the fertilised ground (Clay, 2004).

Deforestation causes increased soil erosion and run-off of soil particles and sediment to aquatic systems (Wakker, 2005). This increases the pressure on riverine and coastal ecosystems, particularly since deforestation is often a continuous process taking place at different places in the same catchment area. Soil erosion becomes especially problematic when oil palms are planted on slopes (Wakker, 2005).

Another important source of pollution is the discharge of wastewater from oil palm mills. The wastewater contains residues from seed shells and from oil (Wakker, 2005). The wastewater is stored in outdoor tanks but with intensive production or heavy rainfall there is the risk that the storage tanks may overflow. In some cases, the wastewater is discharged directly into rivers and other water courses (Wakker, 2005), where the high nutrient content of the wastewater alters the ecology of the aquatic system.

3.4 Social and health effects of palm oil production in Malaysia and Indonesia

In addition to the natural and environmental problems, large-scale palm production also creates social problems in Southeast Asia. In the production there are risks of breaches of labour rights, where the use of chemicals and pesticides, among other things, can pose a health risk to plantation workers (Olsen et al., 2011a; Wakker, 2005). A high unemployment rate in Indonesia and illegal immigrants working in Malaysia not only increase the risk of the wages paid being below the minimum, but also the risk of a negative response to requests for joining trade unions and unsafe working conditions (Wakker, 2005). The expansion of palm oil plantations also results in the displacement of the local population (Olsen et al., 2011a). In Indonesia, there is still a lack of effective recognition of indigenous peoples' rights in the laws on land and natural resources, which is a source of much controversy (Colchester et al., 2006). The state recognises the rights of indigenous people to their land, but the implementation of the letters of the law is not adequate (Wakker, 2005). For palm oil smallholders, the uncertainty surrounding ownership of land, the fear of being trapped in debt and the lack of information about the value of the harvest result in many of them selling out to large incoming enterprises (Colchester et al., 2006). Because of the many disputes about property rights, palm oil farming is the land-based sector most affected by conflicts in Indonesia (Wakker, 2005). Conflicts about property rights also occur in Malaysia, but are not as common as in Indonesia (Wakker, 2005).

Palm oil production creates different types of pollution in the local environment that may have serious effects on the health of the local population. Air pollution from the burning of forests and pollution caused by excessive or inappropriate use of chemicals and pesticides are some of these types (Wakker, 2005). In Southeast Asia, paraquat has been the most commonly used herbicide in palm oil plantations (Wakker, 2005). Paraquat is a highly noxious chemical that can be toxic if inhaled, ingested or absorbed through the skin (DanWatch, 2011; Wakker, 2005). Plantation workers are regularly exposed to toxic herbicides, either directly when they are spraying the plantations or by working on recently sprayed areas (Wakker, 2005).

Interview surveys of female Malaysian plantation workers indicate that many workers do not receive relevant information about protection and that workers suffer from side effects such as respiratory problems, skin problems, dizziness, irritated eyes, headaches, swelling, etc. (Fernandez, et al., 2002). In 2002, the Malaysian state announced that it would phase out the use of paraquat over a two-year period. The pesticide industry opposed this move (Wakker, 2005) and the use of paraquat has not yet been phased out in Malaysia (Danish Energy Agency, 2010)

4 Certification schemes and their focus

In order to encourage production methods that reduce the above-mentioned adverse effects, certification and labelling schemes have been introduced whereby customers help to reduce the environmental load when they purchase certified products. These range from general schemes to schemes that specifically address palm oil and soybeans.

Some of the general schemes with a relatively long history are GlobalGap, Fairtrade, Rainforest Alliance and the Ø-mark. Dedicated schemes include the Roundtable on Sustainable Palm Oil (RSPO) (http://www.rspo.org/) and the Roundtable on Responsible Soy Association (RTRS) (http://www.responsiblesoy.org/) started in 2006. There is also ProTerra that certifies GMO-free products. The following describes the concerns that are embodied in the specific arrangements.

4.1 Certified palm oil

The Roundtable on Sustainable Palm Oil (RSPO) was formed in 2004 as a result of a growing demand for sustainably produced palm oil. The association is based in Zurich, Switzerland, while the secretariat is based in Kuala Lumpur (RSPO, 2012a). RSPO brings together interested organisations from different sectors of the palm oil industry in order to develop and implement global standards for sustainable palm oil (RSPO, 2012a). The main principles behind the certification are transparency, labour standards, use of the best available agricultural practices, protection of nature and environment, and long-term financial planning (RSPO, 2007). Danish member companies include Danisco (now sold to Dupont), Dragsbæk A/S, Oscar A/S, Palsgaard A/S and Rema 1000.

Oil palm plantations are required to publish management plans to enable interested organisations to collect information on environmental, social and legal aspects of relevance for the RSPO criteria (RSPO, 2007) (Table 1). To become certified you have to fulfil the obligations on environmental responsibility and conservation of natural resources and biodiversity. An impact assessment needs to be carried out where environmental impacts are identified and a plan prepared for mitigating the adverse impacts on the environment and nature and for promoting good initiatives. An impact assessment is prepared each time infrastructure or irrigation systems are built, plantations are expanded, natural vegetation is cleared or wastewater from the palm oil mills needs disposal. For plantations and their surroundings, information needs to be gathered about the status of rare and endangered species of high conservation value. If any of these are found in the area and if they are affected by plantation operations, their conservation will need to be taken into account in management plans and operations. In addition, there must be control of illegal or inappropriate hunting, fishing or gathering activities. There are also initiatives to reduce waste, promote recycling and ensuring that waste that cannot be recycled is disposed of in an environmentally sound manner. Burning of waste and plant material is normally avoided, but there may be instances where burning is used before plantations are replanted. In such instances, documentation must be submitted that burning is the most responsible method to use (RSPO, 2007).

Table 1. Summary of Roundtable on Sustainable Palm Oil (RSPO) criteria, certified through GreenPalm and UTZ, among others.

Conversion of natural areas for cultivation/ biodiversity loss	Pesticides and chemicals	Cultivation (best available agricultural practice)	Occupational safety and pollution	Fair wages and prices (illegal land acquisition and land conflicts)
Protection of rare or endangered species, as well as particularly valuable forests/habitats Only native species should be used for biological control Promote recycling and reforestation Control of illegal and inappropriate hunting, fishing and gathering The burning of forests and plant material is avoided Since November 2005, new plantations have not replaced primary forest or areas of special conservation value	Requirements for the phasing out of certain pesticides (e.g. paraquat) A requirement to use appropriate integrated pest management (IPM) techniques to control weeds, pests, diseases and introduced invasive species The use of legal pesticides that are specifically selected for the individual problem	Restriction on pesticide use, control of soil erosion, protection of soil fertility, ensuring good water quality Soil analysis and topographic information used in the planning of new plantations Planting on steep slopes avoided	Responsible sensitivity towards employees and local communities affected by plantations and refineries IPM plan required, which should be implemented and monitored (including guidance and training) Health and safety plan required Pesticides must be applied by trained staff with proper equipment and protection to minimise impacts on surrounding area Monitoring of health of employees dealing with pesticides Pregnant or breast-feeding women not to work with pesticides	Land rights of indigenous people must be respected Requirement for management planning aimed at economic sustainability Minimum standards of pay and conditions for staff sufficient to provide a decent living Child labour only allowed on family farms and to be conducted under the supervision of an adult Employees have the right to form or join trade unions Discrimination is prohibited New and older price lists must be publicly available No plantation to be established on land owned by the indigenous people

The requirement for a documented IPM plan is to ensure appropriate plant protection. Biological control should preferably use native species, and chemicals must not be used in a way that would pose a risk to human health and the environment. For chemicals classified as WHO Type 1A or 1B or listed in the Stockholm and Rotterdam conventions, and for paraquat, the growers must demonstrate that they are seeking alternative remedies and/or reducing the use. Any use of pesticide must also be registered (type, amount, frequency of treatment). Pesticide type must be selective and species-specific and the treatment must be undertaken by a plantation worker who has received appropriate training and is wearing the necessary safety gear. Chemical containers should be disposed of appropriately and storage must comply with the *FAO or GIFAP Code of Practice* (RSPO, 2007). Similarly, there is a requirement for the documentation and implementation of a health and safety plan that includes the health and safety of employees so that they and their duties are recorded, they have the necessary accident insurances, there is the necessary first aid equipment and recordings of accidents and injuries, etc. (RSPO, 2007).

Different criteria are determined to ensure that the best available cultivation practices are used. These criteria should ensure less erosion and degradation of land, for example by generating a map of fragile soils, preparing strategies for planting on slopes and by advising growers on the best growing techniques. There are also criteria for safeguarding the aquatic environment and water quality. Examples of some of the criteria farmers must be able to meet are implementation of water management plans, the establishment of buffer zones near watercourses, the monitoring and appropriate discharge of wastewater, and stipulations for depth of the water table below soil surface (RSPO, 2007).

Managers of plantations and mills must regularly monitor and review their activities and perform and develop action plans to continually demonstrate improvements (RSPO 2007).

There are three different types of certified palm oil: Fully Segregated, Mass Balance and Book and Claim (GreenPalm) (Olsen et al., 2011a). 'Fully Segregated' guarantees that palm oil is grown in an RSPO-certified plantation, and that throughout the supply chain the palm oil is kept separate from conventional palm oil. Once the oil has been processed, the certification is approved by a third-party firm of consultants (e.g. UTZ), and the oil can be labelled 'RSPO-certified sustainable palm oil'. UTZ has developed a web-based tracking system to ensure that the certified palm oil is kept separate from conventional palm oil throughout the transport chain. In the 'Mass Balance' system, the certified palm oil is mixed with conventional palm oil during transport and storage. Until the refinery stage, the mix of certified and uncertified palm oils is monitored by an independent certification body (e.g. UTZ). For example, with a mixture of 200 tonnes palm oil (100 tonnes certified palm oil mixed with 100 tonnes conventional palm oil), a company can only sell 100 tonnes as certified. Mass Balance oil is labelled with the RSPO logo and a ‘mixed' label. 'Book and Claim' is administered through the certificate trading programme GreenPalm. In this system palm oil from certified producers is handled alongside conventional palm oil. Movements and transactions are not monitored throughout the production chain. Instead producers are rewarded for using responsible practices in the plantation by receiving one GreenPalm certificate for each tonne of certified palm oil they produce. The producers subsequently sell their certificates on http://www.greenpalm.org directly to buyers throughout the world, whereby buyers can give economic support to responsibly produced palm oil. GreenPalm certificates give the end user the right to write that a corresponding amount has 'Contributed to the production of RSPO-certified sustainable palm oil' (Olsen et al., 2011a).

4.2 Certified soy

The Round Table on Responsible Soy Association (RTRS) was founded in Switzerland in 2006 and the movement is a market-oriented international umbrella organisation for some of the organisations that support the production, processing and trade of responsibly produced soy (RTRS, 2009). A wide variety of companies and some NGOs are represented in RTRS (Olsen et al., 2011b). There are three Danish RTRS members: Biomar, Arla and Danisco (although Danisco was sold to Dupont in 2011 and can no longer be called a Danish company) (Olsen et al., 2011b). The RTRS standard can be used for both conventionally produced, organically produced and GM crops, and the certification is – in that regard – technology-neutral.

The principles and criteria behind the certification are based on five themes: Compliance with legislation, responsible working conditions, responsible relations to the local neighbourhood, environmental soundness and good agricultural practice (RTRS, 2010) (Table 2). Child labour, forced labour, discrimination and harassment are not permitted. This principle also applies to migrants and seasonal workers and no workers are obliged to submit their identity papers. Children under 15 (or higher, according to national law) must not work in the production, but they are allowed to accompany their families in the field, as long as it does not affect their schooling and they are not exposed to hazardous, unsafe or unhealthy situations. Any discrimination is prohibited and workers must not be exposed to any physical or mental punishment, oppression or abuse.

Workers must be trained and briefed on their duties and rights, and their contracts must be in a language they can understand or carefully explained by a manager or supervisor. Relevant health and safety risks should be identified and procedures be developed and monitored by employers to lessen these risks. These tasks must only be performed by competent workers. Similarly, workers should be instructed in the existing accident and emergency procedures and first aid and medical care should be immediately available.

Wages or benefits must not be withheld by the employer unless permitted by law. Wages must comply with the national legislation and must be paid at least once a month. Paid wages are recorded by the employer and the working week should not exceed 48 hours and weekly overtime must not exceed 12 hours. If additional overtime is required, specific conditions need to be met first (see RTRS (2010), page 3). Employees are entitled to maternity leave and their rights are protected by national legislation. Workers are entitled to get their jobs back on the same terms and conditions after maternity leave, and they are not subject to any form of discrimination, loss of seniority or reduction of wages.

One of the principles of responsible soy production is the requirement that there should be communication and dialogue with the local community about the activities of the local soybean farm and the effects of the operation. In areas where soybean production affects the farming practices of local smallholders, there is an obligation to resolve any disputes. Where there is a disagreement about land rights, a documented assessment of the right is prepared. Where traditional farms have been divested of the right to use the land, the affected communities must be compensated following a free, prior, informative and documented consent. A mechanism that allows local communities and traditional farmers to appeal decisions regarding the production of soy has been implemented and this must be known and accessible to the community. Complaints should be treated timeously. Opportunities for employment in the production of soy must also be advertised in the community, and there should be fair opportunities for employment for the locals. Opportunities for the supply of services should be offered to the locals.

One of the principles in the RTRS certification of soy concerns environmental responsibility. Prior to the establishment of new infrastructure projects, a social and environmental risk assessment needs to be carried out by persons with the necessary skills and experience in this field. This assessment must be comprehensive and undertaken in a transparent manner. Measures for the mitigation or minimisation of the social and environmentally adverse impacts should be identified in the assessment and their implementation documented. To minimise pollution from the production of soy, there should be a waste management plan for all sections of a property. There should, for example, be adequate facilities for storage and disposal of fuel, batteries, tyres, lubricants, wastewater and other waste.

The certification scheme also includes a statement of intent on reducing greenhouse gases. Over time, the use of fossil fuels is recorded and volumes per hectare and per unit of a product monitored. The opportunities for increasing the amount of carbon in the soil by replanting with natural vegetation and forest are likewise identified. The soy farms try to protect biodiversity by keeping a map of the farm's natural vegetation. It is also illegal to hunt rare, threatened or endangered species (RTRS, 2010). By monitoring and preventing the discharge of diffuse substances, attempts are made to prevent or minimise pollution of the aquatic environment. Where irrigation takes place there must be a procedure for monitoring crop irrigation and water use. Natural vegetation surrounding surface waters must be preserved and natural wetlands should not be drained.

In order to avoid adverse environmental and health effects, integrated crop management (ICM) techniques should be implemented. An ICM plan should be documented and implemented in the production. This should include a plan for the reduction over time of substances that are potentially harmful to health and environment. The use of these substances must comply with the relevant regulations and professional recommendations. Agrochemicals must not be listed in the Stockholm and Rotterdam conventions and all handling and storage must be documented and monitored (RTRS, 2010). Both the Stockholm Convention and the Rotterdam Convention are UN treaties. The Stockholm Convention deals with persistent organic pollutants, and the Rotterdam Convention deals with hazardous chemicals and pesticides and is therefore more relevant in this context. The conventions specify the substances that are banned and there is a continuous review of new substances and their potential candidacy to the list as knowledge about their function and effect is obtained.

Companies wishing to buy RTRS-certified soy may do so using one of two models (Olsen et al., 2011b). Soy buyers can buy RTRS-certified soy (which is tracked throughout the supply chain to the end user) either as Fully Segregated soy where the RTRS-certified soy is kept separate from conventional soy or as Mass Balance soy where the RTRS-certified soy is mixed with the conventional soy and where the final agreement then declares the percentage of the soy product that has been certified. The second model is based on companies not directly purchasing certified soy, but supporting its production by buying responsibly-produced soy. The basis for the system is the certificate trading platform (CTP) of RTRS. As a supplement, there is also Non-GM soy. The supply chain structure is the same for Fully Segregated and Mass Balance, which also ensures that there is no GM-soy in the mixtures (Olsen et al., 2011b).

RTRS does not guarantee a 100 percent sustainable production of soy, but the improved development and cooperation between actors in soybean production initiated by RTRS means that RTRS has WWF approval (Olsen et al., 2011b).

Table 2. Summary of Round Table on Responsible Soy Association (RTRS) criteria.

Conversion of natural areas to farming/loss of biodiversity	Pesticides and chemicals	GMO varieties	Cultivation (best available practice)	Occupational safety and pollution	Fair wages and prices (illegal land acquisition and land disputes)
The establishment of new fields since 2009 has not replaced primary forest or areas of high conservation value, such as the Cerrado in Brazil and Gran Chaco in Argentina Risk assessment performed prior to the establishment of new infrastructure projects Implementation of identified and documented measures to mitigate or minimise environmental impacts No form of burning to take place (except in special circumstances, see RTRS (2010) standard, section 4.2.1, page 5) Measures to minimise the spread of introduced invasive species	Preparation of waste management plan that includes all sub-areas of the property Waste pollution to be mitigated by: adequate storage of waste, installation of facilities to avoid oil spills and other pollutants, and waste recycling where possible Requirement for ICM (**) plan and use of appropriate ICM techniques to control weeds, pests, diseases and introduced invasive species Documentation on the use and storage of agrochemicals Agrochemicals must not be listed in Stockholm and Rotterdam conventions	GMOs are allowed, but there is a variant of the certification scheme that ensures GMO-free soy (Non-GM RTRS soy)	Preparing a risk assessment prior to the establishment of new infrastructure projects Implementation of identified and documented measures to mitigate or minimise environmental impacts No form of burning to take place (except in special circumstances, see standards for RTRS (2010), section 4.2.1, page 5) Initiatives should be taken to reduce emissions of greenhouse gases Initiatives should be taken to minimize emissions of fugitive substances into the aquatic environment, for example by maintaining natural vegetation around watercourses Techniques to enhance soil quality and inhibit erosion to be demonstrated and implemented	Minors (under 18) may not perform work that is hazardous or impairs their physical, mental or moral well-being Adequate and appropriate protective equipment to be used for potentially hazardous tasks such as pesticide use and handling Access to first aid and medical care Identification of relevant health and safety risks and procedures to be developed and monitored by employers to accommodate risks. These tasks must be performed by qualified workers who do not pose health risks.	Ownership must be documented before an area can be cultivated with soy Child labour, forced labour, discrimination and harassment are not allowed Family to contract workers are not obliged to work on the farm Equal pay for work of equal value and equal opportunities for education, benefits and promotion Workers must be adequately informed and trained in their duties and aware of their rights Freedom of association and right to collective bargaining Wages must comply with national law and must be paid at least once a month The working week should not exceed 48 hours and weekly overtime should generally not exceed 12 hours Overtime is voluntary Rights and protection relating to maternity leave follow the national regulations If employees live on the farm, rents must be affordable and houses safe with sanitation and access to food and water. Any charges shall be consistent with market prices Documentation of adequate communication between producer and communities Complaints procedures available Fair employment opportunities for locals

** Integrated Crop Management

4.3 Other certification programmes

There are several different certification programmes that have been designed to meet the demand for products with higher socio-economic and environmental sustainability standards. *ProTerra* is one of these programmes, where the standards for certification have been developed by Cert ID, based on the Basel criteria (Coop and WWF, 2004; Cert ID, 2012). Cert ID is a third-party certification company within the food industry, which has producers, retailers and agricultural producers as its customers (Cert ID, 2012). The standards behind the *ProTerra* certification programme are based on social justice, economic viability and environmental prudence – plus the products are GMO-free (International Trade Center, 2011). The certification is valid for three production levels in the food value chain: agricultural production (level 1), handling, transport and storage (level 2) and processing and manufacturing (level 3). *ProTerra* specifies both some basic requirements for certification but also long-term criteria that should ultimately be met (International Trade Center, 2011). Cert ID prepares an inspection plan for applicants seeking ProTerra certification, whereafter the inspection takes place (Cert ID, 2008). There is an annual inspection to check that the customer meets the basic requirements and lives up to the agreed action plans and timetable for progress. A report is submitted before the annual review to confirm progress (Cert ID, 2008). Certification by ProTerra is a guarantee for buyers that the actual product/batch is produced under the ProTerra standard.

GlobalGap is a continuation of EurepGAP, which in 2007 was renamed GlobalGAP to signal the international perspective of establishing 'Good Agricultural Practices' (GAP) between supermarket chains and their producers. EurepGAP is a common standard of production practices, which was formed in the late 1990s by several European supermarket chains and their major manufacturers. The focus is currently on fruit and vegetables and livestock husbandry. Very roughly speaking, the certification ensures that the national laws regarding the production are complied with and inspections are carried out to verify this. GlobalGap has (according to our information) not certified soy or palm oil production.

Import to Europe of *organic products* is generally conditional on the production taking place and being certified as conforming to the European guidelines for organic production, including separation from conventional products and non-use of pesticides, fertilisers and GMO seeds. The certification of organic products has been implemented in many countries, including Brazil.

4.4 Certification and control of 'RSPO sustainable palm oil'

Certification is carried out by a certification body that is independent of the RSPO. The certification body must demonstrate that it is accredited by a national or international organisation (according to ISO 17021:2006 standards). The accreditation body must be able to demonstrate that it operates according to international standards, such as through a member of ISEAL (International Social and Environmental Accreditation and Labelling Alliance). The certification body must further be able to demonstrate that it can meet the specific requirements for RSPO certification. I.e. the certification body must be approved by the RSPO. UTZ conducts an annual inspection and certification of an independent third party following the ISO65 standard.

Before a manufacturer/company can be certified as complying with the RSPO standards, the manufacturer/company must contact an independent RSPO-approved certification body to review their products (a list of these certification bodies can be found on http://www.rspo.org/?q=page/512). The audit report is reviewed by an expert independent reviewer hired by the RSPO before an RSPO certification is awarded (RSPO, 2012a).

http://www.rspo.org/sites/default/files/RSPO-Supply%20Chain%20CertificationSystems%20-5Nov2009_0.pdf
http://www.rspo.org/sites/default/files/RSPO%20P&C%20certification%20system.pdf

For 'supply chain' RSPO certification for 'Fully Segregated' or 'Mass Balance' systems, all links in the chain must be certified and all components must be audited. 'Book and Claim' (GreenPalm) certification is carried out by spot checks.

An auditor must be trained in the RSPO control and be independent of the company being certified (not in their employ or had any other formal relationship with them over the past three years). For the company involved, the auditor should review the organisation, management and implemented policies with reference to RSPO standards. The auditor must ensure that any relevant documentation since the last review is available.

Following the control, the auditor writes a report, which in addition to the ID of the company and persons present at the audit must include a description of the compliance or non-compliance with the respective requirements, and how the company's management system will ensure compliance with such requirements. If conditions not consistent with RSPO requirements are discovered, no certification will be awarded until the matter has been addressed. If this has not been addressed within three months, a new full control will need to be carried out.

A certificate must be renewed each year if the volume is more than 500 tonnes/year – for smaller amounts every three years. Appendix 1 shows a schematic overview of the certification procedure. For trade with certified products there must be documentation of 'origin' and 'certification quality' of products. Examples of criteria and indicators that are used for the audit at growers are shown in Appendix 2.

4.5 Certification and control of 'RTRS Responsible Soy Production''

The principles of certification are comparable to the principles for Sustainable Palm, as illustrated in Figure 1.

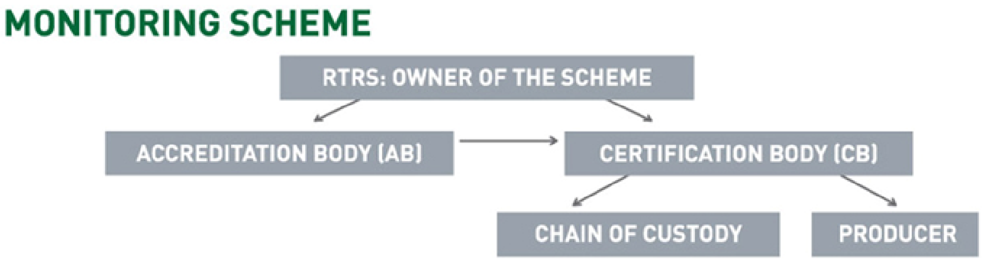

Figure 1. Overview of the monitoring system for RTRS (www.responsiblesoy.org)

RTRS does not itself control the companies. Instead certification bodies (primarily the certification firm Schutter) carries out the inspections for compliance with RTRS standards at the producer and in relation to 'chain of custody' (Figure 1).

These certification bodies must themselves be accredited by national and international accreditation bodies (primarily 'Organismo Argentino de Acreditación (OAA)') (Figure 1). Accredited certification bodies and accreditation bodies can be found on the RTRS website (www.responsiblesoy.org).

The certification process is illustrated in Figure 2. When a company has successfully passed its first audit, it receives a certificate valid for five years, but the certification body will conduct annual rechecks.

This certification is based on the five aforementioned themes. For a number of situations, instructions are available for what needs to be checked in a certification inspection. Appendix 3 provides examples of formulations.

Somewhat more detailed instructions are also prepared for individual countries, with, for example, clearer reference to the legal requirements that need to be checked against. There are currently such national guidelines for Argentina, Brazil and Uruguay, while they are being prepared for India, Paraguay, China and Bolivia. In 2012, RTRS published maps showing the regions of Brazil that may not be converted to soybean cultivation (to avoid deforestation and loss of biodiversity in particularly valuable areas).

Figure 2. Overview of the certification process for RTRS (www.responsiblesoy.org)

5 Discussion of certification schemes for soy and palm oil

The Danish livestock production is largely dependent on imported feed and as such affects/draws on resources outside Denmark. When looking at the environmental impact of the production of various products, including foods, it is important that these effects are taken into account. There are different traditions for how this is done, particularly for assessing the feed materials that are linked to effects such as deforestation. In keeping with the Danish traditions of life-cycle assessments, however, there is now a certain degree of consensus internationally that with the current globalisation of markets, it is important to look at the effects in a global perspective. The constant expansion of livestock production leads to an increasing global demand for soybeans and maize, which in turn leads to an expansion of the areas under these crops. In this rationale, the size of the livestock production is determined by (the increasing) demand, and the marginal extra production is generally based on an increased consumption of soy products and cereals – especially for pigs and poultry. It is also less important where the livestock production takes place as the trade in soy and maize feed products is global. What matters is how effective the livestock production can be.

For some of the aspects covered in this report it is important to note that both livestock production and soy and maize productions are linked to global markets, so it is assumed that livestock production in Denmark replaces a production that would have taken place anyway somewhere else in the world. Neither is it likely that separating out some of the soybean production to be produced under special conditions (for Danish livestock, for example) will reduce the overall pressure on soybean cultivation and the pressure on deforestation or the incorporation of other natural areas into the production of livestock feeds.

However, this does not alter the fact that a number of considerations related to the effects on health and environment can be taken in the production, as discussed below.

5.1 Certification scheme for soy

As described in Section 2, one of the main concerns about the environmental sustainability of soybean production in South America is the link with deforestation and changes to other natural areas, GMOs and pesticides (including paraquat, endosulphate, atrazine and, partly, glyphosate). An additional concern is the conflict over land rights. The question is how the certification scheme Round Table of Responsible Soy (RTRS) deals with these challenges. Finally, there is the question of how the scheme itself, and the control of the scheme, ensures that the standard is enforced.

- Control of the RTRS standard seems to proceed in the same way as for other control schemes such as FSC (Forest Stewardship Council) and PEFC (Programme for the endorsement of Forest Certification schemes), and there is no reason to assume that the production does not meet the requirements in practice.
- With regard to pesticides, the RTRS (2010) standard stipulates that agrochemicals listed in the Stockholm or Rotterdam Convention may not be used. Endosulphate was in October 2011 added to the Annex III list of the Rotterdam Convention and may therefore not be used for RTRS certified soy. Paraquat is currently being considered as a candidate to the Annex III list of the Rotterdam Convention (www.pic.int) – so it is still unclear whether it will be allowed in RTRS certified soy in the future. Atrazine is banned in Denmark, and glyphosate is not listed in the Rotterdam Convention and may therefore be used for RTRS certified soy.
- The RTRS standard can be used both for GM crops and for certified non-GM crops, unlike the organic certification scheme and ProTerra that do not allow GM crops.
- With regard to deforestation, which has implications for both global warming and biodiversity, the RTRS standard generally specifies that expansion of the soybean area after May 2009 must not take place on land cleared of natural vegetation, although with some exceptions. Areas cleared before May 2009 and used for farming or for grazing within the last 12 years may be used for soy production.
- With regard to land rights, the RTRS standard requires the producer applying for certification to identify other traditional users of the area and their right to the land – and the ownership to be documented.

While organic certification and ProTerra certification are based on the buyer's need for assurance that the purchased certified goods have actually been produced as stipulated, the RTRS certification is primarily intended as a driving force for a more sustainable soy production. There is the option with RTRS, as previously mentioned, to purchase certified soy products by the Mass Balance method. The basic idea here is that there is documentation that the amount of certified soy that the buyer pays for has actually been produced, but no guarantee that what the buyer gets reflects this. A buyer of certified soy thus helps to ensure that more certified soy is grown. The method has (probably) been introduced to curb the extra costs associated with the logistics of keeping the materials separated throughout the supply chain and in this way to lower the purchase price for certified soy. When you consider that the aim of certification is to encourage more responsible production methods (as opposed to a particular product quality), the method appears to be mostly appropriate. One problem, however, could be that the certified production takes place in areas where it is easy to document compliance with the requirements rather than in areas where soy production is being expanded and where the largest environmental impacts probably occur.

In summary, certification can clearly help prevent the adverse health effects of inappropriate use of pesticides and can also help provide suitable labour conditions in production. Certification can also ensure that for the land currently under soy cultivation appropriate agronomic practices are used that support the long-term fertility of the land, nature and biodiversity aspects and thus the production capacity in the long term. The certification does not hinder the spread of GM cultivation practices and it is highly uncertain whether the certification actually hinders the current deforestation. However, it is believed that the improved cultivation practices in the longer term will mean that the land can 'remain in production' for longer than would otherwise have been the case, and that could mean less pressure on overall land use.

5.2 Certification scheme for palm oil

Some of the main environmental concerns associated with palm oil production involve the conversion of natural areas, primarily rainforest, to oil palm plantations and air and water pollution from the production. Many of the same conditions apply to the certification of palm oil as for soy. The certification scheme based on the Roundtable on Sustainable Palm Oil (RSPO) is in many ways similar to the certification scheme based on the Roundtable on Responsible Soy Association (RTRS). For certified palm oil, there is, in addition to 'fully segregated' and 'mass balance' (which is also available for soybeans), a third option called 'book and claim', where transactions are not monitored throughout the production chain. Certification and control of 'RSPO Sustainable Palm Oil' follow the same pattern as for 'RTRS Responsible Soy Production'.

A particular issue in palm oil production is that it uses a large amount of fertiliser, although pesticide use is generally low. However, the pesticide used is typically paraquat, which may be added to the Annex III list of the Rotterdam Convention. This probably means that paraquat will not be permitted by the RSPO standard. In this area, certification will therefore eventually lead to the phasing out of products that are not permitted in the EU.

Another general practice in oil palm plantations is the frequent abandonment of older plantations and the establishment of new plantations in areas recently cleared of forest, mainly to save fertiliser. Since the RSPO standard does not allow this practice, it is estimated that older areas will remain in production and there will be less need for new areas.

The certification therefore promotes the use of beneficial cultivation practices in palm oil production that support the long-term fertility of the land and include a number of nature and biodiversity considerations that would not otherwise be taken into account in production. This is achieved, among other things, by certification focusing on management plans to protect endangered species and using only native species for biological control.

6 Conclusion

There are a number of documented adverse environmental and health effects associated with (the steady expansion of) soy and palm oil cultivation in South America and Southeast Asia, wherefrom Denmark imports substantial quantities. The negative effects are mainly related to pesticide use and the subsuming of forest and other natural areas for cultivation. Buyers of these products can help reduce these negative effects by purchasing certified soy via special certification schemes such as the Round Table on Responsible Soy Association (RTRS) and the Roundtable on Sustainable Palm Oil (RSPO), and via other general certification schemes such as organic production.

The general conclusion is that the RTRS and RSPO certification schemes are conducted according to international guidelines for certification, and that the production methods, on which the certification is based, actually reduce the impact on health and environment of soy and palm oil production. These positive effects are particularly associated with a more responsible use of pesticides and the phasing out of certain pesticides that have already been banned in the EU. Some adverse effects on biodiversity are also reduced and the rights of workers are deemed to be improved when production is RTRS- or RSPO-certified. For RTRS it is doubtful whether the certification actually prevents deforestation.

However, it is also important to note that the RTRS and RSPO certification schemes still permit the use of pesticides (in contrast to organic certification), including pesticides that are banned in Denmark. It is also important to note that the RTRS certification scheme can be implemented for both GMO-containing and GMO-free soy – in contrast to organic production and ProTerra where the production has to be GMO-free. Finally, we must be aware that there are different forms of RTRS and RSPO certification, where perhaps the most widely used will be a certification based on Mass Balance. This means – again in contrast to organic production – that the certified soy or palm oil is mixed with conventional soy or palm oil, so you have no chance of knowing which product you receive. Instead they have ensured that an equal volume to what is purchased is produced according to the certification guidelines.

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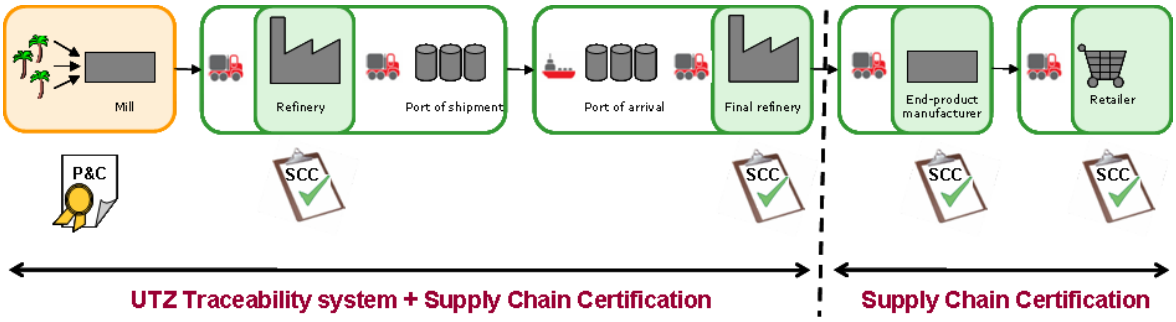
APPENDIX 1: Schematic Overview of Palm Oil Supply Chain



For trade with certified products there must be documentation on product origin and the certification quality of products. Examples of criteria and indicators used in the audit are shown in Appendix 2.

APPENDIX 2: Examples of principles and criteria for Sustainable Palm Oil Production

Principle 4: Use of appropriate best practices by growers and millers

Criterion	Indicators and Guidance
Criterion 4.5 Pests, diseases, weeds and invasive introduced species are effectively managed using appropriate Integrated Pest Management (IPM) techniques.	Indicators: • An IPM plan is documented and current. • Monitoring extent of IPM implementation including training. • Monitoring of pesticide toxicity units (a.i./LD 50 per tonne of FFB or per hectare). Due to problems in the accuracy of measurement, monitoring of pesticide toxicity is not applicable to smallholders. Guidance: Growers should apply recognised IPM techniques, incorporating cultural, biological, mechanical or physical methods to minimise use of chemicals. Native species should be used in biological control wherever possible. National interpretation should provide further guidance on what practices are most appropriate for a particular country, and where needed, on practices which are appropriate to smallholders.
Criterion 4.6 Agrochemicals are used in a way that does not endanger health or the environment. There is no prophylactic use of pesticides, except in specific situations identified in national Best Practice guidelines. Where agrochemicals are used that are categorised as World Health Organisation Type 1A or 1B, or are listed by the Stockholm or Rotterdam Conventions, growers are actively seeking to identify alternatives, and this is documented.	Indicators: • Justification of all agrochemical use. • Records of pesticide use (including active ingredients used, area treated, amount applied per ha and number of applications). • Documentary evidence that use of chemicals categorised as World Health Organisation Type 1A or 1B, or listed by the Stockholm or Rotterdam Conventions, and paraquat, is reduced and/or eliminated. • Use of selective products that are specific to the target pest, weed or disease and which have minimal effect on non-target species should be used where available. However, measures to avoid the development of resistance (such as pesticide rotations) are applied. • Chemicals should only be applied by qualified persons who have received the necessary training and should always be applied in accordance with the product label. Appropriate safety equipment must be provided and used. All precautions attached to the products should be properly observed, applied, and understood by workers. Also see criterion 4.7 on health and safety. • Storage of all chemicals as prescribed in FAO or GIFAP Code of Practice (see Annex 1). All chemical containers must be properly disposed of and not used for other purposes (see criterion 5.3). • Application of pesticides by proven methods that minimise risk and impacts. Pesticides are applied aerially only where there is a documented justification. • Proper disposal of waste material, according to procedures that are fully understood by workers and managers. Also see criterion 5.3 on waste disposal. • Specific annual medical surveillance for pesticide operators, and documented action to eliminate adverse effects. • No work with pesticides for pregnant and breast-feeding women.

	Guidance: National interpretation should consider: statutory requirements concerning pesticide use, lists of legally prohibited agrochemicals, agrochemical residues that should be tested for and the appropriate levels of residues, and best management practices for pesticide use or sources of information on these. ***Note: RSPO will urgently identify safe and cost effective alternatives to replace chemicals that are categorised as World Health Organisation Type 1A or 1B, or listed by the Stockholm or Rotterdam Conventions, and paraquat.***

APPENDIX 3: Examples of principles and guidelines for on-farm check for RTRS

Principle 1: Legal Compliance and Good Business Practice

1.1 There is awareness of, and compliance with, all applicable local and national legislation.

Criterion	Guidance
1.1	Producers need to have access to information which enables them to know what the law requires them to do. Examples include having a register of laws, or access to relevant advice on legislation. Legal compliance should be verified through: • checking publicly available data on compliance where available; • interviews with staff and stakeholders; and • field observations

Principle 2: Responsible Labor Conditions

2.1 Child labor, forced labor, discrimination and harassment are not engaged in or supported.

Criterion	Guidance
2.1	Documented evidence of relevant personal data of workers should be verified (e.g. sex and date of birth). The data collected should be locally appropriate and legal (eg. it may not be appropriate or legal to ask for the religion of employees in some countries). 2.1.1-2.1.3 Personnel should be free to leave their work place after their hours of work have been completed, and be free to terminate their employment provided that they give reasonable notice. 2.1.1-2.1.3 Reference: ILO Convention 29 on Forced Labor and 105 on Abolition of Forced Labor. 2.1.4-2.1.5 Children and minors (below 18) do not work in dangerous locations, in unhealthy situations, at night, or with dangerous substances or equipment, nor do they carry heavy loads. They are not exposed to any form of abuse and there is no evidence of trafficked, bonded or forced labor. 2.1.4-2.1.5 Reference: ILO Convention 138 on Minimum Age and 182 on Worst Forms of Child Labor. 2.1.6-2.1.7 Discrimination includes, but is not limited to: any distinction, exclusion, restriction or preference based on race, color, social class, nationality, religion, disability, sex, sexual orientation, pregnancy, HIV status, union membership or political association, with the purpose or effect of annulling, affecting or prejudicing the recognition, fruition or equal exercise of rights or liberties at work, be it in the process of contracting, remuneration, access to training, promotion, lay-offs or retirement. Divergence in salary is not considered discriminatory when the company has a policy, which is fully known to the employees, which specifies different pay scales for different levels of qualifications, length of experience etc. 2.1.6-2.1.7 Reference: ILO convention 100 on Equal Remuneration, and ILO Convention 111 on Discrimination.

Principle 4: Environmental Responsibility

4.5 On-farm biodiversity is maintained and safeguarded through the preservation of native vegetation.

4.5.1 There is a map of the farm which shows the native vegetation.

4.5.2 There is a plan, which is being implemented, to ensure that the native vegetation is being maintained (except areas covered under Criterion 4.4)

4.5.3 No hunting of rare, threatened or endangered species takes place on the property.

Criterion	Guidance
4.5	The map and plan should be appropriate to the size of the operation. In group certification the group manager can maintain the map centrally and can be responsible for maintaining and developing a plan for conservation.

Principle 5: Good Agricultural Practice

5.4 Negative environmental and health impacts of phytosanitary products are reduced by implementation of systematic, recognized Integrated Crop Management (ICM) techniques.

Criterion	Guidance
5.4	Surface and ground water includes lakes, rivers, lagoons, marshes, swamps, ground water sources, aquifers/water tables. Take into account scale and context especially for small farms – this relates to both the level of ICM expected and the records maintained. 5.4.2 The parameters that are monitored include the number of applications of phytosanitary products per crop cycle, volume of phytosanitary product used per hectare and toxicological class of product. 5.4.2 The level of potential harmfulness of a phytosanitary product can be determined from its WHO class for the purposes of this criterion. 5.4.2 Where targets are not met, documented evidence is presented to justify this. 5.4.4 Both local and national legislation should be taken into account.

DCA - National Centre for Food and Agriculture is the entrance to research in food and agriculture at Aarhus University (AU). The main tasks of the centre are knowledge exchange, advisory service and interaction with authorities, organisations and businesses.

The centre coordinates knowledge exchange and advice with regard to the departments that are heavily involved in food and agricultural science. They are:

Department of Animal Science
Department of Food Science
Department of Agroecology
Department of Engineering
Department of Molecular Biology and Genetics

DCA can also involve other units at AU that carry out research in the relevant areas.